Addendum #1, May 15, 2025

Invitation to Bid (ITB) #2505 YVC Building 2 Tenant Improvement
ITB Close Date/Time: June 5, 2025, 1:00 pm, Local Time

TO: All Offerors of Record

The College offers the following addition:

1. **Addition:**
   "ITB #2505 YVC Building 2 Tenant Improvement Pre-Bid Attendees List" is attached hereto and incorporated herein by this reference.

2. **Matterport**
   The Matterport files can be accessed via the following links:

   DHS Space: https://my.matterport.com/show/?m=DZkHKh14XaB

   Chemeketa Space: https://my.matterport.com/show/?m=97YvYoisBGC

3. **Reminder:**
   The deadline to protest the bid specifications or ask questions is May 21, 2025, 1:00 pm, Local Time.

All other terms and conditions of the original ITB Solicitation Document remain in effect.

Acknowledgement of receipt of all addenda issued must be noted either with the submission of your response to the ITB or separately prior to the public opening of the ITB.

Sincerely,

P. Kevin Walther, CPPB
Procurement Management Analyst
Office: 503.365.4794, Cell: 503.385.6652
kevin.walther@chemeketa.edu

Discover Chemeketa Community College

ITB #2505 YVC Building 2 Tenant Improvement

May 15, 2025, 10:00 am, Local Time

Building 2, 368 NE Norton Lane, McMinnville, OR 97128

Pre-Bid Meeting Attendee List

Company	Contact	Phone	Email	Cell
Joseph Muller Construction	Joshua Muller	541.232.6542	5mullerconstruction@gmail.com	
Kirby Nagelhout Construction Co.	Daniel Jeffery	503.451.9505	Danielj@KirbyNagelhout.com	
Andersen Construction	Justin Costanza	971.804.0669	jcostanza@andersen-const.com	
Woodburn Construction CM/GC	Athena Braff	503.981.9504	bids@woodburnconstruction.com	
Andy Medcalf Construction Co.	Gil Miller	503.584.1416	bids@andymedcalfconstruction.com	
Gerding Builders	Scott Schaumann	541.753.2021	scotts@gerdingbuilders.com	541.223.1890
Triplett Wellman	Nick Wellman	503.982.4188	nick@triplettwellman.com	
Gallant Construction	Jason Draper	415.912.6897	jason.draper@gogallant.com	
Gallant Construction	Jon Cook	503.773.5077	Jon.Cook@gogallant.com	
Truebeck Construction	Paige Camacho	503.367.8135	paige.camacho@truebeck.com	
Creative Contracting	Tai Kim	503.407.1447	t.kim@cciteams.com	971.226.8327
First Cascade Corporation General Contractors	Madison Pihl	503.699.8970	madisonp@firstcascade.com	503.460.7079
First Cascade Corporation General Contractors	Marios Cuellar	503.699.8970	madisonp@firstcascade.com	503.460.7079
Inline	Jeff Rule	503.642.5117	Bids@inline-cc.com	
Perlo Construction	John Kane	503.624.2090	jlkane@perlo.biz	971.442.8380
Perlo Construction	Ben Bracelin	503.828.8823	bbracelin@perlo.biz	
Curt Faus Construction	Alex Newman	503.699.1103	alexnewman@cfauscorp.com	503.826.6362
Curt Faus Construction	Kim Taylor		kimtaylor@cfauscorp.com	
Curt Faus Construction	Matt Ness	503.740.0983	mattness@cfauscorp.com	
Artis	Brianna Frenzel	503.248.9370	bfrenzel@artisbuilds.com	503.360.8380
CB Construction	Troy Farwell	541.263.1555	troy@cbconst.us	
Cedar Mill Construction	Aaron Adams	971.533.3996	aaron@cedarmillcc.com	
HSWC	Kairy Park/Nick Steers	503.220.0895	parkk@hswc.com	
Todd Construction	Will Somme	503.572.3187	bids@toddconstruction.com	
Bremik Construction	Kalie Svellentrop	503.688.1000	bids@bremik.com	
P&C Construction	Bradley McVay	503.705.6377	bmcvay@builtbypandc.com	
2KG Contractors	Mario Lipari	503.489.2020	bids@2kgcontractors.com	
Ever On	Mark Wood	971.732.0079	markwood@everonsolutions.com	971.732.0079
O'Brien	Hank Smitz	503.799.8962	hank@obrien-co.com	
3 Kings Environmental	Jason Jacoby	360.907.4519	jjacoby@3kingsinc.com	
L.R. Brabham	Matt Liles	541.731.8590	matt@lrbrabham.com	
Farnham Electric	Jeff Farnhand	503.931.6804	jeff@farnhamelectric.com	
Flourish Contractors	Ola Elkanah	971.239.2065	flourishcontractors17@gmail.com	
Gormley Plumbing	Dan Hein	971.703.9494	danh@gormleyplumbing.com	503.437.0300
Clima-Tech	Josh Sasser	720.947.9911	josg.sasser@clima-tech.com	
Northwest Mechanical	Mike Parent	541.248.0170	mikep@nwmechanical.net	
BrandSafway Scaffold	Josh Jones	503.896.1252		
BrandSafway Scaffold	Josh Saucedo	971.930.5787	jsaucedo2@brandsafway.com	
HTT Communications	Craig Tibbs	541.990.7025	craig.tibbs@httcommunication.com	
Sunlight Electric	Vitaliy Babiy	971.295.3131	vitaliyb@sunlightelectricinc.com	
LOI Environmental & Demolition Services	Ben Amacher	503.332.1015	b.amacher@loienviro.com	
American Heating	Steve Beskow	503.519.7160	s.beskow@americanheating.net	
Concrete GPR	Reid Davis	541.801.1477	reid@concretegpr.com	
Haworth Inc	Taylor Haworth	971.237.5872	taylor@haworthinc.net	
Caslin	DeWayne Kuffler	503.371.3011	dewayne@caslininc.com	
Caslin			johnh@caslininc.com	
PMG	Ramon Martinez	503.761.5924	ramon@pmgasbestosinc.com	
National Network Services of Oregon	Darin Housley	541.726.9209	darin.housley@nnsoregon.com	541.953.7066
Wiremap Systems	Matt Bonn	541.223.2638	matthew@wiremapsystems.com	
Delta Fire	Tye North	503.620.4020 x 121	tyen@deltafire.com	
Jim Co Electrical Contracting	Adam Bloomfield	541.258.6111	adamb@jimcoelectric.biz	503.648.3288
Salem Fire Alarm	Dave Garrett		garrett@salemfirealarm.com	503.428.2696
Local Plumbing Company	Kenny Flaig	503.642.2067	kennyf@localplumbingco.com	971.228.9193
BX Electric LLC	Bryce Herinckx	971.276.9922	bryce.herinckx@bxelectricllc.com	
TC Electric LLC	Tim Calonder	971.237.0394	tcelectricllc@gmail.com	

Discover Chemeketa Community College

Invitation to Bid (ITB) #2505
Yamhill Valley Campus (YVC)
Building 2 Tenant Improvement

Estimate
$5,000,000

Issue Date
May 8, 2025

Mandatory Pre-Bid Conference
May 15, 2025, 10:00 am, Local Time at
Yamhill Valley Campus, Building 2
368 NE Norton Lane, McMinnville, OR 97128

Closing Date/Time
June 5, 2025, 1:00 pm Local Time
Opening broadcasted live via Zoom at https://chemeketa.zoom.us/j/92920888740

ATTENTION - Electronic Bids Only
Electronic bids must be received prior to the Closing Date/Time at: procurement@chemeketa.edu**.**

*Bids received by mail or common carrier may be rejected and returned unopened***.**

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A. PUBLIC NOTICE

Invitation to Bid (ITB) #2505 Yamhill Valley Campus (YVC) Building 2 Tenant Improvement
Estimate: $5,000,000, **Bid Closing:** June 5, 2025, 1:00 pm, Local Time
Phase 1: Start Date: July 1, 2025, **Final Completion:** December 1, 2025.
Phase 2: Start Date: December 2, 2025, **Final Completion:** June 1, 2026.

Chemeketa Community College requests electronic Bids from qualified Bidders to provide construction services for the YVC Building 2 Tenant Improvement project at 368 NE Norton Lane, McMinnville, OR 97128. The Contractor will specifically provide construction materials and services as described in the Solicitation Document.

Solicitation Documents: Available electronically only on the college Procurement Services website at: https://go.chemeketa.edu/procurement.

Mandatory Pre-Bid Conference: May 15, 2025, 10:00 am, Local Time. Location: YVC, Building 2, 368 NE Norton Lane, McMinnville, OR 97128.

Protest of the Solicitation Document, Specifications, or Contract Terms: Submit via email to procurement@chemeketa.edu with "Question – ITB #2505 YVC Building 2 Tenant Improvement" in the subject line no later than May 21, 2025, 1:00 pm, Local Time.

ELECTRONIC BIDS ONLY: Submit Bid no later than June 5, 2025, 1:00 pm, Local Time with the forms specified in the Solicitation Document via email to procurement@chemeketa.edu with "ITB #2505 YVC Building 2 Tenant Improvement" in the subject line. Bids received in any other format may be rejected and returned unopened. Conclusive proof of Bid receipt shall be determined by the date and time the email containing the Bid is received at procurement@chemeketa.edu.

Bid Closing: June 5, 2025, 1:00 pm Local Time.

Bid Opening: Broadcast live via Zoom at https://chemeketa.zoom.us/j/92920888740 immediately following the Bid Closing, prices will be read aloud.

First-Tier Subcontractor Disclosure Forms: Submit either with the Bid submission or within 2 working hours after Bid Closing to procurement@chemeketa.edu with "First-Tier Subcontractor Form - ITB #2505 YVC Building 2 Tenant Improvement" in the subject line no later than June 5, 2025, 3:00 pm, Local Time. Forms submitted after the deadline will not be accepted.

Prequalification and Bid Bond: NOT required

Public Works: Any contract resulting from this ITB is for a public works subject to ORS 279C.800 to 279C.870, but not subject to the Davis-Bacon Act (40 U.S.C. 3141 et seq.). All workers shall be paid not less than the applicable Oregon prevailing wage rates in accordance with ORS 279C.838 and 279C.840. The applicable prevailing wage rates for this ITB and the resulting contact will be the prevailing wage rates for Oregon non-residential public works projects, effective April 5, 2025.

ITB Coordinator: P. Kevin Walther, kevin.walther@chemeketa.edu

Publish/Date: Chemeketa Community College Procurement website and OregonBuys, May 8, 2025.
Publish/Date: Daily Journal of Commerce, May 9, 2025.

B. GENERAL INFORMATION

Background
In general, the project comprises a 31,636 SF of new office building space for the Health and Human Services department. The building will remain occupied and the portion of the space that is not under construction will remain fully operational. The Work shall be phased in two timeframes, as shown on the Drawings:

Phase I Final Completion: December 1, 2025
Phase II Final Completion: June 1, 2026.

Contractor shall schedule work during regular business hours, 7:00 a.m. to 6:00 p.m., Monday through Friday. Disruptive work that creates excessive noise, traffic, or odors shall be scheduled after hours or on Saturday or Sunday. Before hours, after hours, or weekend work shall be prearranged and scheduled with the Owner's Project Representative. Contractor may be asked to cease daytime work and to reschedule if it is found to interfere with the Owner's operations. General Contractor is responsible for overall coordination of trades. Mechanical and electrical contractors are responsible for coordinating with each other and making provisions in their work for the other's trade.

The Owner will pay the plan review fee, general building permit fee and systems development charges. The Contractor shall pay all other permit and use fees including, but not limited to: Specialty contractor fees and permit costs; public works fees and permits; plumbing, mechanical, electrical and related permits and fees; business license fees; permits and fees for work in public rights-of-way, temporary work, street closures, and utility taps. The Contractor shall be responsible for violations of law for any cause in connection with the completion of the work. The Contractor shall be responsible for obstruction or damage to streets, sidewalks, utilities and other public or private improvements done in connection with completion of the work.

Architect of Record
Facet Architects
3095 River Road N
Salem, Oregon 97303
503 390-0281

Structural Engineer of Record
MSC Engineers, Inc.
3470 Pipebend Place NE, Suite 120
Salem, Oregon 97301
503 399-1399
Fax 503 399-8259

Mechanical/Electrical Engineer of Record
PAE Consulting Engineers
5520 SW Fifth Avenue, Suite 1500
Portland, Oregon 97204
503 226-2921

Commissioning Agent
Elevate Building Commissioning
1028 SE Water Avenue, Suite 215
Portland, Oregon 97214
503 477-7123

Tentative Bid and Award Dates
The College reserves the right to adjust dates as needed.

Release Bid:	May 8, 2025
Mandatory Pre-Bid Conference:	May 15, 2025, 10:00 am, Local Time. Location: YVC, Building 2, 368 NE Norton Lane, McMinnville, OR 97128
Deadline to Protest Bid Specs/Questions:	May 21, 2025, 1:00 pm, Local Time
Bid Closing:	June 5, 2025, 1:00 pm, Local Time
Bid Opening:	Broadcasted live via Zoom at https://chemeketa.zoom.us/j/92920888740 immediately following the Bid Closing, prices will be read aloud.
Deadline for submission of First-Tier Subcontractor Disclosure Form:	June 5, 2025, 3:00 pm, Local Time
Notice(s) of Intent to Award:	June 12, 2025
Board Approval:	June 18, 2025
Issue Notice(s) to Proceed:	July 1, 2025
ITB Coordinator:	P. Kevin Walther, CPPB, Procurement Management Analyst Office: 503.365.4794. Cell: 503.385.6652 kevin.walther@chemeketa.edu

The ITB Coordinator is the single points of contact for this procurement. All communication between the Bidder and the College regarding this solicitation shall be in writing, submitted by e-mail, to the ITB Coordinator. Email inquiries shall be identified in the subject line as "ITB #2505 YVC Building 2 Tenant Improvement." Bidders are to rely on written statements issued exclusively by the ITB Coordinator or their designee. Any other communication will be considered unofficial and non-binding. Communications directed to other parties will have no legal bearing on this ITB or the resulting Contract.

WARNING: Unless otherwise indicated herein, this entire Solicitation Document may be obtained from the College's Procurement Services website @ https://go.chemeketa.edu/procurement. If obtained from any source other, it is the Bidder's responsibility to ensure a full and complete set of the Solicitation Document has been obtained.

Addenda
Any addenda or clarifications to this Solicitation shall be published on the Chemeketa Community College Procurement Services website @ https://go.chemeketa.edu/procurement. It is the responsibility of each Bidder to check for any information or addenda to this solicitation. Failure of any Bidder to receive any such addenda or interpretation shall not relieve the Bidder from any obligation under its Bid as submitted.

Except to the extent required by public interest, College will not issue Addenda less than 72 hours before the Closing unless the Addendum also extends the Closing. Addenda specifically related to the Bid Closing date and time may be issued with less than 72-hours' notice.

Multiple Submittals
Bidders may submit more than one ORIGINAL Bid; however, each alternative Bid must be presented as a complete Bid and will be evaluated independently of any other.

Required Submittals/Bidder's Checklist
For consideration, Bidder(s) shall return one ORIGINAL set of the submittals identified below electronically to procurement@chemeketa.edu. All documents must be clearly and distinctly typed or written with ink in the English language. No erasures are permitted. Mistakes must be crossed out and initialed in ink by the person signing the Bid, otherwise the interlineations may render the Bid non-responsive.

SUBMITTALS SHALL INCLUDE:

- ☒ **Exhibit C – Bid Response Form**
- ☒ **Exhibit D - Responsible Bidder Determination Form**
- ☒ **Exhibit E – First Tier Subcontractor Form** (Submit either with the Bid submission or within 2 working hours after Bid Closing to procurement@chemeketa.edu with "First-Tier Subcontractor Form - ITB #2505 YVC Building 2 Tenant Improvement" in the subject line but no later than June 5, 2025, 3:00 pm, Local Time. Forms submitted after the deadline will not be accepted)

Firm Bids
Bids shall be firm, may not be modified or withdrawn, for a period of sixty (60) days after the Bid Closing date. Each respondent may withdraw their Bid if it has not been accepted within sixty (60) days from the Bid Closing date.

Bid Development Costs
Submission of a Bid to the College does not obligate the College to pay any expenses incurred by the Bidder in preparation of its Bid, nor does it obligate the College in any other respect. The College will not reimburse the cost of a successful protest. It is a condition of submission that costs of submitting a Bid are solely the cost of the Bidder.

Bid Ownership
All Bids become the property of the College and will not be returned to the Bidder. Bids that are not opened may be returned to the Bidder or disposed of by the College at the College's discretion once the time to protest the refusal to consider the Bid has passed.

Bid Review Process
Only those Bids, which appear to meet all of the requirements will be further considered. No material changes may be made to a Bid after the deadline for its submission. The College reserves the right to seek clarifications of each Bid. In clarifying or elaborating on a Bid, a Bidder explains or amplifies what is already there; it does not supplement, change, alter, or correct its Bid.

Bid Rejection and Solicitation Cancellation
The College reserves the right to cancel all or any portion of the procurement and the right to reject any or all Bids.

Contractual Process
After the lowest responsive and responsible Bidder(s) has been selected, the contract shall be prepared by the college, reviewed/approved by appropriate staff and/or Board members, and signed as duly authorized.

Bidders should not submit any information that they do not wish to have become part of the completed Contract. If any discrepancy arises between the Bid and the ITB, the terms in the ITB shall prevail. Failure of the selected Bidder to accept these obligations in a purchase agreement, purchase order, delivery order, or similar acquisition instrument/Contract, may result in cancellation of the award. The Bid, ITB, and subsequent college-issued Contract will collectively form the agreement.

No other additional contracts, unless otherwise indicated by the Bidder at the time of the Bid submittal will be considered. Should Bidder require that a standard company contract be signed, a copy of the proposed contract must be submitted along with the Bid. If submitted, this contract will be evaluated to make certain that it does not deviate from the conditions of the ITB. Should the submitted company contract deviate from the terms and conditions of the ITB, said contract will be modified by the College for compliance. After the contract resulting from this ITB has been awarded and a valid contract has been signed, no other company contract will be considered. Any contracts submitted by the Bidder after such award will be considered a counter Bid and may be subject to rejection and/or cancellation.

C. SCOPE OF WORK/SPECIFICATIONS

Construction Materials & Services
The Contractor will provide construction materials and services for the YVC Building 2 Tenant Improvement project at 368 NE Norton Lane, McMinnville, OR 97128 as described in the Solicitation Document on file at the college Procurement Services Office. The Contractor will specifically provide construction materials and services as defined and required in Exhibit K Drawings and Specifications.

D. SPECIAL TERMS AND CONDITIONS

Confidential/Proprietary Information
Any Contractor awarded a Contract as a result of this ITB will treat as confidential all the College's information in its possession and will take precautions to not reproduce, copy, duplicate, disclose or in any way treat the information supplied by the College in any manner except as specified by this Agreement. Any successful Contractor agrees to exercise extreme caution and discretion in safeguarding the College's information and materials.

Conduct of Contractor's Employees/Subcontractors
College retains the right to stop any activity and/or to require dismissal from the job site any Contractor employee or subcontractor whose conduct does not comply, or gives the College reasonable suspicion to believe the conduct does not comply, with College Policy, or is otherwise unlawful. Activities and/or behaviors may include, but not be limited to, providing a: Respectful workplace; Harassment free workplace; Drug and alcohol-free workplace; and a Smoke free workplace.

The use of tobacco products, marijuana, and inhalant delivery systems is prohibited on any property owned and/or controlled by the College, including but not limited to, buildings, sidewalks, parking lots, vehicles (owned or leased) recreational areas and landscaped areas

It is unlawful for a person under 18 years of age to possess tobacco products or inhalant delivery systems ORS 167.785 [Formerly 167.400]

College retains the right to stop any activity and/or to require dismissal from the job site any Contractor

employee or subcontractor whose conduct is deemed to be hazardous to College employees, members of a user group, students, community members or College owned and/or controlled property, or is otherwise unlawful.

Chemeketa Community College is a college campus; however, there are a large number of minors on College property. Contractors are encouraged to be mindful of any prior misconduct of their employees and/or subcontractors. Contractors are solely responsible and shall be held solely liable for any misconduct of their employees or subcontractors on College owned and/or controlled property.

Contractor is solely liable for Contractor employee's and subcontractor's conduct while performing services on any College owned and/or controlled property.

Contractor is solely responsible for properly addressing allegations of unlawful workplace misconduct or College Policy violations among Contractor's employees and subcontractors on any College owned and/or controlled property.

Contractor agrees to cooperate with investigations of alleged Title IX violations committed by Contractor's employees and subcontractors against College employees, members of a user group, students or community members on College owned and/or controlled property.

Sustainability
The College is committed to sustainable purchasing practices.
Sustainability preferences may include, but are not limited to, the following:
Energy efficiency (such as Energy Star designation)
Energy conservation
Waste reduction
Packaging reduction
Trade-Ins/Retrievals/Refurbishment of Used Products
Use of Recycled and Recyclable Materials (products, packaging, shipping materials)
Responsible shipping and transportation
Reduced water usage
Reduced paper usage (including e-procurement and e-payment)

Any products described as "Green products" in this solicitation shall mean "environmentally-preferable products." Green products are products or services that have a lesser or reduced effect on human health and the environment, when compared with competing products or services that serve the same purpose. This comparison applies to raw materials, manufacturing, packaging, distribution, use, reuse, operation, maintenance, and disposal.

Remainder of page intentionally left blank.

EXHIBIT C - Bid Response Form

ITB #2505 YVC Building 2 Tenant Improvement
Closing Date/Time: Thursday, June 5, 2025 at 1:00 pm, Local Time

I, the undersigned, an authorized representative of _____
(Company Name)

whose address is _____
(Number and Street) (City) (State) (Zip)

have read and thoroughly understand the ITB Solicitation Document issued by Chemeketa Community College for furnishing the Work required by ITB #2505 YVC Building 2 Tenant Improvement.

Acting on behalf of my firm, which is listed above, I do attest that the services offered by us meets Chemeketa Community College's specifications in every respect. We are attaching a list of Exceptions: ☐ **Yes or** ☐ **No**

MANDATORY REQUIREMENT - Prevailing Wage
Any contract resulting from this ITB is for a public works subject to ORS 279C.800 to 279C.870, but not subject to the Davis-Bacon Act (40 U.S.C. 3141 et seq.). All workers shall be paid not less than the applicable Oregon prevailing wage rates in accordance with ORS 279C.838 and 279C.840. The applicable prevailing wage rates for this ITB and the resulting contact will be the prevailing wage rates for Oregon non-residential public works projects, effective January 5, 2025.

Bidder must acknowledge and agree by checking the "Yes" box and initialing this statement:

☐ **Yes**, Bidder hereby agrees to be bound by and will comply with the provisions of ORS 279C.838 and ORS 279C.840 (Oregon prevailing wage laws). **Bidder Initials:** _____

MANDATORY REQUIREMENT - Addenda: Bidder acknowledges, agrees, and certifies to the following: If any Addenda are issued in connection with this ITB, the Bidder has received and duly considered such Addenda, and has completed the blanks below identifying all Addenda issued, and acknowledging and agreeing to the terms of all such Addenda as those terms revise the terms, conditions, Plans and Specifications of this ITB. **Receipt of addenda is hereby acknowledged as follows:**

Addendum No.	Date of Addenda

MANDATORY REQUIREMENT - Oregon Business Registration: Oregon law requires people and businesses transacting business in Oregon under an assumed name to register it as a public record with the Oregon Secretary of State. Please indicate your business' current registration type with an "X" in the appropriate space:

☐ **Corporation** ☐ **Professional Corporation** ☐ **Partnership** ☐ **Limited Partnership**
☐ **Limited Liability Company** ☐ **Limited Liability Partnership** ☐ **Sole Proprietorship** ☐ **Other**

Registration No.: _____

MANDATORY REQUIREMENT – Benefit Company Designation: Is the Bidder a benefit company that has been incorporated, organized, formed or created under ORS 60.754?

☐ **Yes** ☐ **No**

If "Yes", the Bidder must submit a certificate of existence issued under **ORS 60.027 Certificate of existence or authorization** with their Bid to be recognized as such.

MANDATORY REQUIREMENT - Oregon Reciprocal Preference Law (ORS 279.029): In compliance with ORS 279.029, each Bidder must state in its Bid whether it is a Resident or Non-resident Bidder. Bids that fail to provide this information may be considered nonresponsive and may be rejected.

☐ **Oregon Resident Bidder** ☐ **Non-Resident Bidder**

If a Non-resident Bidder, indicate the state in which the Bidder resides and the preference discount given by that state:

State: _____ **Preference Discount (percentage):** _____

The preference discount listed must be specifically for the type of product work or service bid. In determining the lowest responsible Bidder, this percentage will be added to bids of Non-resident bidders that are given a preference discount.

State of Oregon Construction Contractor's Board (CCB) Requirements: Bidders shall be licensed with the CCB prior to bidding on Public Improvement Contract(s). Bids that fail to provide this information may be considered nonresponsive and may be rejected. All subcontractors participating in the project shall be similarly registered with the CCB at the time they propose to engage in subcontract work. The CCB registration requirements apply to all public works contracts unless superseded by federal law.

MANDATORY REQUIREMENT - Bidders will provide their CCB (ORS 701.055) registration number below:

CCB Registration No.: _____ **Expiration Date of CCB No.:** _____

Asbestos Abatement Licensing Requirements: An asbestos abatement license under ORS 468A.720 will not be required of the Contractor or its subcontractors.

Joint Venture/Partnership Disclosure: Bids submitted under "joint venture" arrangements or other multi-party agreements will be rejected.

The Bidder certifies and warrants the following:

The Bidder has the power and authority to enter into and perform any resulting Contract.

The Bidder acknowledges that the Contract when executed and delivered is a valid and binding obligation and enforceable in accordance with Contract terms.

The Bidder has not discriminated and will not discriminate, in violation of ORS 279A.110, against any disadvantaged business enterprise, a minority-owned business, a woman-owned business, a business that a service-disabled veteran owns or an emerging small business that is certified under ORS 200.055 in obtaining any required subcontract.

That the Bidder, for a period of no fewer than six (6) calendar years prior to the date of the order has faithfully complied with the following:

- All tax laws of this state, including but not limited to ORS 305.620 and ORS chapters 316, 317 and 318;
- Any tax provisions imposed by a political subdivision of this state that applied to Bidder, Bidder's operations, receipts, income, or to Bidder's performance of or compensation for any work performed by Bidder;
- Any tax provisions imposed by a political subdivision of this state that applied to Bidder, goods, services, or property, whether tangible or intangible; and
- Any rules, regulations, charter provisions, or ordinances that implemented or enforced any of the forgoing tax laws or provisions.

That any goods or services delivered to the College as contracted shall be provided free and clear of any and all liens, claims, mortgages, security interests, liabilities, charges and encumbrances of any kind.

That prices submitted herein have been arrived at in an entirely independent and lawful manner by the Bidder without consultation with other Offerors or potential Offerors or foreknowledge of the prices to be submitted in response to this solicitation by other Offerors or potential Offerors on the part of the Bidder, its officers, partners, owners, providers, representatives, employees or parties in interest, including the affiant.

That each person signing on behalf of the Bidder certifies, and in the case of a sole proprietorship, partnership or corporation, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of their knowledge and belief, no member of the Chemeketa Community College Board of Education or College officer, employee, or person whose salary is payable in whole or in part by Chemeketa Community College, has a direct or indirect financial interest in the award of this Offer, or in the services to which this Offer relates, or in any of the profits, real or potential, thereof, except as noted otherwise herein.

That before signing his/her Offer, has made a careful examination of the plans, specifications, and character of work required; that he/she has made a careful examination of the location and condition of the work, verified all measurements at the job site, and sources of supply of materials.

That the College will in no case be responsible for any loss for any unanticipated costs which may be suffered by the Contractor as a result of the Contractor's failure to fully inform himself/herself in regard to all conditions pertaining to the completion of the Contract.

That by submitting its Offer that it will comply with all statutes, regulations, executive orders, and College policies as are hereby incorporated by reference.

That the Bidder has read and understood the ITB Solicitation Document issued by Chemeketa Community College for furnishing the Work required by this ITB #2505 YVC Building 2 Tenant Improvement and agree to abide by and fulfill its requirements if awarded the Contract as a result of this Offer.

We, therefore, offer and make this Bid to furnish the work described herein at the lump sum price indicated hereon for the work required by the Solicitation Document:

Base Bid: $ _____ , _____ , _____ . _____

Name of Bidder: _____

Street Address: _____

City: _____ **State:** _____ **Zip:** _____

Signature: _____

Name/Title (please type or print): _____

Phone: _____ **Mobile:** _____

Email: _____

Certification of COBID/DBE Status

The College requests that the Bidder answer the following question: Is your firm currently either an enterprise certified by the State of Oregon's, Oregon Certification Office for Business Inclusion and Diversity (COBID), or a Disadvantaged Business Enterprise certified under the federal criteria set out in 49 CFR 26 and OAR 445-050-0020? **Yes** ☐ **No** ☐ If "Yes" please provide the following:

COBIB Certification Type: _____ **Oregon Certification ID #:** _____

Federal Certification Type: _____ **Federal Certification ID#:** _____

Your Input Will Be Helpful

Please help us understand how to best reach Bidders by quickly filling out the following survey:

How did you find out about this solicitation?

☐ OregonBuys website

☐ Chemeketa Procurement Services website

☐ Other: _____

How can we improve the notification process? _____

_____

Exhibit D Responsible Bidder Determination Form (Exhibit D)
Invitation to Bid (ITB) #2505 YVC Building 2 Tenant Improvement

Required Submittal: This Exhibit D must be completed in its entirety and returned with the Bid no later than the Closing Date/Time, June 5, 2025, 1:00 pm, Local Time.

The information provided in this form is part of the College's inquiry concerning bidder responsibility. Please print clearly or type. If you need more space, use additional pages. Submission of a form with unanswered questions, incomplete or illegible answers may result in a finding that you are not a responsible bidder.

Declaration and Signature

The undersigned hereby declares that they are duly authorized to complete and submit this Exhibit D and that the statements contained herein are true and correct as of the date set forth below. Incomplete, incorrect or misleading information will be reason for a determination by the College of non-responsibility. The undersigned hereby understands and agrees that at the request of the College, the undersigned may be required to obtain from undersigned's major subcontractors and submit to the College all information requested in Exhibit D, contained herein, prior to College awarding the contract. Failure to obtain and submit major subcontractor information as requested by College will be reason for a determination by the College of non-responsibility.

By: _____ **Date:** _____
(Signature of authorized official)

Name: _____ **Title:** _____
(Please Type or Print)

Company Name: _____

The College reserves the right to investigate and consider all information provided in response to this Exhibit D, including without limitation: copies of required licenses and certifications; any customer references, whether or not furnished by the Bidder; past performance of any Bidder with respect to its successful performance of similar contracts; compliance with specifications/contractual obligations; and Bidder's completion or delivery of a product/service on schedule.

Parent Company Name (if applicable) _____

Former Business Name(s) _____
(if applicable) _____
_____
_____
_____

1) Similar Contracts in Currently Force

List any similar contracts you are party to that are currently in force.

Contract #1

Location: _____

Owner's Name: _____

Street Address: _____

_____ _____ _____
(City) (State) (Zip)

Telephone: _____

Type of Work: _____

Term: _____ _____
(Start Date) (End Date)

Contract #2

Location: _____

Owner's Name: _____

Street Address: _____

_____ _____ _____
(City) (State) (Zip)

Telephone: _____

Type of Work: _____

Term: _____ _____
(Start Date) (End Date)

Contract #3

Location: _____

Owner's Name: _____

Street Address: _____

_____ _____ _____
(City) (State) (Zip)

Telephone: _____

Type of Work: _____

Term: _____ _____
(Start Date) (End Date)

2) Similar Contracts as Prime Contractor

List the largest similar contracts you have completed in the last 5 years as a prime contractor (*list at least 3 if applicable*).

Contract #1	
Location:	_____
Owner's Name:	_____
Street Address:	_____
	_____ (City) _____ (State) _____ (Zip)
Telephone:	_____
Type of Work:	_____
Term:	_____ (Start Date) _____ (End Date)

Contract #2	
Location:	_____
Owner's Name:	_____
Street Address:	_____
	_____ (City) _____ (State) _____ (Zip)
Telephone:	_____
Type of Work:	_____
Term:	_____ (Start Date) _____ (End Date)

Contract #3	
Location:	_____
Owner's Name:	_____
Street Address:	_____
	_____ (City) _____ (State) _____ (Zip)
Telephone:	_____
Type of Work:	_____
Term:	_____ (Start Date) _____ (End Date)

3) Similar Contracts as Subcontractor

List the largest similar contracts you have completed in the last 5 years as a subcontractor (*list at least 3 if applicable*).

Contract #1	
Location:	_____
Owner's Name:	_____
Street Address:	_____
	_____ (City) _____ (State) _____ (Zip)
Telephone:	_____
Type of Work:	_____
Term:	_____ (Start Date) _____ (End Date)

Contract #2	
Location:	_____
Owner's Name:	_____
Street Address:	_____
	_____ (City) _____ (State) _____ (Zip)
Telephone:	_____
Type of Work:	_____
Term:	_____ (Start Date) _____ (End Date)

Contract #3	
Location:	_____
Owner's Name:	_____
Street Address:	_____
	_____ (City) _____ (State) _____ (Zip)
Telephone:	_____
Type of Work:	_____
Term:	_____ (Start Date) _____ (End Date)

4) Surety Bonds

List the companies from whom you obtain surety bonds.

Surety Company #1

Company: _____

Contact Name: _____

Email: _____

Present amount of bond coverage: $ _____

Has your application for a surety bond ever been declined? Yes ☐ No ☐
(*If Yes, please provide detailed information in remarks*)

During the past 2 years have you been charged with a failure to meet the claims of your subcontractors or suppliers? Yes ☐ No ☐
(*If Yes, please provide detailed information in remarks*)

Remarks:

Surety Company #2

Company: _____

Contact Name: _____

Email: _____

Present amount of bond coverage: $ _____

Has your application for a surety bond ever been declined? Yes ☐ No ☐
(*If Yes, please provide detailed information in remarks*)

During the past 2 years have you been charged with a failure to meet the claims of your subcontractors or suppliers? Yes ☐ No ☐
(*If Yes, please provide detailed information in remarks*)

Remarks:

5) References

Provide four references, two of whom are project owners and two of whom are subcontractors or suppliers.

Reference #1: Project Owner
Business Name: _____
Contact's Name: _____
Telephone: _____
Email Address: _____
Reference #2: Project Owner
Business Name: _____
Contact's Name: _____
Telephone: _____
Email Address: _____
Reference #3: Subcontractor or Supplier
Business Name: _____
Contact's Name: _____
Telephone: _____
Email Address: _____
Reference #4: Subcontractor or Supplier
Business Name: _____
Contact's Name: _____
Telephone: _____
Email Address: _____

6) Performance and Integrity

a) Has the company or any of its predecessor companies, ever been declared in breach of any contract for unperformed or defective work?

☐ **Yes** ☐ **No** **Explain** _____

_____

_____

b) Has any employee, agent, or predecessor company, ever been convicted of a criminal offense arising out of obtaining, attempting to obtain, or performing a public or private contract or subcontract?

☐ **Yes** ☐ **No** **Explain** _____

_____

_____

c) Has any employee, agent, or predecessor company, been convicted under state or federal law of, including but not limited to, embezzlement, theft, forgery, bribery, falsification or destruction of records, receiving stolen property or any other offense indicating a lack of business integrity or business honesty?

☐ **Yes** ☐ **No** **Explain** _____

_____

_____

d) Has the company, any employee, agent, or predecessor company, been convicted under state or federal antitrust laws?

☐ **Yes** ☐ **No** **Explain** _____

_____

_____

e) Has any officer, partner, or predecessor companies, ever been an officer or partner of another company that failed to complete a security contract?

☐ **Yes** ☐ **No** **Explain** _____

_____

_____

7) Financial Resources

a) Indicate the total amount of work, expressed in dollars, your company reasonably believes it is capable of bonding at any one time: $_____.

What portion of this amount remains available at time of completion of this form? $_____.

b) Has your company, or any predecessor company, ever been at any time in the last ten years the debtor in a bankruptcy case?

☐ **Yes** ☐ **No** **Explain** _____

_____

_____

c) Does your company or any predecessor company have any outstanding judgments pending against it?

☐ **Yes** ☐ **No** **Explain** _____

_____

_____

d) In the past ten years, has your company, or any predecessor company, been a party to litigation, arbitration or mediation where the amount in dispute exceeded $25,000?

☐ **Yes** ☐ **No** **Explain** *(include court, case number and party names)* _____

_____

_____

e) In the past ten years, has your company, or any predecessor company, been a party to litigation, arbitration or mediation on a matter related to payment to subcontractors or work performance on a contract? *Check "yes" even if the matter proceeded to arbitration or mediation without court litigation.*

☐ **Yes** ☐ **No** **Explain** *(include court, case number and party names)* _____

_____

_____

f) Have you, any of your affiliates, or predecessor companies discontinued business operation with outstanding debts?

☐ **Yes** ☐ **No** **Explain** _____

_____

8) Key personnel

List the principal individuals of your company. Corporations are to list current officers and those who own 5% or more of the corporation's stock. Limited liability companies are to list members who own 5% or more of company. Partnerships are to list all partners. Joint ventures are to list each firm that is a member of the joint venture and the percentage of ownership the firm has in the joint venture.

Principal Individual #1
Name: _____
Position: _____
Years in industry: _____
Current Primary Responsibility: _____
_____
Principal Individual #2
Name: _____
Position: _____
Years in industry: _____
Current Primary Responsibility: _____
_____
Principal Individual #3
Name: _____
Position: _____
Years in industry: _____
Current Primary Responsibility: _____
_____

9) Project Superintendent

List the person who will be in direct charge of the work if your company is awarded this Contract and at least two similar projects this person has supervised within the past five years involving similar projects.

Project Superintendent	
Name:	
Position:	
Years in industry:	
Largest project supervised:	
Largest # of employees ever supervised:	

Superintendent's Previous Similar Project #1	
Name/Description of Project:	
Location:	
Type of Work:	
Contract Amount:	$
Year Completed:	
Name of Project Owner:	
Contact Person:	
Email:	

Superintendent's Previous Similar Project #2	
Name/Description of Project:	
Location:	
Type of Work:	
Contract Amount:	$
Year Completed:	
Name of Project Owner:	
Contact Person:	
Email:	

10) Equipment

List the major items of equipment required to complete this project (*if applicable*) that your company owns or has available for long-term use on the proposed work.

Equipment #1
Description: _____
Condition: _____
Quantity:
Equipment #2
Description: _____
Condition: _____
Quantity:
Equipment #3
Description _____
Condition _____
Quantity
Equipment #4
Description: _____
Condition: _____
Quantity:
Equipment #5
Description: _____
Condition: _____
Quantity:
Equipment #6
Description _____
Condition _____
Quantity

Exhibit E - First-Tier Subcontractor Disclosure Form (Form)

Invitation to Bid (ITB) #2505 YVC Building 2 Tenant Improvement

Bid Closing Date/Time: June 5, 2025, 1:00 pm, Local Time

First-Tier Subcontractor Disclosure Deadline Date/Time: June 5, 2025, 3:00 pm, Local Time

It is the responsibility of the Bidder to submit this Form, completed and signed, and any additional sheets, electronically to: procurement@chemeketa.edu, either with the Bid submission, or within two (2) working hours after the advertised Bid Closing Date/Time. Failure to submit this Form, completed and signed, by the disclosure deadline will result in a nonresponsive Bid. A nonresponsive Bid will not be considered for award.

List below the name of each subcontractor that will be furnishing labor, or furnishing labor and materials, that is required to be disclosed, the dollar value of the subcontract, and the category of work that the subcontractor will be performing. Attach additional sheets if needed.

Bidders without subcontractor that are required to be disclosed are still required to submit a completed and signed Form. Enter "NONE" in the "Name" field if there are no subcontractors that need to be disclosed.

The below listed first-tier subcontractor(s) are providing labor, or labor and materials, with a dollar value equal to or greater than:

1. 5% of the total Bid price including all alternates, but at least $15,000; or
2. $350,000 regardless of the percentage of the total Bid price.

	Subcontractor name	Dollar value of subcontract	Category of work
1)	_____	$ _____	_____
2)	_____	$ _____	_____
3)	_____	$ _____	_____
4)	_____	$ _____	_____
5)	_____	$ _____	_____

Company name: _____

Authorized signature: _____ **Date:** _____

Contact name: _____ **Phone:** _____

Email: _____

Submit this Form, completed and signed, to: procurement@chemeketa.edu

STANDARD PUBLIC IMPROVEMENT CONTRACT

PAYMENT BOND

Bond No. _____
Solicitation 2505
Project Name YVC Building 2 Tenant Improvement

_____(Surety #1)	Bond Amount No. 1:	$_____
_____(Surety #2)*	Bond Amount No. 2:*	$_____
**If using multiple sureties*	Total Penal Sum of Bond:	$_____

We, _____ as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto the Chemeketa Community College the sum of (Total Penal Sum of Bond)

_____

(Provided, that we the Sureties bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety), and

WHEREAS, the Principal has entered into a contract with the Chemeketa Community College, the plans, specifications, terms and conditions of which are contained in above-referenced Solicitation;

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, Determination and Findings for Liquidated Damages, and schedule of contract prices, are made a part of this Payment Bond by reference, whether or not attached to the contract (all hereafter called "Contract"); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and schedule of contract prices which are set forth in the Contract and any attachments, and all authorized modifications of the Contract which increase the amount of the work, or the cost of the Contract, or constitute authorized extensions of time for performance of the Contract, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things by it undertaken to be performed under said Contract and any duly authorized modifications that are made, upon the terms set forth therein, and within the time prescribed therein, or as extended therein as provided in the Contract, with or without notice to the Sureties, and shall indemnify and save harmless the Chemeketa Community College, and members thereof, its officers,

employees, volunteers, and agents or partners, against any claim for direct or indirect damages of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by the Contractor or its subcontractors, and shall promptly pay all persons supplying labor, materials or both to the Principal or its subcontractors for prosecution of the work provided in the Contract; and shall promptly pay all contributions due the State Industrial Accident Fund and the State Unemployment Compensation Fund from the Principal or its subcontractors in connection with the performance of the Contract; and shall pay over to the Oregon Department of Revenue all sums required to be deducted and retained from the wages of employees of the Principal and its subcontractors pursuant to ORS 316.167, and shall permit no lien nor claim to be filed or prosecuted against the Chemeketa Community College on account of any labor or materials furnished; and shall do all things required of the Principal by the laws of this State, then this obligation shall be void; otherwise, it shall remain in full force and effect.

Nonpayment of the bond premium will not invalidate this bond nor shall the Chemeketa Community College be obligated for the payment of any premiums.

This bond is given and received under authority of ORS Chapter 279C, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES:

Dated this _____day of _____, 20_____.

PRINCIPAL: _____

By _____
Signature

_____
Official Capacity

Attest: _____
Corporation Secretary

SURETY:_____
[Add signatures for each if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each bond]

_____
Name

_____
Signature

_____
Address

_____
City State Zip

_____
Phone Fax

STANDARD PUBLIC IMPROVEMENT CONTRACT

PERFORMANCE BOND

Bond No. _____
Solicitation 2505
Project Name YVC Building 2 Tenant Improvement

_____(Surety #1)	Bond Amount No. 1:	$_____
_____(Surety #2)*	Bond Amount No. 2:*	$_____
**If using multiple sureties*	Total Penal Sum of Bond:	$_____

We, _____as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto Chemeketa Community College the sum of (Total Penal Sum of Bond)

_____

(Provided, that we the Sureties bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety), and

WHEREAS, the Principal has entered into a contract with the Chemeketa Community College, the plans, specifications, terms and conditions of which are contained in the above-referenced Solicitation;

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, Determination and Findings for Liquidated Damages, and schedule of contract prices, are made a part of this Performance Bond by reference, whether or not attached to the contract (all hereafter called "Contract"); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and all authorized modifications of the Contract which increase the amount of the work, the amount of the Contract, or constitute an authorized extension of the time for performance, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal herein shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things undertaken by Contractor to be performed under the Contract, upon the terms set forth therein,

and within the time prescribed therein, or as extended as provided in the Contract, with or without notice to the Sureties, and shall indemnify and save harmless the Chemeketa Community College, and members thereof, its officers, employees, volunteers, and agents or partners, against any direct or indirect damages or claim of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by the Principal or its subcontractors, and shall in all respects perform said contract according to law, then this obligation is to be void; otherwise, it shall remain in full force and effect.

Nonpayment of the bond premium will not invalidate this bond nor shall the Chemeketa Community College be obligated for the payment of any premiums.

This bond is given and received under authority of ORS Chapter 279C, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES.

Dated this _____day of _____, 20_____.

PRINCIPAL: _____

By _____
Signature

_____
Official Capacity

Attest: _____
Corporation Secretary

SURETY:_____
[Add signatures for each if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each bond]

_____
Name

_____
Signature

_____
Address

_____
City State Zip

_____
Phone Fax

Exhibit H Draft Owner Contractor Agreement

Chemeketa Community College Contract

for Public Works/Public Improvements

(Competitive Bid/Fixed Price or Lump Sum)

This CONTRACT is entered into at Salem, Marion County, Oregon on this _____[date of award] by and between *Chemeketa Community College,* hereinafter "Owner or College", an Oregon Community College District formed and existing pursuant to ORS Chapter 341with its principal offices in Salem, Marion County, Oregon and _____, [describe business entity], a Construction Contractor or Specialty Contractor duly licensed to do business within the State of Oregon and registered with Oregon Construction Contractors' Board under CCB No. _____ [enter CCB number].

By this CONTRACT Contractor agrees and promises to supply all things and to perform all Work to accomplish the Project as described in the Contract Documents to construct a fully functional facility or improvement, complete and ready to use with the applicable and appropriate permits for occupancy under Project known as:

YVC Building 2 Tenant Improvement

In return for the Contract Price of $_____ [List Contract Price that was the basis for award] to be determined and paid according to the terms and conditions of this CONTRACT and of the Laws of the State of Oregon pertaining to payments to be made under public contracts. Progress Payments shall be made to the Contractor by the College monthly on the basis of a Certified Request for Payment made by the Contractor on a form approved by the College and listing the Work, the amount of Work accomplished in the applicable period and the Payment requested. The period covered by each request shall end on the 25th day of the month. Progress Payments are subject to a Retainage of five percent (5%) which may be withheld according to law at the discretion of the College. Retainage not applied to obligations of the Contractor and not released prior the Final Payment shall be paid to the Contractor with the Final Payment. The College shall compute Progress Payments on the basis of the amounts Bid or Proposed for each unit or category of Work or on the basis of an approved Schedule of Values except in the case of a Lump Sum award where Schedule of Values is not required in which case the College will estimate the percentage of completion for the period after consideration of the

Contractor's request. Unless otherwise provided by law, payment shall be due and interest shall commence to run thirty (30 days) after a request for payment in proper form and properly certified is received by the College.

Final Payment shall include all amounts due for the Work performed. Contractor shall request Final Payment as set out in the General Conditions. No request for final payment shall be made prior to the submission by the Contractor or all required Project Documentation including but not limited to documents to prove the payment of the prevailing rate of wage to all subject workers, "as built" documentation, operation manuals, warranties, waivers or releases of claims or liens from subcontractors and material suppliers, documents of title and releases of security interests for installed or supplied equipment and materials. No request for final payment shall be made prior to completion of all "Punch List" items and the correction of any and all defects in the Work to the satisfaction of the College.

Contractor shall submit a preliminary schedule not later than _____ [date].

Contractor shall submit a Project Schedule in _____ format for approval not later than _____ [date].

Contractor shall attend a Pre-Construction Meeting to be held at _____ [place] at ____ [time] on _____ [date]

College will issue Notice to Proceed following the Pre-Construction meeting, receipt of the Preliminary Schedule, proof of insurance and required Bonds.

Failure to promptly and properly complete contract execution within ten (10) calendar days from the date of expiration of the protest period may result in forfeiture of Bid Bond.

Substantial Completion shall be achieved by/within _____ [list days or date].

Final Completion shall be achieved by/within _____ [list days or date].

This Contract is the whole of the Agreement between the Parties and consists of:

> The Solicitation Document and addenda thereto, the Chemeketa Community College Public Improvement Agreement Form or other form of Agreement as appropriate, General Conditions, Supplemental General Conditions, if any, the accepted Offer or Proposal, Plans, Specifications, Amendments, Change Orders and the Determination and Findings for Liquidated Damages incorporated herein as "Attachment A," and no other documents unless otherwise provided in the Solicitation or in writing executed by the parties designating the document as part of the Contract. These may be bound together as a Project

Liquidated Damages shall be assessed at the rate contained in *Exhibit I*, attached and incorporated herein by reference.

Should any part of this Contract be found to be unlawful or otherwise unenforceable the unlawful or unenforceable part shall be stricken and the Contract otherwise enforced according to its terms. No oral agreement or past practice shall be admitted to modify, amend or supplement the terms of the Contract.

This CONTRACT shall be interpreted according to the laws of the State of Oregon and no action, suit or proceeding shall be commenced concerning it in any court except the Circuit Court of the State of Oregon in Marion County. The Parties agree, recite and stipulate that the College is a part of the State of Oregon created according to State law and within the Executive/Administrative Branch of State government and is not subject to suit in the Courts of the United States because of the immunity granted by the Eleventh Amendment of the Constitution of the United States. Contractor stipulates and agrees that no suit or action shall be commenced against the College by the Contractor or any other person on entity claiming on the basis of the Contract whether directly or for contribution or indemnity in any Court of the United States.

The College appoints _____ [name] its _____ [title] as its Authorized Representative to act on its behalf on all things pertaining to the Contract.

The Contractor appoints _____ [name] its _____ [title] as its Superintendent with plenary power to act on its behalf on all things pertaining to the Contract.

Notices to the College shall be addressed to:

Notices to the Contractor shall be addressed to:

NOTE: A payment request is deemed to have been received on the date that the last copy to be delivered is received by the last designated recipient if more than one recipient is designated.

This Contract and the right to payment under it shall not be assigned in whole or in part for any purpose, nor, shall Contractor be relieved of the duty to perform any part of it by reason of any purported assignment whether the same be made by the Contractor or by the operation of law. The College may in its sole discretion consent to assignment of the Contract in writing provided that the assignee consent to all terms and conditions of the Contract, pay the costs incurred by the College in connection with the assignment and provide without expense to the College any and all bonds, insurance, warrantees and guarantees required by law or demanded by the College. Further, any assignee shall provide the College with evidence that any and all liens, claims and other amounts due have been paid to any person or entity providing materials, service or labor for the Work.

The effective date of this CONTRACT is _____.

Executed by:

FOR THE CONTRACTOR

_____

_____

_____

FOR THE COLLEGE

_____
Aaron Hunter, Vice President/Chief Financial Officer

Exhibit I GENERAL CONDITIONS FOR PUBLIC IMPROVEMENT CONTRACTS
January 10, 2019

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ADMINISTRATION OF THE CONTRACT

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A.1 DEFINITION OF TERMS:

In the Contract Documents the following terms shall be as defined below:

ADDENDUM (ADDENDA) means a change, clarification or addition to the Solicitation Documents issued by the Owner to prospective bidders or proposers prior to the time set for the submission of Offers. An Addendum may reset the time for the submission of offers.

ALLOWANCES mean the budget amounts designated in the Contract Documents, Contractor's Proposal, Work Order, Guaranteed Maximum Price (GMP), Supporting Documents, Change Order or Amendment reserved for and dedicated to a specific part of the work which is not to be quantified either by price or in the alternative by duration at the time that the Contract is entered into. The Allowance is a limit of price or of time not to be exceeded without the written consent of the Owner and which is subject to adjustment based upon the actual cost incurred or time consumed. If provided by the Contract the Contractor may agree with the Owner to "buy out" the Allowance by agreeing to a price or a duration for the item described prior to performance of the Work.

ALTERNATES are distinct packages of Work that form a discrete subpart of the solicitation that are in addition to or in lieu of Work described in the base bid or proposal and which the Owner may, at the Owner's sole discretion, elect to have performed at the price bid or proposed. Alternates may or may not be used to determine the successful bid or proposal. Alternates to be performed may be selected prior to Contract award, at the time of award or after award.

ARCHITECT/ENGINEER, also known as Consultant, means the licensed Design Professional appointed by the Owner to act in that capacity (Owner may delegate responsibilities of the Owner's Authorized Representative to the Architect/Engineer).

BUSINESS DAY(S) means every day except Saturday, Sunday, and legal holidays recognized by the State of Oregon. Unless otherwise specified, a Business day commences at 08:00 hrs local time and concludes at 17:00 hrs local time. Work done or notice given after 17:00 hrs on a particular day and before 08:00 hrs on the succeeding day shall be attributed as having been occurred on the succeeding day. Notice given or Work performed on a non-business day shall be treated as if performed on the next business day for the purposes of payment or for determining the timeliness of notice.

CALENDAR DAY means a period of twenty four hours commencing immediately after 24:00 hours local time (Standard Time or Daylight Savings Time as applicable) at the primary local where the Work is to take place (unless otherwise designated) and extending until 24:00 hours of the same day. No days are excluded. No adjustment is allowed for the length of the day.

CHANGE ORDER means a written order issued by the Owner's Authorized Representative to the Contractor requiring a change in the Work within the general scope of the Contract Documents, issued under the changes provisions of Section D.1 in administering the Contract, including Owner's unilateral, written change directives as well as changes reflected in a writing executed by the parties to this Contract and, if applicable, establishing a Contract Price or Contract Time adjustment for the changed Work. Change Order shall be signed by Owner's Agent or Owner, Owner's Authorized Representative, and Contractor.

CLAIM means a demand by Contractor pursuant to Section D.3 for review of the denial of Contractor's initial request for an adjustment of Contract terms, payment of money, extension of Contract Time or other relief, submitted in accordance with the requirements and within the time limits established for review of Claims in these General Conditions.

CONSTRUCTION means the act of performing the Work on the Site of Work.

CONSTRUCTION CHANGE DIRECTIVE means a written order signed by the Owner, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted subsequently.

CONTRACT, also referred to as Agreement, shall mean collectively the Contract Documents.

CONTRACT DOCUMENTS means the Solicitation Document and addenda thereto, the Chemeketa Community College Public Improvement Agreement Form or other form of Agreement as appropriate, General Conditions, Supplemental General Conditions, if

any, the accepted Offer or Proposal, Plans, Specifications, amendments, Change Orders, Non-Conformance Reports, and the Determination and Findings of Liquidated Damages, if applicable and no other documents unless otherwise provided in the Solicitation Document or in writing executed by the parties designating the document as part of the Contract. These may be bound together as a Project Manual.

CONTRACT PERIOD, as set forth in the Contract Documents, means the total period of time beginning with the issuance of the Notice to Proceed and concluding upon Final Completion.

CONTRACT PRICE means the total of the awarded Offer amount, as increased or decreased by the price of approved alternates and Change Orders.

CONTRACT TIME means the number of Calendar Days, Work Days or Business Days allowed by the Contract for the performance of the Work or some discreet part of it. The time charged against Contract Time does not include periods during which the running of Contract Time is suspended or during which the performance of the Work is excused. Contract Time may be expressed in a number of days of a certain kind or in a period with a commencement date and an ending date. When not otherwise described Contract Time is the number of Calendar Days to elapse between Notice of Award of the Contract and the date set for Final Completion of the Contract.

CONTRACTOR means the Person awarded the Contract for the Work contemplated.

CRITICAL PATH means the sequence of tasks needed to complete a project that will take the longest to occur, and which determines the total calendar time required to complete the Work.

DAY(S) means unit(s) of measurement of time lasting 24 hours from 00:00 local time until 24:00 local time. In locations that observe Daylight Savings Time one hour is subtracted from the day of the transition from Standard Time to Daylight Savings Time and one hour is added to the of transition from Daylight Savings Time to Standard Time. Days are calendar days, including weekdays, weekends and holidays, unless otherwise specified. Days are counted at the Site of Work which is in the Pacific Time Zone unless otherwise specified.

DEFECT OR DEFECTIVE means not meeting the prescribed professional standard for appearance, quality, function, or performance.

DELAY means an occurrence or an obstacle to performance of the Work that impedes the accomplishment of Work that is on the Critical Path properly determined according to the approved schedule at the time that it arises.

DESIGN DOCUMENTS means the documents included in the Contract that describe or illustrate the technical requirements for the Work to be done.

DESIGN PROFESSIONAL means a licensed professional practicing a recognized technical discipline that applies creative thought, technical training and scientific and mathematical skills to plan, analyze, describe and illustrate an improvement or public work to be constructed, remodeled, renovated, altered, analyzed, evaluated or demolished. The term includes but is not limited to Architects, Engineers, Landscape Architects, Professional Land Surveyors and Geotechnical professionals and licensed consultants providing service to any of them. The Design Professional or the Owner's Design Professional is the person or entity who signs or seals the Design Documents as the design of that person or entity.

DIRECT COSTS means, unless otherwise provided in the Contract Documents, the cost of: materials, including sales tax, cost of delivery; cost of labor, including social security, old age and unemployment insurance, and fringe benefits required by agreement or custom; workers' compensation insurance; project specific insurance; bond premiums; rental cost of equipment, and machinery required for execution of the work; and the additional costs of field personnel of the grade of superintendent or lower directly attributable to the Work.

FINAL COMPLETION means the final completion of all requirements under the Contract, including Contract Closeout as described in Section K but excluding Warranty Work as described in Section I.2, and the final payment and release of all retainage, if any, released.

FORCE MAJEURE means fire, riot, war, terrorism, or other catastrophe which is beyond the parties' reasonable control and prevents the performance of the Contract. For the purposes of this clause "catastrophe" means an event that is so uncertain of occurrence that it cannot be reasonably anticipated and is so severe in its effect as to suspend the normal business operations of the College for a prolonged period of time.

LIQUIDATED DAMAGES means an amount, stipulated in the Contract, which the parties believe to be a reasonable estimation of the damages which will occur in the event of a breach.

MARKUP means an agreed amount, either fixed or a percentage, added to an item of direct cost to arrive at a price to compensate the Contractor the additional direct and indirect cost, overhead, general and administrative expense, profit and fee associated with the item.

NON-CONFORMANCE REPORT(S) means a report issued by Owner that determines, through Owner's observation, measurement, or testing, that work or portions of the work do not conform to the requirements of the Contract Documents and may result in the suspension of work and/or additional costs to the project related to remediation or removal.

NON-CONFORMING WORK means work, or portions of the work that do not conform to the requirements of the Contract Documents. Non-Conforming Work may result in the suspension of work, with no impact on Contract Time.

NOTICE means a formal written document required by law or by Contract to advise the recipient of an occurrence or condition, to claim a right provided by law or by Contract, to waive a right provided by law or by Contract, to start the running of a period of time or to stop the running of a period of time. Notice must be in the form required by law or by Contract and must be delivered to the person or the address specified within the time allowed. The responsibility for the delivery of Notice rests with the party giving notice. The Notice described in this paragraph shall be delivered, in writing, either in person or by mail, at the address provided for the party receiving Notice in the Contract, during Business Hours on a Business Day. Unless otherwise specified, a Notice that is correctly addressed and placed in the US Mail with correct postage shall be deemed to have been "given" when placed in the custody of the US Postal Service as shown by a postmark applied by the Postal Service.

NOTICE TO PROCEED means the official written notice from the Owner stating that the Contractor is to proceed with the Work defined in the Contract Documents. Notwithstanding the Notice to Proceed, Contractor shall not be authorized to proceed with the Work until all initial Contract requirements, including the Contract, performance bond and payment bond, and certificates of insurance, have been fully executed and submitted to Owner in a suitable form.

OFFER means a written response to an invitation to bid and a proposal in response to a request for proposals.

OFFEROR means a bidder that responds to an invitation to bid and a proposer that responds to a request for proposals.

OVERHEAD means all items of cost and all items of cost that are pooled and apportioned to the Contractor's Work on the basis of a ratio, percentage of direct cost or markup including without limitation: home office overhead; general and administrative expense; bid and proposal costs; general insurance costs; job site overhead; the wages, salary, expenses and per diem of persons above the level of superintendent or any person on the Site of Work who is not included in the requirement to pay PWR; vehicles, equipment and offices provided for persons not paid PWR under the Contract; and, any profit, fee or similar charge. In no case shall any expenses for advertising, entertainment, business promotion or lobbying or the cost of any gift, kickback, bribe or similar payment to any government official be included in any overhead pool or item apportioned to this Contract.

OWNER means Chemeketa Community College.

OWNER'S AGENT means the individual designated by the Owner to provide project management services

OWNER'S AUTHORIZED REPRESENTATIVE(S) means those individuals identified in writing by the Owner to act on behalf of the Owner for this project. Owner may elect, by written notice to Contractor, to delegate certain duties of the Owner's Authorized Representative to more than one party, including without limitation, to an Architect/Engineer. However, nothing in these General Conditions is intended to abrogate the separate design professional responsibilities of Architects under ORS Chapter 671 or of Engineers under ORS Chapter 672.

PERSON means any legally recognized entity doing business as a sole proprietorship, a partnership, a joint venture, a corporation, a limited liability company or partnership, or any other entity possessing the legal capacity to contract.

PLANS means the drawings which show the location, type, dimensions, and details of the Work to be done under the Contract, including any and all Addenda, but do not include shop drawings.

PUNCH LIST means the list of Work yet to be completed or deficiencies which need to be corrected in order to achieve Final Completion of the Contract.

RECORD DOCUMENT(S) means a document intended to be held for a duration longer than the Contract Period, which pertains to Work done or to things purchased or installed, including the Contract Documents, the as-built Plans, Specifications, testing and inspection records, product data, samples, manufacturer and distributor/supplier warranties evidencing transfer to Owner,

operational and maintenance manuals, shop drawings, Change Orders, correspondence, certificate(s) of occupancy, and other documents listed in Subsection B.9.1 of these General Conditions, recording all Services performed.

SITE OF WORK means the physical location(s) where the Work takes place as defined by the Contract Documents. It includes designated real property owned or controlled by the Owner where construction takes place together with designated borrowed sources, storage sites, waste areas, fabrication areas and component assembly sites designated by the Owner and/or wholly or substantially dedicated to the production of materials or assemblies to be used in the construction of the Work such that the obligation to pay the prevailing rate wage applies. The SITE OF WORK does not include commercial aggregate sources; commercial sources for soil, sand or minerals; established fabrication yards; established commercial batch plants; established precast yards or facilities; Contractor equipment and materials storage facilities not located on real property owned or controlled by the Owner; manufacturing plants or other facilities generally available for hire, producing standard products for public sale at established prices or not wholly dedicated to the project which are not on real property owned or controlled by the Owner.

SOLICITATION DOCUMENT means an Invitation to Bid (ITB), Request for Proposal (RFP), Request for Quotations (RFQ), or, Request for Qualifications (RFQ).

SPECIFICATION(S) means any description of the physical or functional characteristics of the Work, or of the nature of a supply, service or construction item. Specifications may include a description of any requirement for inspecting, testing or preparing a supply, service or construction item for delivery and the quantities or qualities of materials to be furnished under the Contract. Specifications generally will state the results or products to be obtained and may, on occasion, describe the method and manner of doing the Work to be performed. Specifications may be incorporated by reference and/or may be attached to the Contract.

SUBCONTRACTOR(S) means a Person(s) having a direct contract with the Contractor, or another Subcontractor, to perform one or more items of the Work.

SUBSTANTIAL COMPLETION means the date when the Owner accepts in writing the construction, alteration or repair of the improvement to real property or any designated portion thereof as having reached that state of completion when it may be used or occupied for its intended purpose. Substantial Completion of facilities with operating systems occurs only after thirty (30) continuous Days of successful, trouble-free operation of the operating systems as provided in Section K.4.2.

SUBSTITUTIONS means items proposed and accepted by the Owner as alternatives to those called for by the Contract that in function, performance, reliability, quality, and general configuration are the same or better than the product(s) specified. Approval of any substitute item shall be solely determined by the Owner's Authorized Representative. The decision of the Owner's Authorized Representative is final.

SUPPLEMENTAL GENERAL CONDITIONS means those conditions that remove from, add to, or modify these General Conditions. Supplemental General Conditions may be included in the Solicitation Document or may be a separate attachment to the Contract.

WORK means the furnishing of all materials, equipment, labor, transportation, services and incidentals necessary to successfully complete any individual item or the entire Contract and the carrying out of duties and obligations imposed by the Contract Documents.

A.2 SCOPE OF WORK

The Work contemplated under this Contract includes all labor, materials, transportation, equipment and services for, and incidental to, the completion of all construction work in connection with the project described in the Contract Documents. The Contractor shall perform all Work necessary so that the project can be legally occupied and fully used for the intended use as set forth in the Contract Documents.

A.3 INTERPRETATION OF CONTRACT DOCUMENTS

A.3.1 Unless otherwise specifically defined in the Contract Documents, words which have well-known technical meanings or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Contract Documents are intended to be complementary. Whatever is called for in one is interpreted to be called for in all. However, in the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following descending order of precedence:

1. Contract Amendments and Change Orders, with those of later date having precedence over those of an earlier date;

2. The Chemeketa Community College Agreement between the Owner and Contractor, or Chemeketa Community College Contract for Public Improvements;

3. The Supplemental General Conditions;

4. The General Conditions;

5. The Specifications;

6. The Plans;

6. The Solicitation Document and any Addenda thereto;

7. The accepted Offer.

A.3.2 In the case of an inconsistency between Plans and Specifications or within either document not clarified by Addendum, the better quality or greater quantity of Work shall be provided in accordance with the Owner's Agent or Owner's Authorized Representative's interpretation in writing. Large scale drawings shall govern over small scale drawings, and dimension numbers written on drawings shall govern over dimensions scaled from drawings.

A.3.3 If the Contractor finds, or reasonably should have found, discrepancies in, or omissions from the Contract Documents, or if the Contractor is in doubt as to their meaning, the Contractor shall at once notify the Owner's Agent or Owner's Authorized Representative. Matters concerning performance under and interpretation of requirements of, the Contract Documents will be decided by the Owner's Agent, who may delegate that duty in some instances to the Owner's Authorized Representative. Responses to Contractor's requests for interpretation of Contract Documents will be made in writing by Owner's Authorized Representative within any time limits agreed upon or otherwise with reasonable promptness. Interpretations and decisions of the Owner's Authorized Representative will be consistent with the intent of and reasonably inferable from the Contract Documents. Contractor shall not proceed without direction in writing from the Owner's Authorized Representative.

A.3.4 References to standard specifications, manuals, codes of any technical society, organization or association, to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, laws or regulations in effect in the jurisdiction where the project is occurring on the first published date of the Solicitation Document, except as may be otherwise specifically stated.

A.4 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE

A.4.1 The Contractor represents and warrants that, before submitting an Offer, the Contractor has made a careful examination of the Contract Documents; has become fully informed as to the quality and quantity of materials and the character of the Work required; and has made a careful examination of the location and conditions of the Work and the sources of supply for materials. The Owner will in no case be responsible for any loss or for any unanticipated costs that may be suffered by the Contractor as a result of the Contractor's failure to acquire full information in advance in regard to all conditions pertaining to the Work. No oral agreement or conversation with any officer, agent, or personnel of the Owner, or with the Owner's Authorized Representative either before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.

A.4.2 Should the Plans or Specifications fail to particularly describe the materials, kind of goods, or details of construction of any aspect of the Work, Contractor shall have the duty to make inquiry of the Owner's Agent and Owner's Authorized Representative as to what is required prior to performance of the Work. Absent Specifications to the contrary, the materials or processes that would normally be used to produce first quality finished Work shall be considered a part of the Contract requirements.

A.4.3 Any design errors or omissions noted by the Contractor shall be reported promptly to the Owner's Authorized Representative, including without limitation, any nonconformity with applicable laws, statutes, ordinances, building codes, rules and regulations.

A.4.4 If the Contractor believes that additional cost or Contract Time is involved because of clarifications or instructions issued by the Owner's Authorized Representative in response to the Contractor's notices or requests for information, the Contractor must submit a written request to the Owner's Authorized Representative, setting forth the nature and specific extent of the request, including all time and cost impacts against the Contract as soon as possible, but no later than ten (10) Days after receipt by Contractor of the clarifications or instructions issued. If the Owner's Authorized Representative denies Contractor's request for additional compensation, additional Contract Time, or other relief that Contractor believes results from the clarifications or

instructions, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process. If the Contractor fails to perform the obligations of Sections A.4.1 to A.4.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations.

A.4.5 Contractor shall maintain and provide a full set of drawings and specifications, incorporating or including all Addenda, and make available within the meeting room used for all regular Owner/Contractor/Design Professional meetings.

A.5 INDEPENDENT CONTRACTOR STATUS

The service or services to be performed under this Contract are those of an independent contractor as defined in ORS 670.600. Contractor represents and warrants that it is not an officer, employee or agent of the Owner.

A.6 RETIREMENT SYSTEM STATUS AND TAXES

Contractor represents and warrants that it is not a contributing member of the Public Employees' Retirement System and will be responsible for any federal or state taxes applicable to payment received under this Contract. Contractor will not be eligible for any benefits from these Contract payments of federal Social Security, employment insurance, workers' compensation or the Public Employees' Retirement System, except as a self-employed individual. Unless the Contractor is subject to backup withholding, Owner will not withhold from such payments any amount(s) to cover Contractor’s federal or state tax obligations.

A.7 GOVERNMENT EMPLOYMENT STATUS

A.7.1 If this payment is to be charged against federal funds, Contractor represents and warrants that it is not currently employed by the federal government. This does not preclude the Contractor from holding another contract with the federal government. This provision does not apply to military members of the reserves of the US Armed Forces or military members of the National Guard who are not on active duty or in status in which the member is being paid for the performance of military duty while this Contract is being performed provided that the member does not hold any other state or federal employment.

A.7.2 Contractor represents and warrants that Contractor is not an employee of Chemeketa Community College, another employer covered by the Oregon Public Employees Retirement System (PERS), or, the State of Oregon for purposes of performing Work under this Contract. This provision does not apply to military members of the reserves of the US Armed Forces or military members of the National Guard who are not on active duty or in status in which the member is being paid for the performance of military duty while this Contract is being performed provided that the member does not hold any other State or Federal employment.

SECTION B
ADMINISTRATION OF THE CONTRACT

B.1 OWNER'S ADMINISTRATION OF THE CONTRACT

B.1.1 The Owner's Authorized Representative will provide administration of the Contract as described in the Contract Documents (1) during construction (2) until final payment is due and (3) during the one-year period for correction of Work. The Owner's Authorized Representative will act on behalf of the Owner to the extent provided in the Contract Documents, unless modified in writing in accordance with other provisions of the Contract. In performing these tasks, the Owner's Agent may rely on the Owner's Authorized Representative or other consultants to perform some or all of these tasks.

B.1.2 The Owner's Authorized Representative will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner's Agent informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against Defects and deficiencies in the Work, and (3) to determine in general if Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. The Owner's Authorized Representative will not make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. Owner's Agent or Owner's Authorized Representative will neither have control over or charge of, nor be responsible for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work.

B.1.3 Except as otherwise provided in the Contract Documents or when direct communications have been specifically authorized, the Owner's Agent and Contractor shall endeavor to communicate with each other through the Owner's Authorized Representative or designee about matters arising out of or relating to the Contract. Communications from the Contractor to the Owner's Agent seeking information about the plans and specifications, submittals required by the contract, materials testing, the measurement of Work for payment, schedules, the progress of the Work, correction of Defective Work, Punch Lists or similar technical matters shall be directed to the Owner's Authorized Representative unless otherwise directed. Communications by and with the Owner's Authorized Representative's consultants shall be through the Owner's Authorized Representative. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner's Authorized Representative.

B.1.4 Based upon the Owner's Authorized Representative's evaluations of the Contractor's Application for Payment, or unless otherwise stipulated by the Owner's Agent, the Owner's Authorized Representative will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

B.2 CONTRACTOR'S MEANS AND METHODS; MITIGATION OF IMPACTS

B.2.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures.

B.2.2 The Contractor is responsible to protect and maintain the Work during the course of construction and to mitigate any adverse impacts to the project, including those caused by authorized changes, which may affect cost, schedule, or quality.

B.2.3 The Contractor is responsible for the actions of all its personnel, laborers, suppliers, and Subcontractors on the project. The Contractor shall enforce strict discipline and good order among Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of persons who are unfit or unskilled for the tasks assigned to them.

B.3 MATERIALS AND WORKMANSHIP

B.3.1 The intent of the Contract Documents is to provide for the construction and completion in every detail of the Work described. All Work shall be performed in a professional manner and unless the means or methods of performing a task are specified elsewhere in the Contract Documents, Contractor shall employ methods that are generally accepted and used by the industry, in accordance with industry standards.

B.3.2 The Contractor is responsible to perform the Work as required by the Contract Documents. Defective Work shall be corrected at the Contractor's expense.

B.3.3 Work done and materials furnished shall be subject to inspection and/or observation and testing by the Owner's Authorized Representative and/or Owner's Agent to determine if they conform to the Contract Documents. Inspection of the Work by the Owner's Authorized Representative does not relieve the Contractor of responsibility for the Work in accordance with the Contract Documents.

B.3.4 Contractor shall furnish adequate facilities, as required, for the Owner's agents and invitees, and the Owner's Authorized Representative to have safe access to the Work including without limitation walkways, railings, ladders, tunnels, and platforms. Producers, suppliers, and fabricators shall also provide proper facilities and access to their facilities.

B.3.5 The Contractor shall furnish samples of materials for testing by the Owner's Authorized Representative and Owner's Agent and include the cost of the samples in the Contract Price.

B.4 PERMITS

Owner will pay for any building permits, and Contractor shall obtain and pay for all other necessary permits and licenses, except for those specifically excluded in the Supplemental General Conditions or elsewhere in the Solicitation Document, for the construction of the Work, for temporary obstructions, enclosures, opening of streets for pipes, walls, utilities, environmental Work, etc., as required for the project. Contractor shall be responsible for all violations of the law, in connection with the construction or caused by obstructing streets, sidewalks or otherwise. Contractor shall give all requisite notices to public authorities. The Contractor shall pay all royalties and license fees. The Contractor shall defend all suits or claims for infringement of any patent or other proprietary rights and save harmless and blameless from loss, on account thereof, the College, its board, officers, agents, employees and volunteers.

B.5 COMPLIANCE WITH GOVERNMENT LAWS AND REGULATIONS

B.5.1 Contractor shall comply with all federal, state and local laws, codes, regulations and ordinances applicable to the Work and the Contract. Failure to comply with such requirements shall constitute a breach of Contract and shall be grounds for Contract termination. Without limiting the generality of the foregoing, Contractor expressly agrees to comply with the following as applicable: i) Title VI and VII of Civil Rights Act of 1964, as amended; (ii) Section 503 and 504 of the Rehabilitation Act of 1973, as amended; (iii) the Health Insurance Portability and Accountability Act of 1996; (iv) the Americans with Disabilities Act of 1990, as amended; (v) ORS Chapter 659A; as amended (vi) all regulations and administrative rules established pursuant to the foregoing laws; and (vii) all other applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations. Owner's performance under the Contract is conditioned upon Contractor's compliance with the provisions of ORS 279C.505, 279C.510, 279C.515, 279C.520, and 279C.530, which are incorporated by reference herein.

B.5.1.1 The Owner's Agent shall have the right under this agreement to stop Work or to order the suspension of any activity using College facilities/areas where in its judgment, the Contractor or persons for whom the Contractor is responsible are committing or participating in violations of established written College Policies and Procedures, the terms of this agreement, or conducting themselves in a manner that is deemed by the Owner's Agent to be hazardous to persons or property lawfully occupying College property, College facilities or public or private property immediately adjacent.

B.5.1.2 Conduct of Contractor's Employees/Subcontractors
Chemeketa Community College is a college campus; however, there are a large number of minors on College property. Contractors are responsible and shall be held liable for any misconduct of their employees or subcontractors on College property. Contractors are encouraged to be mindful of any prior misconduct of its employees and/or subcontractors.

The College retains the right to stop any activity and/or to require dismissal from the job site of any worker whose behavior does not comply, or gives the College reasonable suspicion to believe the worker's behavior does not comply, with pertinent Chemeketa Community College policy(ies), including but not limited to providing a respectful workplace, a harassment free workplace, and a drug and alcohol free workplace, or the activity is deemed hazardous to members of a user group, the public, or College facilities.

B.5.2 Contractor shall comply with all applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations; and

(a) Contractor shall not discriminate against Disadvantaged, Minority, Women or Emerging Small Business enterprises, as those terms are defined in ORS 200.005, in the awarding of subcontracts (ORS 279A.110).

(b) Contractor shall maintain and possess in current and valid form, all licenses and certificates required by law, regulation, or this Contract when performing the Work.

B.5.3 Unless contrary to federal law, Contractor shall certify that it shall not accept a bid from Subcontractors to perform Work as described in ORS 701.005 under this Contract unless such Subcontractors are registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 at the time they submit their bids to the Contractor.

B.5.4 Unless contrary to federal law, Contractor shall certify that each landscape contractor, as defined in ORS 671.520(2), performing Work under this Contract holds a valid landscape contractor's license issued pursuant to ORS 671.560.

B.5.5 The following notice is applicable to Contractors who perform excavation Work:

ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through OAR 952-001-0090. You may obtain copies of the rules by calling the center at 503.232.1987 or by accessing the website located @ www.DigSafelyOregon.com.

B.5.6 Failure to comply with any or all of the requirements of B.5.1 through B.5.5 shall be a breach of Contract and constitute grounds for Contract termination. Damages or costs resulting from such noncompliance shall be the responsibility of Contractor.

B.6 SUPERINTENDENCE

Contractor shall keep on the site at all times Work is being done, even at times the Work is being done solely by Subcontractor(s), a competent superintendent and any necessary assistants who shall be satisfactory to the Owner's Agent and who shall represent the Contractor on the site. Directions given to the superintendent by the Owner's Authorized Representative shall be confirmed in writing to the Contractor.

B.7 INSPECTION

B.7.1 Owner's Agent and Owner's Authorized Representative shall have access to the Work at all times.

B.7.2 Inspection of the Work will be made by the Owner's Authorized Representative at its discretion. The Owner's Authorized Representative will have authority to reject Work that does not conform to the Contract Documents. Any Work found to be not in conformance with the Contract Documents, in the discretion of the Owner's Authorized Representative, shall be removed and replaced at the Contractor's expense.

B.7.3 Contractor shall make or obtain at the appropriate time all tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, codes, ordinances, rules, regulations or orders of public authorities having jurisdiction. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work. The Contractor shall give the Owner's Authorized Representative timely notice of when and where tests and inspections are to be made so that the Owner's Authorized Representative may be present for such procedures. Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Owner's Authorized Representative.

B.7.4 As required by the Contract Documents, Work done or material used without inspection or testing by the Owner's Authorized Representative may be ordered removed at the Contractor's expense.

B.7.5 If directed to do so any time before the Work is accepted, the Contractor shall uncover portions of the completed Work for inspection. After inspection, the Contractor shall restore such portions of Work to the standard required by the Contract. If the Work uncovered is unacceptable or was done without sufficient notice to the Owner's Authorized Representative, the uncovering and restoration shall be done at the Contractor's expense. If the Work uncovered is acceptable and was done with sufficient notice to the Owner's Agent, the uncovering and restoration will be paid for as a Change Order.

B.7.6 If any testing or inspection reveals failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Owner's Agent's and Owner's Authorized Representative's services and expenses, shall be at the Contractor's expense.

B.7.7 When the United States government participates in the cost of the Work, or the Owner has an agreement with other public or private organizations, or if any portion of the Work is being performed for a third party or in close proximity to third party

facilities, representatives of these organizations have the right to inspect the Work affecting their interests or property. Their right to inspect shall not make them a party to the Contract and shall not interfere with the rights of the parties of the Contract. Instructions or orders of such parties shall be transmitted to the Contractor, through the Owner's Agent.

B.8 SEVERABILITY

If any provision of this Contract is declared by a court to be illegal or in conflict with any law, the validity of the remaining terms and provisions shall not be affected and the rights and obligations of the parties shall be construed and enforced as if the Contract did not contain the particular provision held to be invalid.

B.9 ACCESS TO RECORDS

B.9.1 Contractor shall keep, at all times on the Work site, one record copy of the complete Contract Documents, including the Plans, Specifications, Change Orders and addenda, in good order and marked currently to record field changes and selections made during construction, and one record copy of Shop Drawings, Product Data, Samples and similar submittals, and shall at all times give the Owner’s Agent and Owner's Authorized Representative access thereto.

B.9.2 Contractor shall retain and the Owner and its duly authorized representatives shall have access to, for a period not less than ten (10) years, all Record Documents, financial and accounting records, and other books, documents, papers and records of Contractor which are pertinent to the Contract including records pertaining to Overhead and indirect costs, for the purpose of making audit, examination, excerpts and transcripts. If for any reason, any part of the Contract is involved in litigation, Contractor shall retain all such records until all litigation is resolved. The Owner and/or its agents shall continue to be provided full access to the records during litigation.

B.10 WAIVER

Failure of the Owner to enforce any provision of this Contract shall not constitute a waiver or relinquishment by the Owner of the right to such performance in the future nor of the right to enforce any other provision of this Contract. No right of the Owner shall be waived by implication, by the passage of time or by “operation of law.” Any waiver of a right by the Owner shall be in a writing that specifically identifies the right being waived and the circumstances of the waiver, and shall be signed by an authorized representative of the Owner.

B.11 SUBCONTRACTS AND ASSIGNMENT

B.11.1 Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound by the terms and conditions of these General Conditions for Public Improvement Contracts, and to assume toward the Contractor all of the obligations and responsibilities which the Contractor assumes toward the Owner thereunder, unless (1) the same are clearly inapplicable to the subcontract at issue because of legal requirements or industry practices, or (2) specific exceptions are requested by Contractor and approved in writing by Owner’s Agent. Where appropriate, Contractor shall require each Subcontractor at any tier to enter into similar agreements.

B.11.2 At Owner’s Agent’s request, Contractor shall submit to Owner prior to their execution either Contractor’s form of subcontract, or the subcontract to be executed with any particular Subcontractor. If Owner’s Agent disapproves such form, Contractor shall not execute the form until the matters disapproved are resolved to Owner’s Agent’s satisfaction. Owner’s review, comment upon or approval of any such form shall not relieve Contractor of its obligations under this Agreement or be deemed a waiver of such obligations of Contractor.

B.11.3 Contractor shall not assign, sell, or transfer its rights, or delegate its responsibilities under this Contract, in whole or in part, without the prior written approval of the Owner. No such written approval shall relieve Contractor of any obligations of this Contract, and any transferee shall be considered the agent of the Contractor and bound to perform in accordance with the Contract Documents. Contractor shall remain liable as between the original parties to the Contract as if no assignment had occurred.

B.11.4 Upon reasonable concern regarding Contractor’s payment of Subcontractors or suppliers at any tier, Owner may in its sole discretion make payment to Contractor and the Subcontractor at any tier, supplier by dual payee check payable to Contractor and the unpaid party. Upon Owner’s Agent’s request, Contractor shall furnish to Owner all information necessary to facilitate such payments, including without limitation, a complete listing of amounts owed to all Subcontractors at any tier.

B.11.5 Should Contractor fail, neglect or refuse to make prompt payment of any valid claim for labor, services, equipment, or materials furnished to Contractor or any Subcontractor as such claim becomes due for work performed on the Project, Owner may pay such claim directly to the person or entity who furnished such labor, services, equipment or materials, and charge the amount

of the payment against amounts due, or to become due, Contractor. Owner's payment of any such claims shall not relieve Contractor or its surety from any obligation with respect to any claims Contractor fails to pay.

B.11.6 If the Contractor or a first-tier Subcontractor fails, neglects or refuses to make payment to any person furnishing labor or materials for the Work within 30 days after receipt of payment from the Owner, the Contractor or first-tier Subcontractor shall owe the person the amount due plus interest charges commencing at the end of the 10-day period that payment is due under ORS 279C.580 (4) and ending upon final payment, unless payment is subject to a good faith dispute as defined in ORS 279C.580. The rate of interest charged to the Contractor or first-tier Subcontractor on the amount due shall equal three times the discount rate on 90-day commercial paper in effect at the Federal Reserve Bank in the Federal Reserve district that includes Oregon on the date that is 30 days after the date when payment was received from the Owner or from the Contractor, but the rate of interest may not exceed 30 percent. The amount of interest may not be waived.

B.11.7 If the Contractor or a Subcontractor fails, neglects or refuses to make payment to a person furnishing labor or materials in connection with the Contract, the person may file a complaint with the Construction Contractors Board, unless payment is subject to a good faith dispute as defined in ORS 279C.580. Contractor shall include this clause in all subcontracts and require that Subcontractors include the clause in Work subcontracted to a lower tier. Notice shall be in this form:

Subcontractor is notified that every public improvement contract and every contract related to the public improvement contract shall contain a clause or condition that, if the contractor or a subcontractor fails, neglects or refuses to make payment to a person furnishing labor or materials in connection with the public improvement contract, the person may file a complaint with the Construction Contractors Board, unless payment is subject to a good faith dispute as defined in ORS 279C.580. Subcontractor shall include this clause in any contract related to the Work. Complaints may be addressed to the Board at 700 Summer St. NE, Suite 300, PO Box 14140, Salem, OR 97309.

B.12 SUCCESSORS IN INTEREST

The provisions of this Contract shall be binding upon and shall accrue to the benefit of the parties to the Contract and their respective permitted successors and assigns.

B.13 OWNER'S RIGHT TO DO WORK

Owner reserves the right to perform other or additional work at or near the project site with other forces than those of the Contractor. If such work takes place within or next to the project site, Contractor will coordinate work with the other contractors or forces, cooperate with all other contractors or forces, carry out the work in a way that will minimize interference and delay for all forces involved, place and dispose of materials being used so as not to interfere with the operations of another, and join the Work with the work of the others in an acceptable manner and perform it in proper sequence to that of the others. The Owner's Authorized Representative will resolve any disagreements that may arise between or among Contractor and the other contractors over the method or order of doing all work (including the Work). In case of unavoidable interference, the Owner's Authorized Representative will establish work priority (including the Work) which generally will be in the sequence that the contracts were awarded.

B.14 OTHER CONTRACTS

In all cases and at any time, the Owner has the right to execute other contracts related to or unrelated to the Work of this Contract. The Contractor of this Contract will fully cooperate with any and all other contractors without additional cost to the Owner in the manner described in section B.13.

B.15 GOVERNING LAW

This Contract shall be governed by and construed in accordance with the laws of the State of Oregon without regard to principles of conflict of law.

B.16 LITIGATION

Any Claim between Owner and Contractor that arises from or relates to this Contract and that is not resolved through the Claims Review Process in Section D.3 shall be brought and conducted solely and exclusively within the Circuit Court of Marion County for the State of Oregon; provided, however, if a Claim must be brought in a federal forum, then it shall be brought and conducted solely and exclusively within the United States District Court for the District of Oregon. In no event shall this section be construed as a waiver by the Owner of any form of defense or immunity, whether sovereign immunity, governmental immunity, immunity based

on the Eleventh Amendment to the Constitution of the United States or otherwise, from any claim or from the jurisdiction of any court.

Note: CONTRACTOR BY EXECUTION OF THIS CONTRACT HEREBY CONSENTS TO THE IN PERSONAM JURISDICTION OF THE COURTS REFERENCED IN THIS SECTION B.16.

B.17 ALLOWANCES

B.17.1 The Contractor shall include in the Contract Price all Allowances necessary to complete the Work. Items covered by Allowances shall be supplied for such amounts and by such persons or entities as the Owner's Agent may direct.

B.17.2 Unless otherwise provided in the Contract Documents:

(a) When finally reconciled, Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

(b) Contractor's costs for unloading and handling at the site, labor, installation costs, Overhead, profit and other expenses contemplated for stated Allowance amounts shall be included in the Contract Price but not in the Allowances;

(c) Whenever costs are more than or less than Allowances, the Contract Price shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the Allowances under Section B.17.2(a) and (2) changes in Contractor's costs under Section B.17.2(b).

(d) Unless Owner requests otherwise, Contractor shall provide to Owner a proposed fixed price for any Allowance work prior to its performance.

B.18 SUBMITTALS, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

B.18.1 The Contractor shall prepare and keep current, for the Owner's Authorized Representative's approval, a log which shall contain a schedule for delivery of submittals and shall be coordinated with the Contractor's construction schedule and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors, and allows reasonable time to review submittals. Owner's Agent reserves the right to approve the log, in Owner-approved format. Log shall be adjusted to reflect changes in the construction schedule or sequence of Work. Submittals include, without limitation, shop drawings, product data, and samples which are described below:

(a) Shop drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, manufacturer, supplier or distributor, at any tier, to describe some portion of the Work.

(b) Product data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to demonstrate materials or equipment for some portion of the Work.

(c) Samples are physical examples which demonstrate materials, equipment or workmanship and establish standards by which the Work will be judged.

B.18.2 Shop drawings, product data, samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review of submittals by the Owner's Authorized Representative is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, or for approval of safety precautions or, unless otherwise specifically stated by the Owner's Authorized Representative, of any construction means, methods, techniques, sequences or procedures, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Owner's Authorized Representative's review of the Contractor's submittals shall not relieve the Contractor of its obligations under the Contract Documents. The Owner's Authorized Representative's approval of a specific item shall not indicate approval of an assembly of which the item is a component. Informational submittals upon which the Owner's Authorized Representative is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Owner's Authorized Representative without action.

B.18.3 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Owner's Authorized Representative shop drawings, product data, samples and similar submittals required by the Contract Documents, in accordance

with the approved log, and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Owner's Authorized Representative without action.

B.18.4 By approving and submitting shop drawings, product data, samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, and has checked and coordinated the information contained within such submittals with the requirements of the Contract Documents and the Work, including that of all Subcontractors.

B.18.5 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of shop drawings, product data, samples or similar submittals until the respective submittal has been approved by the Owner's Authorized Representative.

B.18.6 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Owner's Authorized Representative's review or approval of shop drawings, product data, samples or similar submittals unless the Contractor has specifically informed the Owner's Authorized Representative, in writing, of such deviation at the time of submittal and: (i) the Owner's Authorized Representative has given written approval to the specific deviation; or (ii) a Change Order has been executed by Owner's Agent authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in shop drawings, product data, samples or similar submittals by the Owner's Authorized Representative's review or approval thereof.

B.18.7 In the event that Owner elects not to have the obligations and duties described under this Section B.18 performed by the Owner's Authorized Representative, or in the event no Owner's Authorized Representative is employed by Owner on the project, all obligations and duties assigned to the Owner's Authorized Representative hereunder shall be performed by the Owner's Agent.

B.19 SUBSTITUTIONS

The Contractor may make Substitutions only with the consent of the Owner's Agent, after evaluation by the Owner's Authorized Representative and only in accordance with a Change Order. Substitutions shall be subject to the requirements of the Solicitation Document. By making requests for Substitutions, the Contractor represents that the Contractor has personally investigated the proposed substitute product; represents that the Contractor will provide the same warranty for the Substitution that the Contractor would for the product originally specified unless approved otherwise; certifies that the cost data presented is complete and includes all related costs under this Contract including redesign costs, and waives all claims for additional costs related to the Substitution which subsequently become apparent; and will coordinate the installation of the accepted Substitution, making such changes as may be required for the Work to be completed in all respects.

B.20 USE OF PLANS AND SPECIFICATIONS

Plans, Specifications and related Contract Documents furnished to Contractor by Owner or Owner's Authorized Representative shall be used solely for the performance of the Work under this Contract. Contractor and its Subcontractors and suppliers are authorized to use and reproduce applicable portions of such documents appropriate to the execution of the Work, but shall not claim any ownership or other interest in them beyond the scope of this Contract, and no such interest shall attach. Unless otherwise indicated, all common law, statutory and other reserved rights, in addition to copyrights, are retained by Owner.

B.20.1 Security and Safety of Individuals and Building (ORS 192.501 et al)

Contractor shall not disclose or permit the disclosure of Plans, shop drawings, or other records or information that would reveal or otherwise identify security measures, or weaknesses or potential weaknesses in security measures, except to the extent certain individuals need such information to properly perform the Work.

Contractor shall not disclose Plans, shop drawings, or other records or information that, if disclosed, would allow a person to: gain unauthorized access to buildings or other property; identify those areas of structural or operational vulnerability that would permit unlawful disruption to, or interference with, services; or disrupt, interfere with or gain unauthorized access to public funds or to information processing, communication or telecommunication systems, including the information contained in the systems, that are used or operated by the Owner, except to the extent certain individuals need such information to properly perform the Work.

B.21 FUNDS AVAILABLE AND AUTHORIZED

Owner reasonably believes at the time of entering into this Contract that sufficient funds are available and authorized for expenditure to finance the cost of this Contract within the Owner's budget, appropriation or limitation. Contractor understands and agrees that, to the extent that sufficient funds are not available and authorized for expenditure to finance the cost of this Contract in subsequent budget periods, Owner's payment of amounts under this Contract attributable to Services performed after the last day of the current budget cycle is contingent on Owner's governing body receiving budgeting and appropriating funds or other

expenditure authority sufficient to allow Owner, in the exercise of its reasonable administrative discretion, to continue to make payments under this Contract. If the project is funded from special funds or from funds established from the proceeds of bonds, grants or revenue obligations Contractor understands and agrees that the total funds to be used on all phases of the Project including but not limited to amounts to be paid to Contractor are limited to the special fund or the proceeds of the grant, bond issue or revenue obligation subject to the Owner's reasonable apportionment of the available funds to those persons or entities having a claim upon them.

B.22 NO THIRD PARTY BENEFICIARIES

Owner and Contractor are the only parties to this Contract and are the only parties entitled to enforce its terms. Nothing in this Contract gives, is intended to give, or shall be construed to give or provide any benefit or right, whether directly, indirectly, or otherwise, to third persons unless such third persons are individually identified by name herein and expressly described as intended beneficiaries of the terms of this Contract.

For the purposes of this provision a court or government appointed receiver, liquidator or trustee shall be considered a "third person."

SECTION C
WAGES AND LABOR

C.1 MINIMUM WAGE RATES ON PUBLIC WORKS

Contractor shall comply fully with the provisions of ORS 279C.800 through 279C.870, or Davis-Bacon-Act (40 U.S.C. 3141 to 3148), or both if the public works project is subject to state and federal prevailing wage laws, and shall pay the higher of the applicable state or federal prevailing rate of wage to workers on public works projects subject to both state and federal prevailing wage laws. Documents establishing those conditions, as determined by the Commissioner of the Bureau of Labor and Industries (BOLI), are included as attachments to or are incorporated by reference in the Contract Documents. Contractor shall pay workers at not less than the specified minimum hourly rate of wage, and shall include that requirement in all subcontracts at any tier.

C.2 PAYROLL CERTIFICATION; ADDITIONAL RETAINAGE; FEE REQUIREMENTS

C.2.1 In accordance with ORS 279C.845, the Contractor and every Subcontractor shall submit written certified statements to the Owner, on the form prescribed by the Commissioner of the Bureau of Labor and Industries, certifying the hourly rate of wage paid each worker which the Contractor or the Subcontractor has employed on the project and further certifying that no worker employed on the project has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the Contract, which certificate and statement shall be verified by the oath of the Contractor or the Subcontractor that the Contractor or Subcontractor has read such statement and certificate and knows the contents thereof and that the same is true to the Contractor or Subcontractor's best knowledge and belief. The certified statements shall set out accurately and completely the payroll records for the prior week including the name and address of each worker, the worker's correct classification, rate of pay, daily and weekly number of hours worked, deductions made and actual wages paid. Certified statements for each week during which the Contractor or Subcontractor has employed a worker on the project shall be submitted once a month, by the fifth business day of the following month.

The Contractor and Subcontractors shall preserve the certified statements for a period of ten (10) years from the date of completion of the Contract.

C.2.2 Pursuant to ORS 279C.845(7),the Owner shall retain 25 percent of any amount earned by the Contractor on this public works project until the Contractor has filed the certified statements required by section C.2.1. The Owner shall pay to the Contractor the amount retained under this subsection within 14 days after the Contractor files the required certified statements, regardless of whether a Subcontractor has failed to file certified statements.

C.2.3 Pursuant to ORS 279C.845(8), the Contractor shall retain 25 percent of any amount earned by a first-tier Subcontractor on this public works project until the first-tier Subcontractor has filed with the Owner the certified statements required by C.2.1. Before paying any amount retained under this subsection, the Contractor shall verify that the first-tier Subcontractor has filed the certified statement. Within 14 days after the first-tier Subcontractor files the required certified statement the Contractor shall pay the first-tier Subcontractor any amount retained under this subsection.

C.2.4 In accordance with statutory requirements, and administrative rules promulgated by the Commissioner of the Bureau of Labor and Industries, the fee required by ORS 279C.825(1) will be paid by Owner to the Commissioner at the time Owner enters into the Contract.

C.3 PROMPT PAYMENT AND CONTRACT CONDITIONS

C.3.1 Pursuant to ORS 279C.505 and as a condition to Owner’s performance hereunder, the Contractor shall:

C.3.1.1 Make payment promptly, as due, to all persons supplying to Contractor labor or materials for the execution of the Work provided for in this Contract.

C.3.1.2 Pay all contributions or amounts due the State Industrial Accident Fund from such Contractor or Subcontractor incurred in the performance of the Contract.

C.3.1.3 Not permit any lien or claim to be filed or prosecuted against the Owner on account of any labor or material furnished. Contractor will not assign any claims that Contractor has against Owner, or assign any sums due by Owner, to Subcontractors, suppliers, or manufacturers, and will not make any agreement or act in any way to give Subcontractors a claim or standing to make a claim against the Owner.

C.3.1.4 Pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.

C.3.1.5 Demonstrate that an employee drug testing program is in place as follows:

(a) Contractor represents and warrants that Contractor has in place at the time of the execution of this Contract, and shall maintain during the term of this Contract, a Qualifying Employee Drug Testing Program for its employees that includes, at a minimum, the following:

(1) A written employee drug testing policy,

(2) Required drug testing for all new Subject Employees or, alternatively, required testing of all Subject Employees every 12 months on a random selection basis, and

(3) Required testing of a Subject Employee when the Contractor has reasonable cause to believe the Subject Employee is under the influence of drugs.

(b) Contractor shall require each Subcontractor providing labor for the project to:

(1) Demonstrate to the Contractor that it has a Qualifying Employee Drug Testing Program for the Subcontractor's Subject Employees, and represent and warrant to the Contractor that the Qualifying Employee Drug Testing Program is in place at the time of subcontract execution and will continue in full force and effect for the duration of the subcontract, or

(2) Require that the Subcontractor's Subject Employees participate in the Contractor's Qualifying Employee Drug Testing Program for the duration of the subcontract.

A drug testing program that meets the above requirements will be deemed a "Qualifying Employee Drug Testing Program." For the purposes of this section, an employee is a "Subject Employee" only if that employee will be working on the project job site.

C.3.2 Pursuant to ORS 279C.515, and as a condition to Owner's performance hereunder, Contractor agrees:

C.3.2.1 If Contractor fails, neglects or refuses to make prompt payment of any claim for labor or services furnished to the Contractor or a Subcontractor by any person in connection with the project as such claim becomes due, the proper officer(s) representing the Owner may pay the claim and charge the amount of the payment against funds due or to become due Contractor under this Contract. Payment of claims in this manner shall not relieve the Contractor or the Contractor's surety from obligation with respect to any unpaid claims.

C.3.2.2 If the Contractor or a first-tier Subcontractor fails, neglects or refuses to make payment to a person furnishing labor or materials in connection with the public contract for a public improvement within thirty (30) Days after receipt of payment from Owner or a contractor, the contractor or first-tier Subcontractor shall owe the person the amount due plus interest charges commencing at the end of the 10-Day period that payment is due under ORS 279C.580(3) and ending upon final payment, unless payment is subject to a good faith dispute as defined in ORS 279C.580. The rate of interest charged to the Contractor or first-tier Subcontractor on the amount due shall equal three times the discount rate on 90-Day commercial paper in effect at the Federal Reserve Bank in the Federal Reserve district that includes Oregon on the date that is thirty (30) Days after the date when payment was received from Owner or from the Contractor, but the rate of interest shall not exceed thirty (30) percent. The amount of interest may not be waived.

C.3.2.3 If the Contractor or a Subcontractor fails, neglects or refuses to make payment to a person furnishing labor or materials in connection with the Contract, the person may file a complaint with the Construction Contractors Board, unless payment is subject to a good faith dispute as defined in ORS 279C.580. Every contract related to this Contract shall contain a similar clause.

C.3.3.1 Pursuant to ORS 279C.580, Contractor shall provide first-tier Subcontractors with a standard form that the first-tier Subcontractors may use as an application for payment or as another method by which the Subcontractors may claim a payment due from Contractor. Contractor may change the form or the regular administrative procedures the Contractor uses for processing payments, if the Contractor: (A) Notifies the Subcontractor, in writing, at least 45 days before the date on which the Contractor makes the change; and (B) Includes with the written notice a copy of the new or changed form or a description of the new or changed procedure.

C.3.3.2 Pursuant to ORS 279C.580, Contractor shall include in each subcontract for property or services entered into by the Contractor and a first-tier Subcontractor, including a material supplier, for the purpose of performing a construction contract:

(a) A payment clause that obligates the Contractor to pay the first-tier Subcontractor for satisfactory performance under its subcontract within ten (10) Days out of such amounts as are paid to the Contractor by Owner under the Contract;

(b) An interest penalty clause that obligates the Contractor if the Contractor does not pay the first-tier Subcontractor within thirty (30) Days after receiving payment from Owner, to pay to the first-tier Subcontractor an interest penalty on amounts due in each payment the Contractor does not make in accordance with the payment clause included in the subcontract under paragraph (a) of this subsection. Contractor or first-tier Subcontractor is not obligated to pay an interest penalty if the only reason that the Contractor or first-tier Subcontractor did not make payment when payment was due is that the Contractor or first-tier Subcontractor did not receive payment from Owner or Contractor when payment was due. The interest penalty applies to the period that begins on the day after the required payment date and that ends on the date on which the amount due is paid, and shall be computed at the rate specified in ORS 279C.515(2).

(c) A clause which requires each of Contractor's Subcontractors to include, in each of their contracts with lower-tier Subcontractors or suppliers, provisions to the effect that the first-tier Subcontractor shall pay its lower-tier Subcontractors and suppliers in accordance with the provisions of subsections (a) and (b), above and requiring each of their Subcontractors and suppliers to include such clauses in their subcontracts and supply contracts.

C.3.4 All employers, including Contractor, that employ subject workers who work under this Contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. Contractor shall ensure that each of its Subcontractors complies with these requirements.

C.4 PAYMENT FOR MEDICAL CARE

Pursuant to ORS 279C.530, and as a condition to Owner's performance hereunder, Contractor shall promptly, as due, make payment to any person, partnership, association or corporation furnishing medical, surgical, and hospital care or other needed care and attention, incident to sickness or injury, to the employees of such Contractor, all sums of which the Contractor agrees to pay for such services and all moneys and sums which the Contractor has collected or deducted from the wages of personnel pursuant to any law, contract or agreement for the purpose of providing or paying for such services.

C.5 HOURS OF LABOR

As a condition to Owner's performance hereunder, Contractor shall comply with ORS 279C.520, as amended from time to time and incorporated herein by this reference:

Pursuant to ORS 279C.520 and as a condition to Owner's performance hereunder, no person shall be employed to perform Work under this Contract for more than ten (10) hours in any one day or forty (40) hours in any one week, except in cases of necessity, emergency or where public policy absolutely requires it. In such instances, Contractor shall pay the employee at least time and a half pay:

(a) For all overtime in excess of eight (8) hours a day or forty (40) hours in any one week when the work week is five consecutive Days, Monday through Friday; or

(b) For all overtime in excess of ten (10) hours a day or forty (40) hours in any one week when the work week is four consecutive Days, Monday through Friday; and

(c) For all Work performed on Saturday and on any legal holiday specified in ORS 279C.540. This Section C.5 shall not excuse Contractor from completion of the Work within the time required under this Contract.

This Section C.5 will not apply to Contractor's work under this Contract if Contractor is currently a party to a collective bargaining agreement with any labor organization.

SECTION D
CHANGES IN THE WORK

D.1 CHANGES IN WORK

D.1.1 The terms of this Contract shall not be waived, altered, modified, supplemented or amended in any manner whatsoever without prior written approval of the Owner's Authorized Representative and Owner's Agent, and then only in a manner consistent with the Change Order provisions of this Section D.1 and after any necessary approvals required by public contracting laws have been obtained. Otherwise, a formal contract amendment is required, which shall not be effective until its execution by the parties to this Contract and all approvals required by public contracting laws have been obtained.

D.1.2 It is mutually agreed that changes in Plans, quantities, or details of Construction are inherent in the nature of Construction and may be necessary or desirable during the course of Construction. Within the general scope of this Contract, the Owner's Authorized Representative and Owner's Agent may, at any time, without notice to the sureties and without impairing the Contract, require changes consistent with this Section D.1. All Change Order Work shall be executed under the conditions of the Contract Documents. Such changes may include, but are not limited to:

(a) Modification of Specifications and design.

(b) Increases or decreases in quantities.

(c) Increases or decreases to the amount of Work.

(d) Addition or elimination of any Work item.

(e) Change in the duration of the project.

(f) Acceleration or delay in performance of Work.

(g) Deductive changes.
Deductive changes are those that reduce the scope of the Work, and shall be made by mutual agreement whenever feasible.

In cases of suspension or partial termination under Section J, Owner reserves the right to unilaterally impose a deductive change and to self-perform such Work, for which the provisions of B.13 (Owner's Right to Do Work) shall then apply.

Adjustments in compensation shall be made under the provisions of D.1.3, in which costs for deductive changes shall be based upon a Direct Costs adjustment together with the related percentage markup specified for profit, Overhead and other indirect costs, unless otherwise agreed to by Owner.

D.1.3 The Owner and Contractor agree that Change Order Work shall be administered and compensated according to the following:

(a) Unit pricing may be utilized at the Owner's option when unit prices or solicitation Alternates were provided that established the cost for additional Work, and a binding obligation exists under the Contract on the parties covering the terms and conditions of the additional Work.

(b) If the Owner elects not to utilize unit pricing, or in the event that unit pricing is not available or appropriate, fixed pricing may be used for Change Order Work. In fixed pricing the basis of payments or total price shall be agreed upon in writing between the parties to the Contract, and shall be established before the Work is done whenever feasible. The mark-ups set forth in D.1.3(c) shall be utilized by the parties as a guide in establishing fixed pricing, and will not be exceeded by Owner without adequate justification. Cost and price data relating to Change Orders shall be supplied by Contractor to Owner's Agent upon request, but Owner's Agent shall be under no obligation to make such requests.

(c) In the event that unit pricing and fixed pricing are not utilized, then Change Order Work shall be performed on a cost reimbursement basis for Direct Costs. Such Work shall be compensated on the basis of the actual, reasonable and allowable direct cost of labor, equipment, and material furnished on the Work performed. In addition, the following markups shall be added to the Contractor's or Subcontractor's Direct Costs as full compensation for profit, Overhead and other indirect costs for Work directly performed with the Contractor's or Subcontractor's own forces:

On Labor.....12%
On Equipment..... 8%
On Materials..... 8%

When Change Order Work under D.1.3(c) is invoiced by an authorized Subcontractor at any level, each ascending tier Subcontractor or Contractor will be allowed a supplemental mark-up on each piece of subcontract Work covered by such Change Order as follows:

$0.00 - $2,000.00 10%, and then
Over $2,000.00 5%

Payments made to the Contractor shall be complete compensation for Overhead, profit, and all costs that were incurred by the Contractor or by other forces furnished by the Contractor, including Subcontractors, for Change Order Work. Owner may establish a maximum cost for Change Order Work under this Section D.1.3(c), which shall not be exceeded for reimbursement without additional written authorization from Owner. Contractor shall not complete such Change Order Work without additional authorization.

D.1.4 Any necessary adjustment of Contract Time that may be required as a result of a Change Order must be agreed upon by the parties before the start of the Change Order Work unless Owner's Authorized Representative and Owner's Agent authorizes Contractor to start the Work before agreement on Contract Time adjustment.

Contractor shall submit any request for additional compensation (and additional Contract Time if Contractor was authorized to start Work before an adjustment of Contract Time was approved) as soon as possible but no later than thirty (30) Days after receipt of the Change Order.

If Contractor's request for additional compensation or adjustment of Contract Time is not made within the thirty (30) day time limit, Contractor's requests pertaining to that Change Order are barred, unless otherwise prohibited by law.

The thirty (30) day time limit for making requests shall not be extended for any reason, including without limitation Contractor's claimed inability to determine the amount of additional compensation or adjustment of Contract Time, unless an extension is granted in writing by Owner's Agent.

If the Owner's Agent denies Contractor's request for additional compensation or adjustment of Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process. No other reimbursement, compensation, or payment will be made, except as provided in Section D.1.5 for impact claims.

D.1.5 If any Change Order Work under Section D.1.3 causes an increase or decrease in the Contractor's cost of, or the Contract Time required for the performance of, any other part of the Work under this Contract, the Contractor must submit a written request to the Owner's Agent, setting forth the nature and specific extent of the request, including all time and cost impacts against the Contract as soon as possible, but no later than thirty (30) Days after receipt of the Change Order by Contractor.

The thirty (30) day time limit applies to claims of Subcontractors, suppliers, or manufacturers that may be affected by the Change Order and that request additional compensation or an extension of Contract Time to perform; Contractor has responsibility for contacting its Subcontractors, suppliers, or manufacturers within the thirty (30) day time limit, and including their requests with Contractor's requests.

If the request involves Work to be completed by Subcontractors, or materials to be furnished by suppliers or manufacturers, such requests shall be submitted to the Contractor in writing with full analysis and justification for the compensation and additional Contract Time requested.

The Contractor will analyze and evaluate the merits of the requests submitted by Subcontractors, suppliers, and manufacturers to Contractor prior to including those requests and Contractor's analysis and evaluation of those requests with Contractor's requests for additional compensation or Contract Time that Contractor submits to the Owner's Agent.

Failure of Subcontractors, suppliers, manufacturers or others to submit their requests to Contractor for inclusion with Contractor's requests submitted to Owner's Agent within the time period and by the means described in this section shall constitute a waiver of these Subcontractor claims, unless otherwise prohibited by law.

The Owner's Authorized Representative and the Owner's Agent will not consider direct requests or claims from Subcontractors, suppliers, manufacturers or others not a party to this Contract. The consideration of such requests and claims under this section

does not give any person, not a party to the Contract the right to bring a claim against the Owner, whether in this claims process, in litigation, or in any dispute resolution process.

If the Owner's Agent denies the Contractor's request for additional compensation or an extension of Contract Time, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

D.1.6 No request or Claim by the Contractor for additional costs or an extension of Contract Time shall be allowed if made after receipt of final payment application under this Contract. Contractor agrees to submit its final payment application within ninety (90) days after Substantial Completion, unless written extension is granted by Owner. Contractor shall not delay final payment application for any reason, including without limitation nonpayment of Subcontractors, suppliers, manufacturers or others not a party to this Contract, or lack of resolution of a dispute with Owner or any other person of matters arising out of or relating to the Contract. If Contractor fails to submit its final payment application within ninety (90) days after Substantial Completion, and Contractor has not obtained written extension by Owner, all requests or Claims for additional costs or an extension of Contract Time shall be waived.

D.1.7 It is understood that changes in the Work are inherent in construction of this type. The number of changes, the scope of those changes, and the effect they have on the progress of the original Work cannot be defined at this time. The Contractor is notified that numerous changes may be required and that there will be no compensation made to the Contractor directly related to the number of changes. Each change will be evaluated for extension of Contract Time and increase or decrease in compensation based on its own merit.

D.2 DELAYS

D.2.1 Delays in Construction include "Avoidable Delays", which are defined in Section D.2.1.1, and "Unavoidable Delays", which are defined in Section D.2.1.2. The effect of Avoidable Delays is described in Section D.2.2 and the effect of Unavoidable Delays is described in Section D.2.3.

D.2.1.1 Avoidable Delays include any delays other than Unavoidable Delays, and include delays that otherwise would be considered Unavoidable Delays but that:

(a) Could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors.

(b) Affect only a portion of the Work and do not necessarily prevent or delay the execution of other parts of the Work nor the completion of the whole Work within the Contract Time.

(c) Do not impact activities on the accepted Critical Path schedule.

(d) Are associated with the reasonable interference of other contractors employed by the Owner that do not necessarily prevent the completion of the whole Work within the Contract Time.

D.2.1.2 Unavoidable Delays include delays other than Avoidable Delays that are:

(a) Caused by any actions of the Owner, Owner's Authorized Representative, Owner's Agent, or any other employee or agent of the Owner, or by separate contractor employed by the Owner.

(b) Caused by any site conditions which differ materially from what was represented in the Contract Documents or from conditions that would normally be expected to exist and be inherent to the construction activities defined in the Contract Documents.

The Contractor shall notify the Owner's Authorized Representative immediately of differing site conditions before the area has been disturbed.

The Owner's Authorized Representative will investigate the area and make a determination as to whether or not the conditions differ materially from either the conditions stated in the Contract Documents or those which could reasonably be expected to exist and be inherent in this particular Contract.

If Contractor and the Owner's Authorized Representative agree that a differing site condition exists, any additional compensation or additional Contract Time will be determined based on the process set forth in Section D.1.5 for Change Order Work.

If the Owner's Authorized Representative disagrees that a differing site condition exists and denies Contractor's request for additional compensation or Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

(c) Caused by Force Majeure acts, events or occurrences that could not have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors.

(d) If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect, and cost impact, if any, on the scheduled construction. For the purposes of this provision, weather that is not usual but is within historic climatic norms for the site of Work shall not be a basis for the adjustment of Contract Time. Weather that is either an extreme or a prolonged deviation from historic climatic norms that actually prevents or severely retards discrete Work that is on the Critical Path may support a Claim. Climatic norms will be determined from the records of the official government weather observation station that is closest to the site. In the case of extremely localized weather phenomena such as micro-bursts, tornados, lightning strikes and hail data and observations from conditions at the site of Work and information inferred from the damage to the Work and nearby structures shall be presented and may be considered. Localized events that actually occur at the site of Work shall not be considered to be with climatic norms. Data to support claims based on more general phenomena shall be substantiated with the observations of the nearest government weather observation station. An event or phenomena is considered within climatic norms if the same event, pattern or phenomena has occurred within the county in which the Work is located twice within the period of time during which reliable weather observations have been recorded or twice within the 100 years preceding the event, pattern or phenomena. For the purposes of this provision, flooding due to the overflow of a river or a fish bearing stream is not considered a weather event.

D.2.2 Except as otherwise provided in ORS 279C.315, Contractor shall not be entitled to additional compensation or additional Contract Time for Avoidable Delays.

D.2.3 In the event of Unavoidable Delays, based on principles of equitable adjustment, Contractor may be entitled to the following:

(a) Contractor may be entitled to additional compensation or additional Contract Time, or both, for Unavoidable Delays described in Section D.2.1.2 (a) and (b).

(b) Contractor may be entitled to additional Contract Time for Unavoidable Delays described in Section D.2.1.2(c) and (d).

In the event of any requests for additional compensation or additional Contract Time, or both, as applicable, arising under this Section D.2.3 for Unavoidable Delays, other than requests for additional compensation or additional Contract Time for differing site conditions for which a review process is established under Section D.2.1.2 (b), Contractor shall submit a written notification of the delay to the Owner's Agent within two (2) Business Days of the occurrence of the cause of the delay.

This written notification shall state the cause of the potential delay, the project components impacted by the delay, and the anticipated additional Contract Time or the additional compensation, or both, as applicable, resulting from the delay.

Within seven (7) Days after the cause of the delay has been mitigated, or in no case more than thirty (30) Days after the initial written notification, the Contractor shall submit to the Owner's Agent, a complete and detailed request for additional compensation or additional Contract Time, or both, as applicable, resulting from the delay. If the Owner's Agent denies Contractor's request for additional compensation or adjustment of Contract Time, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

If Contractor does not timely submit the notices required under this Section D.2., then unless otherwise prohibited by law, Contractor's Claim shall be barred.

D.3 CLAIMS REVIEW PROCESS

D.3.1 All Contractor Claims shall be referred to the Owner's Authorized Representative and Owner's Agent for review.

Contractor's Claims, including Claims for additional compensation or additional Contract Time, shall be submitted in writing by Contractor to the Owner's Authorized Representative and Owner's Agent within five (5) Days after a denial of Contractor's initial request for an adjustment of Contract terms, payment of money, extension of Contract Time or other relief, provided that such

initial request has been submitted in accordance with the requirements and within the time limits established in these General Conditions. Within thirty (30) Days after the initial Claim, Contractor shall submit to the Owner's Authorized Representative and Owner's Agent, a complete and detailed description of the Claim (the "Detailed Notice") that includes all information required by Section D.3.2.

Unless the Claim is made in accordance with these time requirements, it shall be waived.

D.3.2 The Detailed Notice of the Claim shall be submitted in writing by Contractor and shall include a detailed, factual statement of the basis of the Claim, pertinent dates, Contract provisions which support or allow the Claim, reference to or copies of any documents which support the Claim, the dollar value of the Claim, and the Contract Time extension requested for the Claim.

If the Claim involves Work to be completed by Subcontractors, the Contractor will analyze and evaluate the merits of the Subcontractor claim prior to forwarding it and that analysis and evaluation to the Owner's Authorized Representative.

The Owner's Authorized Representative and Owner's Agent will not consider direct claims from Subcontractors, suppliers, manufacturers, or others not a party to this Contract. Contractor agrees that it will make no agreement, covenant, or assignment, nor will it commit any other act that will permit or assist any Subcontractor, supplier, manufacturer, or other to directly or indirectly make a claim against Owner.

D.3.3 The Owner's Authorized Representative and Owner's Agent will review all Claims and take one or more of the following preliminary actions within ten (10) Days of receipt of the Detailed Notice of a Claim: (1) request additional supporting information from the Contractor; (2) inform the Contractor and Owner in writing of the time required for adequate review and response; (3) reject the Claim in whole or in part and identify the reasons for rejection; (4) based on principles of equitable adjustment, recommend approval of all or part of the Claim; or (5) propose an alternate resolution.

D.3.4 The Owner's Authorized Representative's and Owner's Agent's decision shall be final and binding on the Contractor unless appealed by written notice to the Owner, through the Owner's Procurement Services office, within fifteen (15) Days of receipt of the decision.

The Contractor must present written documentation supporting the Claim within fifteen (15) Days of the notice of appeal.

After receiving the appeal documentation, the Owner shall review the materials and render a decision within thirty (30) Days after receiving the appeal documents.

D.3.5 The decision of the Owner shall be final and binding unless the Contractor delivers to the Owner its request for mediation, which shall be a non-binding process, within fifteen (15) Days of the date of the Owner's decision.

The mediation process will be considered to have commenced as of the date the Contractor delivers the request. Both parties acknowledge and agree that participation in mediation is a prerequisite to commencement of litigation of any disputes relating to the Contract.

Both parties further agree to exercise their best efforts in good faith to resolve all disputes within sixty (60) Days of the commencement of the mediation through the mediation process set forth herein.

In the event that a lawsuit must be filed within this sixty (60) day period in order to preserve a cause of action, the parties agree that notwithstanding the filing, they shall proceed diligently with the mediation to its conclusion prior to actively prosecuting the lawsuit, and shall seek from the Court in which the lawsuit is pending such stays or extensions, including the filing of an answer, as may be necessary to facilitate the mediation process.

Further, in the event settlements are reached on any issues through mediation, the parties agree to promptly submit the appropriate motions and orders documenting the settlement to the Court for its signature and filing.

D.3.6 The mediator shall be an individual mutually acceptable to both parties, but in the absence of agreement each party shall select a temporary mediator and the temporary mediators shall jointly select the permanent mediator. Each party shall pay its own costs for the time and effort involved in mediation. The cost of the mediator shall be split equally between the two parties. Both parties agree to exercise their best effort in good faith to resolve all disputes in mediation.

Participation in mediation is a mandatory requirement of both the Owner and the Contractor. The schedule, time and place for mediation will be mutually acceptable, or, failing mutual agreement, shall be as established by the mediator.

The parties agree to comply with Owner's administrative rules governing the confidentiality of mediation, if any, and shall execute all necessary documents to give effect to such confidentiality rules.

In any event, the parties shall not subpoena the mediator or otherwise require the mediator to produce records, notes or work product, or to testify in any future proceedings as to information disclosed or representations made in the course of mediation, except to the extent disclosure is required by law.

D.3.7 Unless otherwise directed by Owner's Agent, Contractor shall proceed with the Work while any Claim of Contractor is pending, including a Claim for additional compensation or additional Contract Time resulting from Change Order Work.

Regardless of the review period or the final decision of the Owner's Agent, the Contractor shall continue to diligently pursue the Work as identified in the Contract Documents.

In no case is the Contractor justified or allowed to cease Work without a written stop work order from the Owner's Agent or Owner's Authorized Representative.

SECTION E
PAYMENTS

E.1 SCHEDULE OF VALUES

The Contractor shall submit, at least ten (10) Days prior to submission of its first application for progress payment, a schedule of values for the contracted Work.

This schedule will provide a breakdown of values for the contracted Work and will be the basis for progress payments. The breakdown shall be in Construction Specifications Institute (CSI), format and shall be by Subcontractor or supplier and by value of each subcontract. Unless objected to by the Owner's Agent, this schedule shall be used as the basis for reviewing Contractor's applications for payment.

If objected to by Owner's Agent, Contractor shall revise the schedule of values and resubmit the same for approval of Owner's Agent.

E.2 APPLICATIONS FOR PAYMENT

E.2.1 Owner shall make progress payments on the Contract monthly as Work progresses. Payments shall be based upon estimates of Work completed and the Schedule of Values.

All payments shall be approved by the Owner's Agent.

A progress payment shall not be considered acceptance or approval of any Work or waiver of any Defects therein.

Owner shall pay to Contractor interest on the progress payment, not including retainage, due the Contractor. The interest shall commence thirty (30) Days after the receipt of invoice ("application for payment") from the Contractor or fifteen (15) Days after the payment is approved by the Owner's Authorized Representative, whichever is the earlier date.

The rate of interest shall equal three times the discount rate on 90-day commercial paper in effect at the Federal Reserve Bank in the Federal Reserve district that includes Oregon on the date that is thirty (30) Days after receipt of the application for payment from the Contract or fifteen (15) Days after the payment is approved by the Owner, whichever is the earlier date, but the rate of interest shall not exceed thirty (30) percent.

Notwithstanding the foregoing, in instances when an application for payment is filled out incorrectly, or when there is any Defect or impropriety in any submitted application or when there is a good faith dispute, Owner shall so notify the Contractor within fifteen (15) Days stating the reason or reasons the application for payment is Defective or improper or the reasons for the dispute.

A Defective or improper application for payment, if corrected by the Contractor within seven (7) Days of being notified by the Owner, shall not cause a payment to be made later than specified in this section unless interest is also paid. Accrual of interest will be postponed when payment on the principal is delayed because of disagreement between the Owner and the Contractor.

E.2.2 Contractor shall submit to the Owner's Authorized Representative and Owner's Agent, an application for each payment and, if required, receipts or other vouchers showing payments for materials and labor, including payments to Subcontractors. Contractor shall include, in its application for payment, a schedule of the percentages of the various parts of the Work completed, based on the Schedule of Values which shall aggregate to the payment application total, and shall include, on the face of each copy thereof, a certificate in substantially the following form:

"I, the undersigned, hereby certify that the above bill is true and correct, and the payment therefore, has not been received.

Signed: _____"

E.2.3 Generally, Applications for Payment will be accepted only for materials that have been installed.

Under special conditions, Applications for Payment for stored materials will be accepted at Owner's sole discretion. Such a payment, if made, will be subject to the following conditions:

(a) The request for stored material shall be submitted at least thirty (30) Days in advance of the application for payment on which it appears. Applications for Payment shall be entertained for major equipment, components or expenditures only.

(b) The Contractor shall submit applications for payment showing the quantity and cost of the material stored.

(c) The material shall be stored in a bonded warehouse and Owner's Authorized Representative and/or Owner's Agent shall be granted the right to access the material for the purpose of removal or inspection at any time during the Contract Period.

(d) The Contractor shall name the Owner as co-insured on the insurance policy covering the full value of the property while in the care and custody of the Contractor until it is installed. A certificate noting this coverage shall be issued to the Owner.

(e) Payments shall be made for materials only. The submitted amount of the Application for Payment shall be reduced by the cost of transportation and for the cost of an inspector to check the delivery at out of town storage sites. The cost of said inspection shall be borne solely by the Contractor.

(f) Within sixty (60) Days of the Application for Payment, the Contractor shall submit evidence of payment covering the material stored.

(g) Payment for stored materials shall in no way indicate acceptance of the materials or waive any rights under this Contract for the rejection of the Work or materials not in conformance with the Contract Documents.

(h) All required documentation must be submitted with the respective application for payment.

E.2.4 The Owner reserves the right to withhold all or part of a payment, or may nullify in whole or part any payment previously made, to such extent as may be necessary in the Owner's Agent's opinion to protect the Owner from loss because of:

(a) Work that is Defective and not remedied, or that has been demonstrated or identified as failing to conform with the Contract Documents;

(b) Third party claims filed or evidence reasonably indicating that such claims will likely be filed unless security acceptable to the Owner is provided by the Contractor;

(c) Failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment (in which case Owner may issue checks made payable jointly to Owner and such unpaid persons under this provision, or directly to Subcontractors and suppliers at any level under Section C.3.2.1);

(d) Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price;

(e) Damage to the Owner or another contractor;

(f) Reasonable evidence that the Work will not be completed within the Contract Time required by the Contract, and that the unpaid balance would not be adequate to cover actual or Liquidated Damages for the anticipated delay;

(g) Failure to carry out the Work in accordance with the Contract Documents; or

(h) Assessment of Liquidated Damages, when withholding is made for offset purposes.

E.2.5 Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

(a) Take that portion of the Contract Price properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Price allocated to that portion of the Work in the Schedule of Values, less retainage as provided in Section E.5... Pending final determination of cost to the Owner of changes in the Work, amounts not in the dispute may be included even though the Contract Price has not yet been adjusted by Change Order;

(b) Add that portion of the Contract Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner pursuant to Section E.2.3, suitably stored off the site at a location agreed upon in writing), less retainage as provided in Section E.5;

(c) Subtract the aggregate of previous payments made by the Owner; and

(d) Subtract any amounts for which the Owner's Authorized Representative and/or Owner's Agent has withheld or nullified payment as provided in the Contract Documents.

E.2.6 Contractor's Applications for Payment may not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier.

E.2.7 The Contractor warrants to Owner that title to all Work covered by an application for payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which payments are received from the Owner shall be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

E.2.8 If Contractor disputes any determination by Owner's Authorized Representative and/or Owner's Agent with regard to any Application for Payment, Contractor nevertheless shall continue to progress expeditiously with the Work. No payment made hereunder shall be or be construed to be final acceptance or approval of that portion of the Work to which such partial payment relates or shall relieve Contractor of any of its obligations hereunder.

E.3 PAYROLL CERTIFICATION REQUIREMENT

Payroll certification is required before payments are made on the Contract. Refer to Section C.2 for this information.

E.4 DUAL PAYMENT SOURCES

Contractor shall not be compensated for Work performed under this Contract from any source other than the College.

E.5 RETAINAGE

E.5.1 Retainage shall be withheld and released in accordance with ORS 279C.550 to 279C.570:

E.5.1.1 Owner may reserve as retainage from any progress payment an amount not to exceed five percent of the payment. A progress payment shall not be considered acceptance or approval of any work or waiver of any Defects therein.

As Work progresses, Owner may reduce the amount of the retainage and may eliminate retainage on any remaining monthly Contract payments after 50 percent of the Work under the Contract is completed if, in the Owner's Agent's opinion, such Work is progressing satisfactorily.

Elimination or reduction of retainage shall be allowed only upon written application by the Contractor, which application shall include written approval of Contractor's surety; except that when the Work is 97-1/2 percent completed the Owner may, at its discretion and without application by the Contractor, reduce the retained amount to 100 percent of the value of the Work remaining to be done.

Upon receipt of written application by the Contractor, Owner shall respond in writing within a reasonable time.

E.5.1.2 In accordance with the provisions of ORS 279C.560 and any applicable administrative rules, unless the Owner finds in writing that accepting a bond, security or other instrument described in options (a) or (c) below poses an extraordinary risk that is not typically associated with the bond, security or instrument, the Owner will approve the Contractor's written request:

(a) To be paid amounts which would otherwise have been retained from progress payments where Contractor has deposited acceptable bonds and securities of equal value with Owner or in a custodial account or other mutually-agreed account satisfactory to Owner, with an approved bank or trust company to be held in lieu of the cash retainage for the benefit of Owner;

(b) That retainage be deposited in an interest bearing account, established through the State Treasurer for state agencies, in a bank, savings bank, trust company or savings association for the benefit of Owner, with earnings from such account accruing to the Contractor; or

(c) That the Owner allow Contractor to deposit a surety bond for the benefit of Owner, in a form acceptable to Owner, in lieu of all or a portion of funds retained, or to be retained. Such bond and any proceeds therefrom shall be made subject to all claims and liens in the manner and priority as set forth for retainage under ORS 279C.550 to ORS 279C.625.

Where the Owner has accepted the Contractor's election of option (a) or (b), Owner may recover from Contractor any additional costs incurred through such election by reducing Contractor's final payment. Where the Owner has agreed to Contractor's request for option (c), Contractor shall accept like bonds from Subcontractors and suppliers on the project from which Contractor has required retainages.

E.5.1.3 The retainage held by Owner shall be included in and paid to the Contractor as part of the final payment of the Contract Price.

The Owner shall pay to Contractor interest at the rate specified by the version of ORS 279C.570 that is in effect on the date the application for final payment is submitted.

Contractor shall notify Owner in writing when the Contractor considers the Work complete and Owner shall, within fifteen (15) Days after receiving the written notice, either accept the Work or notify the Contractor of Work yet to be performed on the Contract.

If Owner does not within the time allowed notify the Contractor of Work yet to be performed to fulfill contractual obligations, the interest provided by this subsection shall commence to run thirty (30) Days after the end of the 15-Day period, provided that, no interest shall be due upon any payment application which contains any false, fraudulent or materially misleading claim for payment or a claim for payment supported by any false, fraudulent or materially misleading data.

In addition to any other remedy under this agreement or a law, the Contractor shall pay to the Owner as liquidated damages and not as a penalty an amount that is three times the total amount of the payment claimed on any application for final payment containing any false, fraudulent or materially misleading claim for payment or a claim for payment supported by any false, fraudulent or materially misleading data. Damages shall be due regardless of whether the Owner, the Owner’s Authorized Representative, the Architect or an auditor detected the false, fraudulent or materially misleading claim or data and refused or reclaimed the payment for the affected item.

E.5.1.4 In accordance with the provisions of ORS 279C.560, Owner shall reduce the amount of the retainage if the Contractor notifies the controller of the Owner that the Contractor has deposited in an escrow account with a bank or trust company, in a manner authorized by the Owner, bonds and securities of equal value of a kind approved by the Owner's Agent.

E.5.1.5 Contractor agrees that if Contractor elects to reserve a retainage from any progress payment due to any Subcontractor or supplier, such retainage shall not exceed five percent of the payment, and such retainage withheld from Subcontractors and suppliers shall be subject to the same terms and conditions stated in Subsection E.5 as apply to Owner’s retainage from any progress payment due to Contractor.

E.5.2 As provided in subsections C.2.2 and C.2.3, additional retainage in the amount of 25% of amounts earned shall be withheld and released in accordance with ORS 279C.845(7) when the Contractor fails to file certified statements as required by section C.2.1.

E.6 FINAL PAYMENT

E.6.1 Upon completion of all the Work under this Contract, the Contractor shall notify the Owner's Authorized Representative and Owner’s Agent, in writing, that Contractor has completed Contractor's part of the Contract and shall request final payment. Upon receipt of such notice the Owner's Authorized Representative and Owner’s Agent will inspect the Work, and if acceptable, submit to the Owner a recommendation as to acceptance of the completed Work and as to the final estimate of the amount due the Contractor. If the Work is not acceptable, Owner will notify Contractor within fifteen (15) Days of Contractor's request for final payment. Upon approval of this final estimate by the Owner and compliance by the Contractor with provisions in Section K. 3 AFFIDAVIT/RELEASE OF LIENS AND CLAIMS, and other provisions as may be applicable, the Owner shall pay to the Contractor all monies due under the provisions of these Contract Documents.

E.6.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Owner’s Authorized Representative and Owner’s Agent (1) a notarized affidavit/release of liens and claims in a form satisfactory to Owner that states that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least thirty (30) Days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of

liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner.

If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien or claim. If such lien or claim remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien or claim, including all costs and reasonable attorneys' fees.

E.6.3 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

SECTION F
JOB SITE CONDITIONS

F.1 USE OF PREMISES

Contractor shall confine equipment, storage of materials and operation of Work to the limits indicated by Contract Documents, law, ordinances, permits or directions of the Owner's Agent. Contractor shall follow the Owner's Agent's instructions regarding use of premises, if any.

Contractor shall use due diligence to work with the Owner's Agent to access any and all potentials for hazardous materials at the Site of Work prior to commencement of Work.

F.2 PROTECTION OF WORKERS, PROPERTY, AND THE PUBLIC

F.2.1 Contractor shall maintain continuous and adequate protection of all of the Work from damage, and shall protect the Owner's Authorized Representative and others, Owner's Agent, Owner's agents, Owner's invitees, Owner's workers, Owner's volunteers, Owner's students and property from injury or loss arising in connection with this Contract.

Contractor shall remedy acceptably to the Owner, any damage, injury, or loss, except such as may be directly due to errors in the Contract Documents or caused by authorized representatives or personnel of the Owner.

Contractor shall adequately protect adjacent property as provided by law and the Contract Documents.

F.2.2 Contractor shall take all necessary precautions for the safety of all personnel on the job site, and shall comply with the Contract Documents and all applicable provisions of federal, state and municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the Work is being performed. Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for protection of persons lawfully on the Site of Work, workers and the public against any hazards created by construction.

Contractor shall designate a responsible employee or associate on the Work site, whose duty shall be the prevention of accidents. The name and position of the person designated shall be reported to the Owner's Authorized Representative and to the Architect/Engineer. The Owner's Authorized Representative has no responsibility for Work site safety. Work site safety is the responsibility of the Contractor.

F.2.3 Contractor shall not enter upon private property without first obtaining permission from the property owner or its duly authorized representative. Contractor shall be responsible for the preservation of all public and private property along and adjacent to the Work contemplated under the Contract and shall use every precaution necessary to prevent damage thereto.

In the event the Contractor damages any property, the Contractor shall at once notify the property owner and make, or arrange to make, full restitution. Contractor shall report, immediately in writing, to the Owner's Authorized Representative and Owner's Agent, all pertinent facts relating to such property damage and the ultimate disposition of the claim for damage.

F.2.4 Contractor is responsible for protection of adjacent work areas including, but not limited to, impacts brought about by activities, equipment, labor, utilities, and materials on the site. Contractor shall save, defend, indemnify and hold Owner harmless from any claim for damages, suit, action, judgment or award the cause of which is the interruption of utility service caused by Contractor or a Subcontractor if the Contractor did not attempt to locate utilities through the Oregon Utility Notification Center, if the utility was shown in the Contract Documents, if the utility was known to be in the general area or if the utility was evident either by direct observation or by the observation of markers, supports, bedding or conduit prior to being encountered.

F.2.5 Contractor shall at all times direct its activities in such a manner as to minimize adverse effects on the environment. Handling of all materials will be conducted so no release will occur that may pollute or become hazardous.

F.2.6 In an emergency affecting the safety of life or of the Work or of adjoining property, the Contractor, without special instruction or authorization from the Owner's Authorized Representative and Owner's Agent, shall act reasonably to prevent threatened loss or injury, and shall so act, without appeal, if instructed by the Owner's Authorized Representative or Owner's Agent. Any compensation claimed by the Contractor on account of emergency work shall be determined in accordance with Section D.

F.3 CUTTING AND PATCHING AND INFERRED SUPPLIES

F.3.1 Contractor shall be responsible for coordinating all cutting, fitting, or patching of the Work to make its several parts come together properly and fit to receive or be received by work of other contractors or Subcontractors shown upon, or reasonably implied by, the Contract Documents.

F.3.2 Contractor shall be responsible for restoring all cut, fitted, or patched surfaces to an original condition; provided, however, that if a different condition is specified in the Contract Documents, then Contractor shall be responsible for restoring such surfaces to the condition specified in the Contract Documents.

F.3.3 Contractor shall as part of the Work and at no additional cost to the Owner supply and install all pipe, cable, conduit, sleeves, casings, hangers, valves, fittings, conductors, fasteners, anchors, mastics, adhesives, screws, nails and the like needed to construct the finished improvement whether specifically called for in the Contract Documents or not. When not specifically called for in the Contract Documents such materials shall be new and of good quality and suited to the application in which they are used. All installations shall comply with the applicable codes.

F.4 CLEANING UP

The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove from and about the project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials. Contractor shall remove from the site any hazardous waste or other deleterious material caused by or resulting from the Work.

F.4.1 Removal and disposal shall be in compliance with all applicable laws and regulations.
F.4.2 Contractor shall remove any staging area used during construction, grade such area to a level condition, and seed it with stabilizing vegetation acceptable to the Owner, unless otherwise specified on drawings or technical specifications. Contractor shall comply with local ordinances and regulations concerning the recycling of materials and segregation of waste and rubbish by type. In addition, Contractor shall comply with College policies concerning the reduction of waste and recycling of waste materials and packaging.

F.5 ENVIRONMENTAL CONTAMINATION

F.5.1 Contractor will be held responsible for and shall indemnify, defend (with counsel of Owner’s choice) and hold harmless Owner from and against any costs, expenses, damages, claims, and causes of action, (including attorney fees), any or all of them, resulting from all spills, releases, discharges, leaks and disposal of environmental pollution, including storage, transportation, and handling during the performance of the Contract which occur as a result of, or are contributed by, the negligence or actions of Contractor or its personnel, agents, or Subcontractors or any failure to perform in accordance with the Contract Documents (except to the extent otherwise void under ORS 30.140). Nothing in this section F.5.1 shall limit Contractor's responsibility for obtaining insurance coverages required under Section G.3 of these General Conditions, and Contractor shall take no action that would void or impair such coverages.

F.5.1.1 Contractor agrees to promptly dispose of such spills, releases, discharge or leaks to the satisfaction of Owner and proper regulatory agencies in a manner that complies with applicable federal, state, and local laws and regulations. Cleanup shall be at no cost to the Owner and be performed by properly qualified personnel.

F.5.1.2 Contractor shall obtain the Owner's written consent prior to bringing onto the Work site any (i) environmental pollutants or (ii) hazardous substances or materials, as the same or reasonably similar terms are used in any applicable federal, state, and local laws and regulations. Notwithstanding such written consent from the Owner, the Contractor, at all times, shall:

(a) Properly handle, use and dispose of all environmental pollutants and hazardous substances or materials brought onto the Work site, in accordance with all applicable federal, state, and local laws and regulations;

(b) Be responsible for any and all spills, releases, discharges, or leaks of (or from) environmental pollutants or hazardous substances or materials which Contractor has brought onto the Work site; and

(c) Promptly clean up, without cost to the Owner, such spills, releases, discharges, or leaks to the Owner's satisfaction and in compliance with all applicable federal, state, and local laws and regulations.

F.5.2 Contractor shall report all reportable quantity releases to applicable federal, state, and local regulatory and emergency response agencies. Reportable quantities are found in 40 CFR Part 302, Table 302.4 for hazardous substances and in OAR Chapter 340 Division 109 for all products addressed therein. Upon discovery, regardless of quantity, Contractor must telephonically report all releases to the Owner. A written follow-up report shall be submitted to Owner within 48 hours of the telephonic report. Such written report shall contain, as a minimum:

(a) Description of items released (identity, quantity, manifest number, and all other documentation required by law.)

(b) Whether amount of items released is EPA/DEQ reportable, and, if so, when it was reported.

(c) Exact time and location of release, including a description of the area involved.

(d) Containment procedures initiated.

(e) Summary of communications about the release Contractor has had with members of the press or State and/or Federal officials.

(f) Description of cleanup procedures employed or to be employed at the site, including disposal location of spill residue.

(g) Personnel injuries, if any, resulting from, or aggravated by, the release.

F.6 ENVIRONMENTAL CLEAN-UP

F.6.1 Unless disposition of environmental pollution is specifically a part of this Contract, or was caused by the Contractor (reference F.5 Environmental Contamination), Contractor shall immediately notify Owner of any hazardous substance(s) which Contractor discovers or encounters during performance of the Work required by this Contract. "Hazardous substance(s)" means any hazardous, toxic and radioactive materials and those substances defined as “hazardous substances,” “hazardous materials,” “hazardous wastes,” “toxic substances,” and/or other similar designations in any federal, state, and local laws and regulations, including without limitation asbestos, polychlorinated biphenyl (PCB), or petroleum, and any substances, materials or wastes regulated in and defined as hazardous in 40 CFR, Part 261.3. In addition to notifying Owner of any hazardous substance(s) discovered or encountered, Contractor shall immediately cease working in any particular area of the project where a hazardous substance(s) has been discovered or encountered if continued work in such area would present a risk or danger to the health or well-being of construction workers, Owner’s employees, students, or passersby.

F.6.2 Upon being notified by Contractor of the presence of hazardous substance(s) on the project site, Owner shall arrange for the proper disposition of such hazardous substance(s).

F.7 FORCE MAJEURE

Neither party shall be held responsible for delay or default caused by fire, riot, war or other catastrophe, which is beyond such party's reasonable control. Each party shall, however, make all reasonable efforts to remove or eliminate such a cause of delay or default and shall, upon the cessation of the cause, diligently pursue performance of its obligations under the Contract. For the purposes of this clause “catastrophe” means an event that is so uncertain of occurrence that it cannot be reasonably anticipated, and so severe in its effect as to suspend the normal operation of civil government in the affected area for a prolonged period of time.

SECTION G
INDEMNITY, BONDING, AND INSURANCE

G.1 RESPONSIBILITY FOR DAMAGES/INDEMNITY

G.1.1 Contractor shall be responsible for all damage to property, injury to persons, and loss, expense, inconvenience, and delay that may be caused by, or result from, the carrying out of the Work to be done under this Contract, or from any act, omission or neglect of the Contractor, its Subcontractors, personnel, or agents.

G.1.2 To the fullest extent permitted by law, Contractor shall indemnify, defend (with counsel approved by Owner, but Owner's approval of counsel will not be unreasonably withheld), and hold harmless the Owner, Owner's Authorized Representative, board members, officers, agents, employees, and volunteers, (collectively "Indemnitees") from and against all liabilities, damages, losses, claims, expenses (including reasonable attorney fees), demands and actions of any nature whatsoever which arise out of, result from or are related to,

(a) Any damage, injury, loss, expense, inconvenience or delay described in this Section G.1.2,

(b) Any accident or occurrence which happens or is alleged to have happened in or about the project site or any place where the Work is being performed, or in the vicinity of either, at any time prior to the time the Work is fully completed in all respects,

(c) Any failure of the Contractor to observe or perform any duty or obligation under the Contract Documents which is to be observed or performed by the Contractor, or any breach of any agreement, representation or warranty of the Contractor contained in the Contract Documents or in any subcontract,

(d) The negligent acts or omissions of the Contractor, a Subcontractor or anyone directly or indirectly employed by them or any one of them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder (except to the extent otherwise void under ORS 30.140), and

(e) Any lien filed upon the project or bond claim in connection with the Work.

Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section G.1.2.

G.1.3 In claims against any person or entity indemnified under this Section G.1.2 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section G.1.2 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

G.2 PERFORMANCE AND PAYMENT SECURITY; PUBLIC WORKS BOND

G.2.1 When the Contract Price is $75,000 or more, the Contractor shall furnish and maintain in effect at all times during the Contract Period, a performance bond in a sum equal to the Contract Price, and a separate payment bond also in a sum equal to the Contract Price.

The bonds may be required if the Contract Price is less than the above thresholds, if required by the Contract Documents.

G.2.2 Bond forms furnished by the Owner and notarized by awarded Contractor's surety company authorized to do business in Oregon are the only acceptable forms of performance and payment security, unless otherwise specified in the Contract Documents.

G.2.3 Before starting Work the Contractor shall file with the Construction Contractors Board, and maintain in full force and effect, the separate public works bond required by Oregon Laws 2005, Chapters 670 and 701 et al, and OAR 839-025-0015, unless otherwise exempt under those provisions. The Contractor shall also include in every subcontract a provision requiring the Subcontractor to have a public works bond filed with the Construction Contractors Board before starting Work, unless otherwise exempt, and shall verify that the Subcontractor has filed a public works bond, is properly licensed or registered with the Oregon

Construction Contractors' Board (CCB) unless exempt, and is not a person or entity that is debarred or suspended from contracting for public work in any state of the United States before permitting the Subcontractor to start Work.

G.3 INSURANCE

G.3.1 Primary Coverage: Insurance carried by Contractor under this Contract shall be the primary coverage, and the Owner's insurance is excess and solely for damages or losses for which the Owner is responsible. The coverages indicated are minimums unless otherwise specified in the Contract Documents. Nothing contained in these insurance requirements shall be construed as limiting the extent of the Contractor's responsibility or liability for payment of damages resulting from Contractor's operations under this Contract.

G.3.2 Workers' Compensation: All employers, including Contractor, that employ subject workers who work under this Contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. This shall include Employer's Liability Insurance with coverage limits of not less than $500,000 for each accident. Contractors who perform the Work without the assistance or labor of any employee need not obtain such coverage if the Contractor certifies so in writing. Contractor shall ensure that each of its Subcontractors complies with these requirements. The Contractor shall require proof of such Workers' Compensation by receiving and keeping on file a certificate of insurance from each Subcontractor or anyone else directly employed by either the Contractor or its Subcontractors.

G.3.3 Builder's Risk Insurance

G.3.3.1 Builder's Risk: During the term of this Contract, for new construction the Contractor shall maintain in force, at its own expense, Builder's Risk insurance on an all risk form, including earthquake and flood, for an amount equal to the full amount of the Contract.

G.3.3.2 Builder's Risk Installation Floater: Not used.

G.3.3.3 Such insurance shall be maintained until Owner has fully occupied the facility.

G.3.3.4 A loss insured under the Builder's Risk insurance shall be adjusted by the Owner and Contractor and made payable to the Owner and Contractor for the insureds, as their interests may appear. Owner shall be named as loss payee on the policy with the loss payee endorsement attached to the insurance certificate. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner. The Owner shall have power to adjust and settle a loss with insurers.

G.3.3.5 The Property Insurance deductibles will be $5000 per occurrence. The Contractor shall pay costs not covered because of such deductibles.

G.3.3.6 Coverage required for performance of this Contract shall include Chemeketa Community College, its board, officers, agents, employees and volunteers as a named insured. The Owner and Contractors of all tiers agree to mutual waiver of subrogation rights for any loss that is covered by the Builder's Risk policy.

G.3.4 Liability Insurance:

G.3.4.1 Commercial General Liability: Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Commercial General Liability Insurance covering bodily injury and property damage in a form and with coverages that are satisfactory to the Owner. This insurance shall include personal injury liability, products and completed operations, and contractual liability coverage for the indemnity provided under this Contract (to the extent contractual liability coverage for the indemnity is available in the marketplace), and shall be issued with limits not less than $5,000,000 General Aggregate; $5,000,000 products/completed operations aggregate; $5,000,000 personal and advertising injury; and $5,000,000 per occurrence. The General Liability policy shall be endorsed with a per project aggregate with the endorsement attached to the insurance certificate. Coverage shall be written on an occurrence basis. Claims-Made policies are not acceptable without prior approval.

G.3.4.2 Automobile Liability: Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Automobile Liability Insurance covering owned, non-owned and/or hired vehicles, as applicable. The coverage may be written in combination with the Commercial General Liability Insurance. Combined single limit per occurrence shall not be less than $1,000,000.00, or the equivalent.

G.3.4.3 Pollution Liability: Contractor shall obtain, at the Contractor's expense, and keep in effect during the term of this Contract, Pollution Liability if Contractor's work involves hazardous materials, substances, wastes, or pollutants. The coverage must

be maintained throughout all applicable statute of limitation and statute of repose periods. The minimum limit of liability required is $1,000,000.

G.3.4.4 "Tail" Coverage: If any of the required liability insurance is arranged on a "claims made" basis, "tail" coverage will be required at the completion of this Contract for a duration as follows: three (3) years for projects valued $1 million or less; and five (5) years for projects valued over $1 million. This will be a condition of the final acceptance of Work or services and related warranty (if any).

G.3.5 Additional Insured: All liability insurance coverages required for performance of this Contract shall include the Chemeketa Community College, its board, officers, agents, employees and volunteers as Additional Insureds. The Additional Insured status must extend to both ongoing and completed operations performed by the Contractor(s). The Additional Insured endorsements must be attached to the insurance certificate. If Contractor cannot obtain an insurer to name Chemeketa Community College, its departments, divisions, officers and employees as Additional Insureds, Contractor shall obtain at Contractor's expense, and keep in effect during the term of this Contract, Owners and Contractors Protective Liability Insurance, naming the Chemeketa Community College, its, board, officers, agents, employees and volunteers as Named Insureds with not less than a $1,000,000.00 limit per occurrence. This policy must be kept in effect for 12 months following Final Completion. As evidence of coverage, Contractor shall furnish the actual policy to Owner prior to its issuance of a Notice to Proceed.

G.3.6 Waiver of Subrogation: All Commercial General Liability, Automobile Liability, Pollution Liability, and Workers' Compensation and Employer's Liability policies must provide a waiver of subrogation to Chemeketa Community College, its board, officers, agents, employees, and volunteers. This must be noted on the insurance certificate with the appropriate endorsement(s) attached.

G.3.7 Notice of Cancellation or Change: There shall be no cancellation, material change, potential exhaustion coverages without thirty (30) Days' written notice from the Contractor or its insurer(s) to the Owner. Any failure to comply with the reporting provisions of this insurance, except for the potential exhaustion of aggregate limits, shall not affect the coverages provided to the Chemeketa Community College, its board, officers, agents, employees and volunteers.

G.3.8 Certificate(s) of Insurance: As evidence of the insurance coverage required by this Contract, the Contractor shall furnish certificate(s) of insurance to the Owner prior to its issuance of a Notice to Proceed.

The certificate(s) will specify all of the parties, who are Additional Insureds and Loss Payees with the appropriate endorsements attached to the insurance certificate.

Insurance coverage required under this Contract shall be obtained from insurance companies or entities acceptable to the Owner that are allowed to provide such insurance under Oregon law. Eligible insurers include admitted insurers that have been issued a certificate of authority from the Oregon Department of Consumer and Business Services authorizing them to do an insurance business in the state of Oregon, and certain non-admitted surplus lines insurers that satisfy the requirements of applicable Oregon law and are approved by the Owner.

The certificates will also specify that there shall be no cancellation, material change, potential exhaustion of aggregate limits or intent not to renew insurance coverages without thirty (30) Days' written notice from the insurer(s) to the Owner.

The Contractor shall be financially responsible for all deductibles, self-insured retentions and/or self-insurance included hereunder. Any deductible, self-insured retention and/or self-insurance in excess of $50,000 shall be approved by the Owner in writing prior to issuance of a Notice to Proceed and is subject to Owner's approval.

SECTION H
SCHEDULE OF WORK

H.1 CONTRACT PERIOD

H.1.1 TIME IF OF THE ESSENCE ON THIS CONTRACT
The Contractor shall at all times carry on the Work diligently, without delay and punctually fulfill all requirements herein. Contractor shall commence Work on the site within fifteen (15) Days of Notice to Proceed, unless directed otherwise.

H.1.2 Unless specifically extended by Change Order, all Work shall be complete by the date(s) or within the times contained in the Contract Documents. The Owner shall have the right to accelerate the completion date of the Work, which may require the use of overtime. Such accelerated Work schedule shall be acceleration in performance of Work under Section D.1.2 (f) and shall be subject to the Change Order process of Section D.1.

H.1.3 The Owner shall not waive any rights under the Contract by permitting the Contractor to continue or complete the Work or any part of it after the date described in Section H.1.2 above.

H.2 SCHEDULE

H.2.1 Contractor shall provide, by or before the pre-construction conference, a detailed schedule for review and acceptance by the Owner. The submitted schedule must illustrate Work by significant project components, significant labor trades, long lead items (including, but not limited to, components, machinery and permits), broken down by building and/or floor where applicable.

Each schedule item shall account for no greater than 5% of the monetary value of the project or 5% of the available Contract Time. Schedules with activities of less than one day or valued at less than 1% of the Contract, will be considered too detailed and will not be accepted. Schedules lacking adequate detail, and/or are unreasonably detailed, will be rejected.

Included within the schedule are the following: Notice to Proceed, Substantial Completion, and Final Completion.

Acceptance of the schedule by the Owner does not constitute agreement by the Owner, as to the Contractor's sequencing, means, methods, controls, or allocated Contract Time.

The primary purposes of the schedule are: to demonstrate to the Owner that the Contractor has a reasonably achievable plan to complete the Work within the time allowed by the Contract; to allow the Owner to budget and schedule funds to be available for payment based upon the forecast completion of the Work; to permit the Owner to schedule its resources to carry out its obligations under the Contract; to permit the Owner to schedule other contracts and the purchase of materials to occupy the building or improvement upon completion; and, to permit the Owner to timely schedule testing, observation and the review of shop drawings, submittals. Failure of the Work to progress as scheduled in the approved original schedule or accepted revisions of it may be a material breach of the Contract.

H.2.2 Contractor shall prepare its schedule using the critical path method (CPM), and shall present schedule information to the Owner in such other forms as the Owner may require. Contractor shall submit a monthly update of the overall critical path schedule as part of each Application and Certificate for Payment. Contractor shall also submit weekly a three-week look-ahead schedule for work items to be performed during the period.

H.2.3 NOT USED ~~The Contractor's bid, budget and schedule shall include an impact time allowance, which shall be under the control of the Owner. At the Owner's sole discretion, Owner may release some or all of this impact time allowance to address the time impact of matters affecting the critical path which are beyond the contractor's control and which might otherwise entitle the Contractor to a time extension. Such matters include, without limitation, time required on the critical path to incorporate Changes or to address alleged errors or omissions in the Contract Documents, site conditions or other "changed conditions" or delays due to weather. Contractor shall not be entitled to any extension of the date for Substantial Completion or the date for Final Completion of the Project or for any additional compensation for delays addressed by the Owner's application of the "impact time allowance." Thirty days before the date originally specified for Substantial Completion, the Owner may release any unused part of the "impact time allowance" to be applied by the Contractor for the benefit of the Project.~~

H.2.4 Contractor shall have no right to claim for delay or impact or to claim additional compensation for extended overhead, unabsorbed overhead or general and administrative expense either due to finishing the Work before the completion dates contained in the Contract, or, by reason of an assertion that it might have finished the Work before the specified completion dates but for some cause attributable to the Owner it being understood that the Contractor's bid or proposal is priced based upon the

Contractor incurring both home office and job site overhead and general and administrative expense for the entire period of performance allowed in the Contract and not otherwise. Should the Contractor finish the Work "early", Contractor shall be entitled to retain any savings in overhead or general and administrative expenses realized due the early finish. Should this provision be determined to be invalid, Contractor shall be required to remit to the Owner any and all amounts that it would have realized as savings due to an "early finish" or an "early finish" that may have been realized but for delays caused in whole or in part by the Contractor.

H.3 PARTIAL OCCUPANCY OR USE

H.3.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage, provided such occupancy or use is consented to by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have reasonably accepted, in writing, the responsibilities assigned to each of them for payments, retainage, if any, security, insurance or self-insurance, maintenance, heat, utilities, and damage to the Work, and have agreed, in writing, concerning the period for correction of the Work and commencement of warranties required by the Contract Documents with respect to such portion of the Work.

Approval by the Contractor to partial occupancy or use shall not be unreasonably withheld. Immediately prior to such partial occupancy or use, the Owner and Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

SECTION I
CORRECTION OF WORK

I.1 CORRECTION OF WORK PRIOR TO WARRANTY

I.1.1 The Contractor promises to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from Defects, and that the Work will conform to the requirements of the Contract Documents.

I.1.2 WORK IN PROGRESS:
Owner's Authorized Representative and/or the Owner's Agent may determine through observation, measurement, testing, or other means that Work or portions thereof, performed by or on behalf of the Contractor, do not conform to the requirements of the Contract Documents. Owner's Authorized Representative and/or the Owner's Agent may determine that continuing the Work, or performing subsequent work founded on the Non-Conforming Work, could negatively impact the project due to remediation or removal. Under such circumstances, Owner's Authorized Representative and/or the Owner's Agent may provide to the Contractor written notification in the form of a Non-Conformance Report, which directs that related Work be suspended as described in Section J.1.1 of the General Conditions. Contractor shall propose, within five (5) working Days, corrective work and obtain written approval from Owner's Agent before resuming work. Remedial work shall be completed within thirty (30) Days of notification unless otherwise agreed between Owner's Agent and Contractor.

I.1.3 COMPLETED WORK
Completed Work which fails to conform to the requirements of the Contract Documents shall be deemed Non-Conforming by the Owner's Authorized Representative and/or the Owner's Agent. Written notification, which describes the Non-Conforming Work, may be provided to the Contractor by the Owner's Authorized Representative and/or the Owner's Agent. Contractor shall remove, replace, or repair all Non-Conforming Work and any Work damaged during the performance of such remedial Work, within thirty (30) Days of notification, unless otherwise agreed between Owner's Agent and Contractor.

I.1.4 NO COST TO OWNER
Removal and replacement shall be without loss or expense to the Owner, and Contractor shall bear the cost of repairing all Work destroyed or damaged by such removal or replacement. Upon notification from the Contractor that the Work is complete, Owner's Agent shall arrange for inspection of the Work. All costs for testing and inspection of remedial work shall be borne by the Contractor.

I.1.5 FAILURE TO CORRECT
If Contractor fails to complete the work within the above time period, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within thirty (30) days after demand, without affecting Contractor's obligations.

Any salvageable materials and/or assemblies of the Work that must be removed to correct the Non-Conforming Work may be removed and stored by Owner at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten (10) days after written notice, the Owner may upon ten (10) additional days' written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Owner's Authorized Agent's services and expenses made necessary thereby. If such proceeds of sale do not cover costs, which the Contractor should have borne, the Contract Price shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

I.2 WARRANTY WORK

I.2.1 Neither the final certificate of payment nor any provision of the Contract Documents shall relieve the Contractor from responsibility for Defective Work and, unless a longer period is specified in the Contract Documents or law, Contractor shall correct all Defects that appear in the Work within a period of one year from the date of issuance of the written notice of Substantial Completion by the Owner except for latent Defects, which will be remedied by the Contractor at any time they become apparent.

The Owner shall give Contractor notice of Defects with reasonable promptness. Contractor shall perform such warranty work within a reasonable time after Owner's demand, and in no case longer than seven (7) working Days.

If Contractor fails to complete the warranty work within such period as Owner determines reasonable, or at any time in the event of warranty work consisting of emergency repairs, without affecting Contractor's obligations, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within thirty (30) Days after demand.

I.2.2 This provision does not negate guarantees or warranties for periods longer than one year including without limitation such guarantees or warranties required by other sections of the Contract Documents for specific installations, materials, processes, equipment or fixtures.

I.2.3 In addition to Contractor's warranty, manufacturer's warranties shall pass to the Owner and shall not take effect until affected Work has been accepted in writing by the Owner's Authorized Representative and/or Owner's Agent.

I.2.4 The one-year period for correction of Work shall be extended with respect to portions of Work performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work. Such period shall be extended by corrective Work performed by the Contractor pursuant to this Section. The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

I.2.5 Nothing contained in this Section I.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the period for correction of Work as described in this Section I.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

I.2.6 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Price will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

SECTION J
SUSPENSION AND/OR TERMINATION OF THE WORK

J.1 OWNER'S RIGHT TO SUSPEND THE WORK

J.1.1 The Owner's Agent and/or the Owner's Authorized Representative has the authority to suspend portions or all of the Work due to the following causes:

(a) Failure of the Contractor to correct unsafe conditions;

(b) Failure of the Contractor to carry out any provision of the Contract;

(c) Failure of the Contractor to carry out orders;

(d) Conditions, in the opinion of the Owner's Authorized Representative and/or Owner's Agent, which are unsuitable for performing the Work;

(e) Time required to investigate differing site conditions;

(f) Any reason considered to be in the public interest.

J.1.2 The Owner shall notify Contractor and the Contractor's surety, in writing, of the effective date and time of the suspension and shall notify Contractor and its surety, in writing, to resume Work.

J.2 CONTRACTOR'S RESPONSIBILITIES

J.2.1 During the period of the suspension, Contractor is responsible to continue maintenance at the Site of Work just as if the Work were in progress. This includes, but is not limited to, protection of completed Work, maintenance of access, protection of stored materials, temporary facilities, and clean-up.

J.2.2 When the Work is recommenced after the suspension, the Contractor shall replace or renew any Work damaged during the suspension, remove any materials or facilities used as part of temporary maintenance, and complete the Work in every respect as though its execution had been continuous and without suspension.

J.3 COMPENSATION FOR SUSPENSION

J.3.1 Depending on the reason for suspension of the Work, the Contractor or the Owner may be due compensation by the other party. If the suspension was required due to acts or omissions of Contractor, the Owner may assess the Contractor actual costs of the suspension in terms of administration, remedial work by the Owner's forces or another contractor to correct the problem associated with the suspension, rent of temporary facilities, and other actual costs related to the suspension. If the suspension was caused by acts or omissions of the Owner, the Contractor shall be due compensation which shall be defined using Section D, Changes in Work. If the suspension was required through no fault of the Contractor or the Owner, neither party owes the other for the impact.

J.4 OWNER'S RIGHT TO TERMINATE CONTRACT

J.4.1 The Owner may, without prejudice to any other right or remedy, and after giving Contractor seven (7) Days' written notice and an opportunity to cure, terminate the Contract in whole or in part under the following conditions:

(a) If Contractor should voluntarily or involuntarily, seek protection under the United States Bankruptcy Code and Contractor as debtor-in-possession or the Trustee for the estate fails to assume the Contract within a reasonable time;

(b) If Contractor should make a general assignment for the benefit of Contractor's creditors;

(c) If a receiver should be appointed on account of Contractor's insolvency;

(d) If Contractor should refuse or fail to supply an adequate number of skilled workers or proper materials to carry on the Work as required by the Contract Documents, or otherwise fail to perform the Work in a timely manner;

(e) If Contractor should fail to make prompt payment to Subcontractors or for material or labor, or should disregard laws, ordinances, College policies or the instructions of the Owner's Agent or Owner's Authorized Representative;

(f) If funding from federal, state, or other sources is not obtained or continued at levels sufficient to allow for the purchase of the indicated quantity of Work, this Contract may be modified to accommodate a reduction in funds; or

(g) If Contractor is otherwise in material breach of any part of the Contract.

J.4.2 At any time that any of the above occurs, Owner may exercise all rights and remedies available to Owner at law or in equity, and in addition, Owner may take possession of the premises and of all materials and appliances and finish the Work by whatever method it may deem expedient. In such case, the Contractor shall not be entitled to receive further payment until the Work is completed. If the Owner's cost of finishing the Work exceeds the unpaid balance of the Contract Price, Contractor shall pay the difference to the Owner.

J.5 TERMINATION FOR CONVENIENCE

J.5.1 Owner may terminate the Contract in whole or in part whenever Owner determines that termination of the Contract is in the best interest of the public.

J.5.2 The Owner will provide the Contractor with seven (7) Days' prior written notice of a termination for public convenience. After such notice, the Contractor shall provide the Owner with immediate and peaceful possession of the premises and materials located on and off the premises for which the Contractor received progress payment under Section E. Compensation for Work terminated by the Owner under this provision will be according to Section E. In no circumstance shall Contractor be entitled to lost profits for Work not performed due to termination.

J.6 ACTION UPON TERMINATION

J.6.1 Upon receiving a notice of termination, and except as directed otherwise by the Owner, Contractor shall immediately cease placing further subcontracts or orders for materials, services, or facilities. In addition, Contractor shall terminate all subcontracts or orders to the extent they relate to the Work terminated and, with the prior written approval of the Owner, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts and orders.

J.6.2 As directed by the Owner, Contractor shall upon termination transfer title and deliver to the Owner all Record Documents, information, and other property that, if the Contract had been completed, would have been required to be furnished to the Owner.

SECTION K
CONTRACT CLOSE OUT

K.1 RECORD DOCUMENTS

As a condition of final payment (refer also to section E.6), Contractor shall comply with the following:

Contractor shall provide to Owner's Agent, Record Documents of the entire project. Record Documents shall depict the project as constructed and shall reflect each and every change, modification, and deletion made during the construction. Record Documents are part of the Work and shall be provided prior to the Owner's issuance of final payment. Record Documents include all modifications to the Contract Documents unless otherwise directed.

K.2 OPERATION AND MAINTENANCE MANUALS

Prior to submission of any pay request for more than 75% of the Work and as part of the Work to be done, Contractor shall submit two (2) completed operation and maintenance manuals ("O & M Manuals") for review by the Owner's Authorized Representative (unless another person is designated to receive them by Owner's Agent). This requirement shall be shown in the schedule submitted under Section H.2.2. No payments beyond 75% will be due from the Owner until the 0 & M Manuals have been received. The O & M Manuals shall contain a complete set of all submittals, all product data as required by the Specifications, training information, phone list of consultants, manufacturers, installer and suppliers, manufacturer's printed data, record and shop drawings, schematic diagrams of systems, appropriate equipment indices, warranties and bonds. The Owner's Authorized Representative and Owner's Agent shall review and return to Contractor one O & M Manual for any modifications or additions required. Prior to submission of its final pay request, Contractor shall deliver three (3) complete and approved sets of O & M Manuals to the Owner's Agent.

K.3 AFFIDAVIT/RELEASE OF LIENS AND CLAIMS

As a condition of final payment, the Contractor shall submit to the Owner's Authorized Representative a notarized affidavit/release of liens and claims form, in a form satisfactory to Owner, which states that all Subcontractors and suppliers have been paid in full, all disputes with property owners have been resolved, all obligations on the project have been satisfied, all monetary claims and indebtedness have been paid, and that, to the best of the Contractor's knowledge, there are no claims of any kind outstanding against the Work. The Contractor shall indemnify, defend (with counsel of Owner's choice) and hold harmless the Owner from all claims for labor and materials furnished under this Contract. The Contractor shall furnish complete and valid releases or waivers, satisfactory to the Owner, of all liens arising out of or filed in connection with the Work.

K.4 COMPLETION NOTICES

K.4.1 Contractor shall provide Owner notice of both Substantial and Final Completion. The certificate of Substantial Completion shall state the date of Substantial Completion, the responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and the time within which the Contractor shall finish all items on the Punch List accompanying the Certificate. Both completion notices must be signed by the Contractor and the Owner to be valid. The Owner shall provide the final signature on the notices. The notices shall take effect on the date they are signed by the Owner.

K.4.2 Substantial Completion of a facility with operating systems (e.g., mechanical, electrical, HVAC) shall be that degree of completion that has provided a minimum of thirty (30) continuous Days of successful, trouble-free operation, which period shall begin after all performance and acceptance testing has been successfully demonstrated to the Owner's Authorized Representative and Owner’s Agent. All equipment contained in the Work, plus all other components necessary to enable the Owner to operate the facility in the manner that was intended, shall be complete on the Substantial Completion date. The Contractor may request that a Punch List be prepared by the Owner's Authorized Representative with submission of the request for the Substantial Completion notice.

K.5 TRAINING

As part of the Work, and prior to submission of the request for final payment, the Contractor shall schedule and perform with the Owner's Agent, training sessions for all equipment and systems, as required in the individual Specifications sections. Contractor shall schedule training sessions at least two weeks in advance of the date of training to allow Owner’s personnel adequate notice. This requirement shall be included in the Schedule submitted under Section H.2.2 and in the “look ahead” schedules for the appropriate period.

The O & M Manual shall be used as a basis for training. Training shall be a formal session, held after the equipment and/or system is completely installed and operational in its normal operating environment.

K.6 EXTRA MATERIALS

As part of the Work, Contractor shall provide spare parts, extra maintenance materials, and other materials or products in the quantities specified in the Specifications, prior to final payment. Delivery point for extra materials shall be designated by the Owner's Agent.

K.7 ENVIRONMENTAL CLEAN-UP

As part of the Final Completion notice, or as a separate written notice submitted with or before the notice of Final Completion, the Contractor shall notify the Owner’s Agent that all environmental pollution clean-up which was performed as a part of this Contract has been disposed of in accordance with all applicable rules, regulations, laws, and statutes of all agencies having jurisdiction over such environmental pollution. The notice shall reaffirm the indemnification given under Section F.5.1 above.

K.8 CERTIFICATE OF OCCUPANCY

The Contractor shall not be granted Final Completion or receive final payment if the Owner has not received an unconditioned certificate of occupancy from the appropriate state and/or local building officials, unless failure to obtain an unconditional certificate of occupancy is due to the fault or neglect of Owner.

K.9 OTHER CONTRACTOR RESPONSIBILITIES

The Contractor shall be responsible for returning to the Owner’s Agent all items issued during construction such as keys, security passes, site admittance badges, and all other pertinent items. The Contractor shall be responsible for notifying the appropriate utility companies to transfer utility charges from the Contractor to the Owner. The utility transfer date shall not be before

Substantial Completion and may not be until Final Completion, if the Owner does not take beneficial use of the facility and the Contractor's forces continue with the Work.

K.10 SURVIVAL

All warranty and indemnification provisions of this Contract, and all of Contractor's other obligations under this Contract that are not fully performed by the time of Final Completion or termination, shall survive Final Completion or any termination of the Contract

SECTION L
LEGAL RELATIONS & RESPONSIBILITIES

L.1 LAWS TO BE OBSERVED

In compliance with ORS 279C.525, Sections L.2 through L.4 contain lists of federal, state and local agencies of which the Owner has knowledge that have enacted ordinances or regulations relating to environmental pollution and the preservation of natural resources that may affect the performance of the Contract:

L.2 FEDERAL AGENCIES

Agriculture, Department of

Forest Service

Soil Conservation Service

Coast Guard

Defense, Department of

Army Corps of Engineers

Energy, Department of

Federal Energy Regulatory Commission

Environmental Protection Agency

Health and Human Services, Department of

Housing and Urban Development, Department of

Solar Energy and Energy Conservation Bank

Interior, Department of

Bureau of Land Management

Bureau of Indian Affairs

Bureau of Mines

Bureau of Reclamation

Geological Survey

Minerals Management Service

U.S. Fish and Wildlife Service

Labor, Department of

Mine Safety and Health Administration

Occupation Safety and Health Administration

Transportation, Department of

Federal Highway Administration

Water Resources Council

L.3 STATE AGENCIES

Administrative Services, Department of

Agriculture, Department of

Columbia River Gorge Commission

Consumer and Business Services, Department of

Energy, Department of

Environmental Quality, Department of

Fish and Wildlife, Department of

Forestry Department of

Geology and Mineral Industries, Department of

Human Resources, Department of

Land Conservation and Development Commission

Parks and Recreation, Department of

Soil and Water Conservation Commission

State Lands, Division of

Water Resources Department of

L.4 LOCAL AGENCIES

City Councils

County Courts

County Commissioner, Board of

Design Commissions

Historical Preservation Commissions

Planning Commissions

Chemeketa Community College

L.5. CHEMEKETA COMMUNITY COLLEGE POLICIES AND PROCEDURES

Contractor and Contractor's Employees and/or subcontractors at any tier, shall abide by all Chemeketa Community College policies and procedures. All College policies/procedures, which are posted and may be obtained electronically on the College's Website at: https://www.chemeketa.edu/faculty-staff/policies-procedures-guidelines/, are incorporated into these General Conditions for Public Improvements herein by this reference.

EO/AA/ADA/Title IX institution

www.chemeketa.edu/about/legal

Exhibit J INSTRUCTIONS TO OFFERORS
5-7-25

Chemeketa Community College
4000 Lancaster Drive NE
P.O. Box 14007
Salem, Oregon 97309-7070

For a disability-related accommodation, please contact Disability Services at 503.399.5192 (TTY/voice), at least five working days in advance.

1. **Definitions**

As used in the Contract Documents, unless the context requires otherwise:

A. **"Addendum" or "Addenda"** means an addition or deletion to, a material change in, or general interest explanation of a Solicitation Document. Addenda shall be labeled as such and distributed to all interested persons in accordance with these rules.

B. **"Alternates"**: An Alternate Bid (or Alternate), is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents is accepted by the Owner. Any or all Alternates may be accepted or rejected in any order, unless otherwise indicated.

C. **"Award"** or **"Intent to Award"** means, as the context requires, either the act or occurrence of the College's identification of the Person with whom the college will enter into a Contract following the resolution of any protest of the College's selection of that Person, and the completion of all Contract negotiations.

D. **"Base Bid"**: The Base Bid is the sum stated in the Bid for which the Bidder offers to perform all the Work shown and described in the Bidding Documents as a lump sum bid, to which Work may be added or deducted for sums stated in Alternate Bids, if any.

E. **"Bid"** means a competitive offer in response to an Invitation to Bid in which price, delivery (or project completion), and conformance to specifications will be the predominant award criteria.

F. **"Bidder"**: An individual, firm, or corporation who submits a Bid in response to the College's Invitation to Bid.

G. **"Bidding Documents"**: Bidding Documents include, but are not limited to, the Advertisement for Bids, Instructions to Bidders, Bid Form, the Form of Bid Bond (if required), and the proposed Contract Documents, including any Addenda issued prior to receipt of bids. All requirements and obligations of the Bidding Documents are hereby incorporated by reference into the Contract Documents and are binding on the Successful Bidder(s) upon award of the Contract.

H. **"Bidding/Proposing Period"**: means the span of time between the date of the Solicitation Document and the time and date set for receipt of Offers. The time period shall be stated in the Solicitation Document. Generally a period of fourteen (14) calendar days shall be provided, but in no case shall the time provided be less than five (5) calendar days.

I. **"Business Services Director"**: means Richard Kline or his duly appointed successor.

J. **“Chief Financial Officer”** means Aaron Hunter or his duly appointed successor.

K. **“Closing”**: The date and time specified in the College’s Solicitation Document as the deadline for submitting Offers.

L. **“Code”** means the Public Contracting Code, as defined in ORS 279A.010.

M. **“College”**: See definition of the “Owner” under general conditions of the contract for construction. For non-construction contracts, the term “Owner” shall be synonymous with “College” or “Chemeketa Community College” and shall mean the “Owner” or the “Owner’s authorized representative.”

N. **“Competitive Range”** means the Offerors with whom the College will conduct discussions or negotiate if the College intends to conduct discussions or negotiations in accordance with its own rules.

O. **“Competitive Sealed Bidding”** means the issuing of Invitations to Bid, which follow the formal process for advertising, submitting bids, and conducting of public bid openings as required by ORS 279B.055.

P. **Competitive Sealed Proposals”** means the issuing of Request for Proposals, which follow the formal process for advertising, submitting proposals, and conducting of public openings as required by ORS 279B.060.

Q. **“Contract”** means a “Public Contract,” as defined in ORS 279A(1)(z), a sale or other disposal, or a purchase, lease, rental or other acquisition, by a contracting agency of personal property, services, including personal services, public improvements, public works, minor alterations, or ordinary repair or maintenance necessary to preserve a public improvement. “Public Contract” does not include grants. The “Contract” includes the College’s Solicitation Document and the accepted portions of a Solicitation Document, whether attached or incorporated by reference, between the College and Contractor describing the work to be done and the obligations of the parties. Depending upon the goods and services being procured, the College may use
“Contract” as meaning a purchase order, price agreement, or other contract document in addition to the College’s Solicitation Document and the accepted portions of a Solicitation Document. If the Contract is for a public improvement or public work, the “Contract” may consist of the College’s Solicitation Document, including any addenda, the general and special and/or supplementary conditions or other conditions governing the work, the accepted portions of the Solicitation Document, the performance and payment bond (if required), certificates of insurance, plans, technical specifications, approved shop drawings, Construction Change Directive or written order for a minor change in the Work, Notice of Award, Notice to Proceed, and any contract amendments, including approved change orders.

R. **“Contract Documents”**: The Contract Documents consist of the Advertisement, Instructions to Offerors, Bureau of Labor and Industries Prevailing Wage Rates, Bid Form, Bid Bond, Performance Bond, Payment Bond, Notice of Award, Notice to Proceed, Agreement between Owner and Contractor (hereinafter the “Agreement”), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract.

S. **“Contract Price”** means, as the context requires, (i) the maximum monetary obligation that the College will or may incur under a Contract, including bonuses, incentives, approved alternates, fully executed change orders or amendments, and contingency amounts, if the Contractor fully performs under the Contract, (ii) the maximum not-to-exceed amount of payments specified in the Contract, or (iii) the unit prices for Goods or Services set forth in the Contract.

T. **“Contract Review Authority”** means the College’s Local Contract Review Board as set forth in ORS 279A.060.

U. **“Contractor”** means the Person with whom the College enters into a Contract and shall be synonymous with “Independent Contractor” (i.e., a person or business that provides services to the College in which the College neither controls nor has the right to control the means or manner by which work is performed). The College may control the results of the services, but not control the means or manner of the Contractor’s performance of the Work.

V. **“Cost”** means not only the product price but also other items of expense such as the actual or reasonably estimated costs related to quality or conversion, and may include such actual or estimated items as shipping, delivery, setup, installation, and training.

W. **Descriptive Literature”** means Written information submitted with the Offer that addresses the Goods and Services included in the Offer.

X. “**Disadvantaged Business Enterprise (DBE)”** means a small business concern pursuant to ORS 200.005(1), which is at least 51 percent owned by one or more socially and economically disadvantaged individuals, or, in the case of any corporation, at least 51 percent of the stock of which is owned by one or more socially and economically disadvantaged individuals and whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it.

Y. “**Effective Date of Contract”** means the date established in the Contract for the Contractor’s work to begin, or the date the Contract has been fully executed and received all required approvals, whichever date is later.

Z. **“Electronic Advertisement”** means notice of the College’s request for Offers or request for quotes, available over the internet via (a) The World Wide Web or some other Internet protocol; or (b) the College’s electronic procurement system. An Electronic Advertisement may include a Solicitation Document.

AA. **“Electronic Offer”** means a response to the College’s request for Offers or request for quotes submitted to the College via email or through the College’s Electronic Procurement System.

BB. **“Electronic Procurement System”** means an information system that Persons may access through the Internet, using the World Wide Web or some other Internet protocol, or that Persons may otherwise remotely access using a computer, that enables the College to post Electronic Advertisements, receive Electronic offers, and conduct other activities related to a procurement.

CC. **“Facsimile”** means electronic equipment that communicates and reproduces both printed and handwritten material.

DD. **"Gift"** means something of economic value given to a public official or the public official's relative without an exchange of valuable consideration of equivalent value, including the full or partial forgiveness of indebtedness, and which is not extended to others who are not public officials or the relatives of public officials on the same terms and conditions; and something of economic value given to a public official or the public official's relative for valuable consideration less than that required from others who are not public officials.

EE. **"Goods and Services"** or "Goods or Services" have the meaning set forth in ORS 279A.010(1)(j).

FF. **"Invitation to Bid" (ITB)** means all documents used for soliciting Offers in accordance with either ORS 279A.010(2)(bb). (See also "Competitive Sealed Bidding.")

GG. **"Life Cycle Costing"** means determining the cost of a product for its estimated useful life, including its disposal.

HH. **"Local Contract Review Board"** means Chemeketa Community College's Board of Education as established by Resolution No. 83-84-6.

II. **"Lowest Responsible Bidder"** means: (a) the bidder whose Offer substantially complies with the requirements and criteria set forth in the Invitation to Bid and with all prescribed public procurement procedures and requirements; or (b) When the invitation to bid specifies or authorizes the award of multiple contracts to the responsible bidders, the bidder whose bids substantially comply with the requirements and criteria set forth in the Invitation to Bid and with all prescribed public procurement procedures and requirements and who qualify for the award of a Public Contract under the terms of the Invitation to Bid (ORS 279B.055(10)). Depending upon the requirements of the Solicitation Document, "Lowest Responsible Bidder" may also mean one who, in the determination of the Advocate for Minority, Women and Emerging Small Businesses, has undertaken both a policy and practice of actively pursuing participation by minority and women-owned business in all bids, both public and private, submitted by such bidder, pursuant to ORS 200.025 and 200.045.

JJ. **"Model Rules"** means the Chemeketa Community College Rules of Procurement (CCRP), adopted in accordance with ORS 279A.065(5)(a) and ORS 279A.070 by the College's Local Contract Review Board, January 15, 2005, through Resolution No. 04-05-11, as currently amended.

KK. **"ORS"** means Oregon Revised Statutes.

LL. "**Offer"** means a response to a Solicitation Document that is binding on the Offeror.

MM. **"Offeror"** means a Person, who submits an Offer.

NN. **"Opening"** means the date, time, and place announced in the Solicitation Document for the public opening of Written sealed Offers.

OO. **"PCC"** means Public Contracting Code as it is defined in ORS 279A.010(z).

PP. **"Person"** means any of the following with legal capacity to enter into a Contract: individual, corporation, business trust, estate, trust, partnership, limited liability company, association, joint venture, governmental agency, public corporation or any other legal or commercial entity.

QQ. **"Personal Property"** means everything subject to ownership, which is not real property and has exchangeable value; includes all chattels and movables, such as boats and vessels, merchandise and stock in trade, furniture and personal effects, goods, livestock, vehicles, farming implements, movable machinery, movable tools and movable equipment pursuant to ORS 307.020.

RR. **"Personal Services Competitive Solicitation"** means a documented process providing an equal and open opportunity to qualified parties, which culminates in a selection based on criteria that include, but are not limited to, the Contractor's availability, capacity, experience, reputation, responsiveness to time limitations, responsiveness to solicitation requirements, quality of previous performance and fees or costs.

SS. **"Personal Services Contract"** or **"Contract for Personal Services"** means a Contract or member of a class of Contracts, other than a Contract for the services of an Architect, Engineer, Land Surveyor or Provider of Related Services (which are subject to ORS 279C.105, ORS 279C.110 or ORS 279C.120, and which are defined as Personal Contracts pursuant to ORS 279C.100(5)), that the College's Local Contract Review Board has designated as a Personal Services Contract pursuant to ORS 279A.055, whose primary purpose is to acquire specialized skills, knowledge and resources in the application of technical or scientific expertise, or the exercise of professional, artistic or management discretion or judgment, including, without limitation, a Contract for the services of a(n): accountant; physician, dentist or lawyer; educator; consultant(s) for information technology, travel, banking, investing, collections, or other consultant; broadcaster or artist (including a photographer, filmmaker, painter, weaver, or sculptor). (See also Personal Services Contracting Rules section within these Community College Rules for an expanded definition.)

TT. **"Personal Services Contractor"** means an Independent Contractor that performs a Contract for Personal Service(s) for the College, when the College has no right to and does not control the means and manner of performing the Contract, except as to the delivery schedule, determining compliance with the Statement of Work, and accepting or rejecting the deliverables or results required under the Contract.

UU. **"Prequalification of Offeror"** means a process followed by the College, in advance of issuance of Solicitation Documents, to determine the qualifications of prospective Offerors to perform Public Contracts.

VV. **"Product Sample"** means the exact Goods or a representative portion of the Goods offered by the Offeror in response to the Solicitation Document. Unless otherwise provided in the Solicitation Document, the Product Sample shall be the exact products or a representative portion of that product offered by the Offeror.

WW. **"Proposal"** means an Offer in response to a Request for Proposals.

XX. **"Public Contract"** means a sale or other disposal, or a purchase, lease, rental or other acquisition, by the College of personal property, services, including personal services, public improvements, public works, minor alterations, or ordinary repair or maintenance necessary to preserve a public improvement. (ORS 279A.010(1)(z)).

YY. **"Public Notice"** means a public notice of Solicitation Document that is published at least once in at least one newspaper of general circulation in the area where the contract is to be

performed and in as many additional issues and publications as the College determines or is published electronically.

ZZ. **"Request for Proposals"** or **"RFP"** means all documents used for soliciting Proposals in accordance with either ORS 279B.060 or 279C.110, where proposal evaluation and contract award is based on criteria such as proposer qualifications and experience, product features and characteristics, service quality and efficiency, and conformance with the specifications and requirements of the Solicitation Document. Price may be evaluation criterion for an RFP, but will not necessarily the the predominant basis for contract award.

aa. **"Request for Qualifications"** means a Written document describing the College's circumstances and the type of service(s) desired, setting forth all significant evaluation factors and their relative importance, written qualifications, and, if appropriate, price. The Request for Qualifications will not result in a Contract but is intended to establish a list of qualified Contractors from which to seek Offers and select a Contractor.

bb. **"Request for Quotes"** or **"RFQ"** means the solicitation by the College of Offers from competing vendors in an effort to obtain competitive quotes. The solicitation may be by advertisement or by the College initiating a request to vendors to make an offer in accordance with the provisions of Small Procurements and Intermediate Procurements as these categories are defined in ORS 279B.065 and 279B.070, pursuant to the rules established by the College's Local Contract Review Board for competitive thresholds. The solicitation may be accomplished by advertisement or by the College initiating a request to vendors to make an Offer. The solicitation and the offer may be electronic, in writing, or oral.

cc. **"Requirements Contract"** means a price agreement that constitutes a firm Offer by the Contractor, regardless of whether any order or purchase has been made or any performance has been tendered under the price agreement and is enforceable for the period stated in the price agreement and is not revocable by the Contractor. A price agreement does not constitute an exclusive dealing commitment on the part of the College or the Contractor unless the price agreement expressly so provides. (ORS 279B.140)

dd. **"Responsible Offeror"** (also, **"Responsible Bidder"** or **"Responsible Proposer,"** as applicable), means a Person that has submitted an Offer and meets the standards set forth in ORS 279B.005 and/or ORS 279B.110, and that has not been debarred or disqualified by the College. When used alone, "**Responsible"** means meeting the aforementioned standards.

ee. **"Responsive Offer"** (also, **"Responsive Bid"** or **"Responsive Proposal,"** as applicable), means an Offer that substantially complies in all material respects with applicable solicitation requirements. When used alone, "**Responsive"** means having the characteristic of substantially complying in all material respects with applicable solicitation requirements.

ff. **"Service Contract"** means a contract that calls primarily for a contractor's time and effort rather than for an end product.

gg. **"Signed"** means, as the context requires, that a Written document contains a Signature or that the act of making a Signature has occurred.

hh. **"Signature"** means any Written mark, word or symbol that is made or adopted by a Person with the intent to be bound and that is attached to or logically associated with a Written

document to which the Person intends to be bound and executed or adopted by a Person with the intent to be bound.

ii. **"Solicitation Document"** means an Invitation to Bid, Request for Proposals or other document issued to invite offers from prospective contractors pursuant to ORS Chapter 279B or 279C and includes all documents incorporated by reference.

jj. **"Specification/Scope of Work"** means any description of the physical or functional characteristics, or of the nature of a supply, service or construction item, including any requirement for inspecting, testing or preparing a supply, service or construction item for delivery and the quantities or qualities of materials to be furnished under a Contract. Specifications generally will state the result to be obtained and may, on occasion, describe the method and manner of doing the Work to be performed. Specifications may be incorporated by reference and/or through attachment to the Contract.

kk. **"Standard Fee Contract"** means a contract awarded for service to be performed for a standard fee, when the standard fee is established by the College, and a like contract is available to all qualified applicants.

ll. **"Statement of Work"** means a written statement that specifically describes the phases of work or services, major tasks, or areas of responsibility the Contractor is to perform at a particular site, or within a particular locale during a stated period of time, according to a schedule of delivery. The statement must identify specific objectives that the Contractor is to attain or describe, in detail, and the deliverables that the Contractor is to provide.

mm. **"Work"** means the furnishing of all materials, equipment, labor and incidentals necessary to successfully complete any individual item in a Contract or the entire Contract, and successful completion of all duties and obligations imposed by the Contract.

nn **"Writing"** means letters, characters and symbols inscribed on paper by hand, print, type or other method of impression, intended to represent or convey particular ideas or meanings. "Writing," when required or permitted by law, or required or permitted in a Solicitation Document, also means letters, characters and symbols made in electronic form and intended to represent or convey particular ideas or meanings.

oo. **"Written"** means existing in Writing.

2. **Notice to Offerors**

Statutes, regulations, executive orders, and college policies cited in the "Instructions to Offerors" are hereby incorporated by reference and the Offeror represents by submitting its Offer that it will comply with all such provisions.

3. **Compliance with College Policies**

The College retains the right to stop any activity and/or to require dismissal from the job site of any worker whose behavior does not comply, or gives the College reasonable suspicion to believe the worker's behavior does not comply, with pertinent Chemeketa Community College policy(ies), including but not limited to providing a respectful workplace, a harassment free workplace, and a drug and alcohol free workplace, or the activity is deemed hazardous to members of a user group, the public, or College facilities

4. **General Statutory Provisions Concerning Public Contracts**

The attention of the Offeror(s) is called to the provisions of all Local, State, and Federal laws, regulations, ordinances, and resolutions applicable to the work, as well as laws, regulations, ordinances, resolutions, and permits relating to obstructing streets, maintaining signals, storing and handling of explosives, preserving safety or affecting the Offeror, or its employees or its work hereunder in its relation to the College or any other person. The Offeror shall obey all such laws, regulations, ordinances, permits or resolutions applicable to the Work or controlling or limiting Contractors while engaged in the prosecution of the Work under this Contract.

The provisions of this Contract shall be interpreted in accordance with the laws of the State of Oregon and in accordance with the laws, ordinances, regulations, permits, and resolutions of Marion County.

Statutory citations within the Solicitation Documents are made for reference purposes only, and are not to be considered all-inclusive. They are meant only as an aid to Offerors for Public Contracts; they are not captured verbatim, may not contain the most recent legislative updates, and all applicable numeric citations are not included within these Instructions to Offerors. Some of the statutory citations included for reference purposes are:

A. *Preferences for Oregon goods and services; nonresident bidders.*
In accordance with the provisions of Oregon Revised Statute (ORS 279A.120), the public contracting agency (College), shall prefer goods or services that have been manufactured or produced in this state if price, fitness, availability, and quality are otherwise equal.

B. *Award of contract; bonds.*
Pursuant to ORS 279C.375(2) in determining the lowest responsible Bidder, a public contracting agency shall check the list created by the Construction Contractors Board under ORS 701.227 for bidders who are not qualified to hold a contract for a public improvement and determine whether the prospective bidder has met the standards of responsibility. Pursuant to ORS 279A.120 for the purposes of awarding a Public Contract, a public contracting agency shall add a percent increase on the Bid of a nonresident Bidder equal to the percent, if any, of the preference given to that Bidder in the state in which the Bidder resides. In accordance with ORS 279A.120(4), the Oregon Department of Administrative Services on or before January 1 of each year shall publish a list of states that give preference to in-state Bidders with the percent increase applied in each such state. The College may rely on the names of states and percentages so published in determining the lowest responsible Bidder without incurring any liability to any Bidder.

C. *Discrimination in subcontracting prohibited; remedies.*
Pursuant to ORS 279A.110(1), a bidder or proposer who competes for or is awarded a Public Contract may not discriminate against a subcontractor in the awarding of a subcontract because the subcontractor is a disadvantaged business enterprise, a minority-owned business, a woman-owned business, a veteran-owned business or an emerging small business that is certified under ORS 200.055. Pursuant to ORS 279A.110(4) a bidder or proposer shall certify in the documents accompanying the bidder's or proposer's offer to enter into a Public Contract that the bidder or proposer has not discriminated and will not discriminate, in violation

of subsection (1) of this section, against any minority, women or emerging small business enterprise in obtaining any required subcontract. If the contractor violates the certification made under subsection (4) of this section, the contracting agency may regard the violation as a material breach of contract and terminate the contract.

D. *Conditions concerning payment, contributions, liens, withholding, drug testing.*
In accordance with the provisions of Oregon Revised Statute 279B.220 and 279C.505, it is agreed that the contractor shall: demonstrate that an employee drug testing program is in place; make prompt payment, as due, to all persons supplying to the contractor labor or material for the prosecution of the work provided for herein; pay all contributions or amounts due the Industrial Accident Fund from the contractor or subcontractor incurred in the performance of the contract; not permit any lien or claim to be filed or prosecuted against the state, county, school district, municipality, municipal corporation or subdivision thereof, on account of any labor or material furnished; and pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.

(1) Pursuant to ORS 279C.505, the College's performance under this contract is conditioned upon the Contractor's compliance with the following Contractor representations and warranties.

Contractor represents and warrants the following:

(a) That Contractor has at the time of the execution of this contract, and shall maintain during the term of this contract, an employee drug testing program for its employees that includes, at a minimum the following:

a. A written employee drug-testing policy;
b. Required drug testing for all new Subject Employees every six months on a random selection basis;
c. Required testing of a Subject Employee when the Contractor has reasonable cause to believe the Subject Employee is under the influence of drugs; and
d. Required testing of a Subject Employee when the Subject Employee is involved in:
   1. an incident causing an injury requiring treatment by a physician; or
   2. an incident resulting in damage to property or equipment.

(2) A drug-testing program that meets the above requirements will be deemed a "Qualifying Employee Drug-Testing Program." For the purposes of this section, an employee is a "Subject Employee" only if that employee will be working on the Project job site; and

(a) That Contractor shall require each subcontractor providing labor for the Project to:

(1) Demonstrate to the Contractor that it has a Qualifying Employee Drug-Testing Program for the subcontractor's Subject Employees, and represent and warrant to the Contractor that the Qualifying Employee Drug-Testing Program is in place at the time of subcontract execution and will continue in full force and effect for the duration of the subcontract; or
(2) Require the subcontractor's Subject Employees participate in the Contractor's Qualifying Employee Drug-Testing Program for the duration of the subcontract.

E. *Demolition contracts to require material salvage; lawn and landscape maintenance contracts to require composting or mulching.*

Pursuant to ORS 279C.510, Contractor shall salvage or recycle construction and demolition debris, if feasible and cost-effective; and, if public improvement contract is for lawn and landscape maintenance, Contractor shall compost or mulch yard waste material at an approved site, if feasible and cost-effective.

F. *Conditions concerning payment of claims by public officers, payment to persons furnishing labor or materials and complaints.*
Pursuant to ORS 279C.515, it is agreed that if the Contractor fails, neglects, or refuses to make prompt payment of any claim for labor or services furnished to the contractor or a subcontractor by any person in connection with the Public Contract as such claim becomes due, the proper officer or officers representing the College may pay such claim to the person furnishing the labor or services and charge the amount of the payment against funds due or to become due the Contractor by reason of such contract. If contract is for a public improvement and Contractor or a first-tier subcontractor fails, neglects or refuses to make payment to a person furnishing labor or materials in connection with the Public Contract for a public improvement within 30 days after receipt of payment from the public contracting agency or a contractor, the contractor or first-tier subcontractor shall owe the person the amount due plus interest charges commencing at the end of the 10-day period that payment is due under ORS 279C.580(4) and ending upon final payment, unless payment is subject to a good faith dispute as defined in ORS 279C.580.

G. *Condition concerning hours of labor.*
Pursuant to ORS 279C.520, it is a condition of any Public Contract resulting from this Solicitation Document that no person shall be employed by the Contractor for more than ten hours in any one day, or forty hours in any one week, except in cases of necessity, emergency, or when the public policy absolutely requires it, and in such cases, except in cases of contracts for personal services designated under ORS 279A.055, the employee shall be paid at least time and a half pay:

(1) For all overtime in excess of eight hours a day in any one day or 40 hours in any one week when the work week is five consecutive days, Monday through Friday; or

(2) For all overtime in excess of 10 hours in any one day or 40 hours in any one week when the work week is four consecutive days, Monday through Friday; and

(3) For all work performed on Saturday and on any legal holiday specified in ORS 279C.540.

An employer must give notice, in writing, to employees who work on a Public Contract, either at the time of hire or before commencement of work on the contract, or by posting a notice in a location frequented by employees, of the number of hours per day and days per week that the employees may be required to work.

I. *Condition concerning payment for medical care and providing workers' compensation.*
Pursuant to ORS 279C.530, it is an express condition of this agreement that the contractor shall, promptly, as due, make payment to any person, co-partnership, association, or corporation furnishing medical, surgical, and hospital care services or other needed care and attention, incident to sickness or injury, to the employees of such contractor, of all sums which the contractor agrees to pay for such services and all moneys and sums which the contractor collected or deducted from the wages of employees under any law, contract or agreement for the purpose of providing or paying for such services. All subject employers working under the contract are subject employers that will comply with

ORS 656.017 or employers that are exempt under ORS 656.126.

J. *Extension and compensation when work suspended.*
Pursuant to ORS 279C.655, if a Public Contract is not terminated but work under the Contract is suspended by an order of a contracting agency for any reason considered to be in the public interest other than a labor dispute or any third-party judicial proceeding relating to the work other than a suit or action filed in regards to a labor dispute, the contractor is entitled to a reasonable extension of the contract time and reasonable compensation for all costs resulting from the suspension plus a reasonable allowance for overhead with respect to such costs.

K. *Maximum hours of labor on public contracts; holidays; exceptions; liability to workers; rules.*
Pursuant to ORS 279C.540, except where the contractor is a party to a collective bargaining agreement in effect with any labor organization, in all cases where labor is employed by the College, through a contractor, no person shall be required or permitted to labor more than ten hours in any one day, or 40 hours in any one week, except in cases of necessity, or emergency, or when the public policy absolutely requires it, in which event, the person so employed for excessive hours shall receive at least time and a half pay:

(A) For all overtime in excess of eight hours a day or 40 hours in any one week when the work week is five consecutive days, Monday through Friday; or

(B) For all overtime in excess of ten hours a day or 40 hours in any one week when the work week is four consecutive days, Monday through Friday; and

(C) For all work performed on Saturday and on any legal holiday specified in ORS 279C.540.

An employer shall give notice in writing to employees who perform work on a Public Contract in writing, either at the time of hire or before commencement of work on the contract, or by posting a notice in a location frequented by employees, of the number of hours per day and days per week that employees may be required to work.

This section does not apply to contracts for personal services designated under ORS 279A.055, provided that persons employed under such contracts shall receive at least time and a half pay for work performed on the legal holidays specified in subsection (1)(b)(B) to (G) of this section and for all overtime worked in excess of 40 hours in any one week, except for individuals under personal services contracts who are excluded under ORS 653.010 to 653.261 or under 29 U.S.C.201 to 209 from receiving overtime.

L. *Time limitation on claim for overtime; posting of circular by contractor.*
Pursuant to ORS 279C.545, it is a condition of this agreement that any worker employed by the contractor shall be foreclosed from the right to collect for any overtime provided in ORS 279C.540 unless a claim for payment is filed with the contractor within 90 days from the completion of the contract in accordance with the provisions of this statute.

M. *Prevailing wage rate*
The hourly rate of wage to be paid by the Contractor and incorporated into Contractor's subcontracts, shall be not less than the specified minimum hourly rate of wage provided in, and in accordance with, ORS 279C.800 to ORS 279C.870, if the project is subject to the state of Oregon's Prevailing Wage Rate law, or the Davis-Bacon Act (40 U.S.C. 3141 to 3148), if the

public works project is subject to federal prevailing wage laws. It shall be the responsibility of the Contractor to comply, when applicable, with prevailing wage rates if the Contract is for a public work subject to Oregon Revised Statutes (ORS) 279C.800 to 279C.870, or the Davis-Bacon Act (40 U.S.C. 3141 to 3148), to pay workers not less than the specified minimum hourly rate of wage in accordance with ORS 279C.838, 279C.840 or 40 U.S.C. 3141 to 3148, and to pay the higher of the applicable state or federal prevailing rate of wage to workers on public works projects, if the public works project is subject to both state and federal prevailing wage laws. Prevailing rates of wage are available electronically on the Internet from the State of Oregon Bureau of Labor and Industries' website @ http://www.oregon.gov/boli/WHD/PWR/Pages/pwr_state.aspx and shall be incorporated herein by reference. Rates shall be those in effect when the Public Contract was first advertised, but if not advertised, then the earliest date appearing on the face of the Contract, Purchase Order, or similar form of agreement. It shall be the responsibility of the Contractor to monitor the prevailing wage rates during the project for any increase in rates and to adjust wage rates accordingly.

N. *Retainage*
In accordance with ORS 279C.550-279C.580 (Progress payments on Public Contracts), the withholding of retainage by a contractor or subcontractor on Public Contracts for public improvements shall be in accordance with ORS 701.420, and ORS 701.430 except when the charter of the public agency contains provisions requiring retainage by the public agency of more than five percent of the contract price of the work completed. A progress payment shall not be considered acceptance or approval of any work or waiver of any defects therein.

O. *Right of action on payment bond of contractor or subcontractor; notice of claim.*
Pursuant to ORS 279C.600, the right of action against bond of contractor or subcontractor; notice of claim and action by claimant on contractor's bond limitations, shall be implemented and prescribed as applicable.

P. *Notice of claim*
Pursuant to ORS 279C.605, the notice of claim required by ORS 279C.600 (action on payment bonds), must be sent by registered or certified mail or hand delivered no later than 120 days after the day the person last provided labor or furnished materials, or 120 days after the worker listed in the notice of claim by the Commissioner of the Bureau of Labor and Industries last provided labor.

Q. Use of r*ecycled products when economically feasible.*
In accordance with ORS 279B.280, recycled products should be used to the maximum extent economically feasible in the performance of the contract work set forth in this document, if the quality of a recycled product is functionally equal to the same product manufactured with virgin resources, including but not limited to recycled paper, recycled oil and recycled PETE products.

R. *Applicant required to be independent contractor to be eligible for license; classes of licenses.* **(***Construction Contractors Board)*
Pursuant to ORS 701.035 to 701.055, a person shall not submit a bid to do work as a "contractor" as defined in ORS 701.055(2) unless that person has a current valid license issued by the Construction Contractors Board. Bids from persons who fail to comply with this requirement shall be deemed non-responsive and be rejected, unless contrary to federal law. By submitting its Bid, the contractor certifies that all subcontractors performing work as

described in ORS 701.005(2) (i.e., construction work) have current valid licenses with the Construction Contractors Board in accordance with ORS 701.035 to 701.055, before the subcontractors commence work under the contract.

S. *Performance within state of public printing, binding, and stationery work; stipulation in request for bids and in contracts; exceptions. (Public Printing)*
Pursuant to ORS 282.210, "(1) except as provided in subsection (2) of this section, all printing, binding and stationery work for the state or any county, city, town, port district, school district, or other political subdivision thereof, shall be performed within the state. All requests for bids and all contracts for such work shall so stipulate. (2) The work referred to in subsection (1) of this section may be performed outside the state if it is established that: (a) The work cannot be performed within the state; (b) The lowest price for which such work can be procured within the state exceeds the charge usually and customarily made to private individuals and corporations for work of similar character and quality; or (c) All bids for the work, or any part thereof, are excessive and not reasonably competitive."

T. *Contractor's relations with subcontractors.* (*Subcontractor Payment Provisions)*
Pursuant to ORS 279C.580, Contractor shall include in each subcontract: (a) A payment clause that obligates the Contractor to pay the subcontractor for satisfactory performance under its subcontract within ten (10) days out of such amounts as are paid to the Contractor by the College under the contract; and (b) An interest penalty clause that obligates the Contractor to pay to the subcontractor an interest penalty on amounts due in the case of each payment not made in accordance with the payment clause included in the subcontract under paragraph (a) of this subsection. (A) For the period beginning on the day after the required payment date and ending on the date on which the payment of the amount due is made; and (B) computed at the rate specified in ORS 279C.515(2).

Pursuant to ORS 279C.580, Contractor shall include in each of its subcontracts, for the purpose of performance of such contract condition, a provision requiring the subcontractor to include a payment clause and an interest penalty clause in each of its subcontracts and to require each of its subcontractors to include such clauses in their subcontracts with each lower tier subcontractor or supplier. A dispute between a contractor and first-tier subcontractor relating to the amount or entitlement of a first-tier subcontractor to a payment or a late payment interest penalty under a clause included in the subcontract under subsection (3) or (4) of this section (ORS 279C.580), does not constitute a dispute to which the College is a party. The College may not be included as a party in any administrative or judicial proceeding involving such a dispute.

U. *Public works bond; rules*
Subject to ORS 279C.830-279C.836, before starting work on a contract or subcontract for a public works project, a Contractor or subcontractor shall file with the State of Oregon Construction Contractors Board a public works bond with a corporate surety authorized to do business in Oregon in the amount of $30,000, unless exempt under ORS 279C.836(7) or (8), and Contractor must include in every subcontract a provision requiring the subcontractor to have a public works bond filed with the Construction Contractors Board before starting work on the project, unless exempt under ORS 279C.836(7) or (8). The bond must provide that the Contractor or subcontractor will pay claims ordered by the Bureau of Labor and Industries to workers performing labor upon public works projects. Before permitting a subcontractor to start work on a public works project, the Contractor shall verify that the subcontractor has filed a public works bond as required.

V. *Withholding of tax required; elective provisions for agricultural employees; liability of supplier of funds to employer for taxes.* (*Employee Withholding Payments to Oregon Department of Revenue)*
Each Offeror agrees that if awarded the Contract, it will pay to the Oregon Department of Revenue all sums withheld from employees pursuant to ORS 316.167.

W. *Employer required to pay compensation and perform other duties; state not authorized to be direct responsibility employer.* (*Workers Compensation Coverage)*
All Offerors agree that all subject employers working under this Contract are either employers that will comply with ORS 656.017 or employers that are exempt under ORS 656.126.

X. Material Safety Data Sheet
Upon request, Contractor shall provide a Material Safety Data Sheet as required by Chapter 437-002-360 (35), 29 CFR 1910.1200, for any item included in this contract which contains hazardous chemicals. This information shall be provided within two (2) days of request (if faxable, within twenty-four (24) hours).

5. **Method of Submitting Offers**

A. If required by the Solicitation Document, each Offer shall be accompanied with either a certified or cashiers check, or irrevocable letter of credit issued by an insured institution, payable to Chemeketa Community College, in an amount not less than ten percent of the total bid based upon the estimated quantities of items offered together with all additive alternates, or an Offeror's bond naming Chemeketa Community College as the obligee for not less than ten percent of the total Offer based upon the total amount of the Offer together with all additive alternates.

B. ELECTRONIC BIDS ONLY: Submit Bid no later than June 5, 2025, 1:00 pm, Local Time with the forms specified in the Solicitation Document via email to procurement@chemeketa.edu with "ITB #2505 YVC Building 2 Tenant Improvement" in the subject line. Bids received in any other format may be rejected and returned unopened. Conclusive proof of Bid receipt shall be determined by the date and time the email containing the Bid is received at procurement@chemeketa.edu.

i. All documents must be clearly and distinctly typed or written with ink in the English language. No erasures are permitted. Mistakes must be crossed out and initialed in ink by the person signing the Bid, otherwise the interlineations may render the Bid non-responsive.

ii. SUBMITTALS SHALL INCLUDE:
- Exhibit C – Bid Response Form
- Exhibit D - Responsible Bidder Determination Form
- Exhibit E – First Tier Subcontractor Form (Submit Exhibit E either with the Bid submission or within 2 working hours after Bid Closing to procurement@chemeketa.edu with "First-Tier Subcontractor Form - ITB #2505 YVC Building 2 Tenant Improvement" in the subject line no later than June 5, 2025, 3:00 pm, Local Time. Forms submitted after the deadline will not be accepted.)

C. Offers shall be submitted on the Offer Response Form contained in the Solicitation Document, attached hereto.

(1) Unless otherwise indicated, the total amount of the Offer shall be entered in words and figures in the space provided. Where applicable, the unit price of lump sum items, and their extensions, shall be entered in figures in the respective columns provided for each item Offered. All entries shall be typewritten or printed in ink. The signatures of all persons shall be in longhand. Any entry of an amount that appears on the face of the Offer to have involved an erasure, deletion, white-out and/or substitution or other such change or alteration, shall show beside the change of alteration, the initials of the person signing the Offer or his/her authorized designee, and the date of the change of alteration. A failure to comply with this requirement may be cause for disqualification of the Offer.

(2) **College reserves the right to reject any and all Offers: to waive any and all informalities not involving price, time, or changes in the Work; to negotiate contract terms with the successful Offeror; and to disregard all nonconforming, nonresponsive, unbalanced, or conditional Offers. College reserves the right to reject the Offer of any Offeror, if College believes that it would not be in the best interest of the project to make an award to that Offeror, whether because the Offer is nonresponsive, or the Offeror is unqualified or of doubtful financial ability, or fails to meet any other pertinent standard or criteria.**

D. The Offer Response Form of the specifications shall be signed with ink or indelible pencil, as follows:

(1) In the case of an individual Offeror, by such individual Offeror.

(2) In the case of a partnership, the name of the partnership must appear upon such proposal, and it shall be signed in the name of such partnership by at least one of the partners. In addition to such signatures, the names of all partners shall be stated in such proposal.

(3) In the case of a corporation, the corporate name shall be subscribed to by the president or other managing officer, and there shall be set forth, under the signature of such officer, the name of the office he/she holds or the capacity in which he/she acts for such corporation.

F. Prices entered upon proposal sheets, attached, and submitted, shall represent the Offeror's net price per unit, after all trade, donation, and cash discounts have been deducted.

   (1) No charges will be allowed for handling which includes, but is not limited to, packing, wrapping, bags, containers or reels, etc., unless specifically stated hereon.

G. For lump sum Offers, in the event of a discrepancy between the Offered amount in writing and that in figures, the written value shall govern.

H. The Offeror shall assume full responsibility for timely delivery of Offers. Under no circumstances shall the College be held liable for Offeror's failure to submit its Offer by Closing.

I. Offers shall not contain any restatement or qualifications of work to be done. No oral, telegraphic, telephonic, electronic, or facsimile modifications will be considered.

J. In accordance with ORS 279A.055 and 279C.365, Offers will be received by Chemeketa Community College, and will be opened and read at the time and place set forth in the Public Notice. Offerors, or their representative, and other interested persons may be present at the Opening.

K. No responsibility will be attached to any person or persons for premature opening of an Offer not properly identified. In the event of such accidental opening, the Offer shall be closed and stored for opening at the correct time, and documentation of the resealing shall be placed in the solicitation file.

L. Offerors shall use complete sets of Solicitation Documents in preparing their Offers; neither the College, its employees, officers, nor agents shall assume any responsibility for errors, omissions, misinterpretations resulting from the use of incomplete sets of Solicitation Documents.

M. Offerors shall include applicable federal, state, and local taxes in their Offers and pay for all applicable taxes.

N. At the conclusion of the selection process, the contents of all Offers will be placed in the public domain and be open to inspection by interested parties (ORS 192.410 to 192.505). Trade secrets or proprietary information that are recognized as such and are protected by law (ORS 646.461 to 646.475, Uniform Trade Secrets Act), may be withheld, if clearly identified as such in the Offer. Pricing information and discounts offered cannot be considered proprietary information.

O. All opened Offers become the property of the College and will not be returned to the Offeror.

P. The College will not pay any costs incurred in the preparation and/or submission of Offers, or costs incurred in making necessary studies for the preparation of Offers.

Q. *Price Reductions*
By submitting an Offer in response to this Solicitation Document, Offeror agrees to guarantee that Chemeketa Community College is receiving the lowest price offered by Offeror to any of its other customers for similar services at comparable volumes in a similar geographic area. If at any time during the contract period Offeror offers a lower price to another customer, similar prices must be extended to Chemeketa Community College. If a notification is not made to the College of said price reductions, upon discovery the College shall reserve the right to take any or all of the following actions:

1. Cancel the contract, if it is currently in effect;
2. Determine the amount for which the College was overcharged and submit a request-for-payment from the Offeror/Contractor awarded the Contract to the College, for that amount;
3. Subtract the amount due from Contractor's outstanding invoice(s);
4. Take the necessary steps to collect any performance surety provided on the applicable contract.

R. *Access to Records*
The College, the Secretary of State's Office of the state of Oregon and their duly authorized representatives shall have access to the books, documents, papers, and records of the Contractor, which are directly pertinent to this specific contract for the purpose of making audit, examination, excerpts, and transcripts for a period not less than ten (10) years.

Contractor agrees to maintain books of account and records related to receipt and expenditure of the funds received through this Contract in accordance with Generally Accepted Accounting Principles. The books of account and records must be maintained in sufficient detail to permit College to verify how the Contract funds were expended or utilized. The books of account and records shall include receipts and invoices, as appropriate. Contractor shall retain and keep accessible the books of account and records it is required to maintain under this Contract for a minimum of ten (10) years, or such longer period as may be required by other provisions of this Contract or applicable law, following the later of completion of the Project, the final disbursement of Contract funds hereunder, or termination of this Contract; provided, however, that if there is any audit issue, dispute, claim, or litigation relating to this Contract or the Contract funds, the Contractor shall retain and keep accessible the books of account and records until the audit issue, dispute, claim, or litigation has been finally concluded or resolved. If the Contractor is unable to maintain the books of account and records for this ten-year period, it must notify College immediately.

6. Obtaining Solicitation Documents

a. Potential Offerors may obtain complete sets of the Solicitation Documents electronically from the issuing office designated in the Public Notice.

(1) The College, in making copies of the Solicitation Documents available on the above terms, does so only for the purpose of obtaining Offers on the work and does not confer a license or grant for any other use.

(2) When boring data is provided by Solicitation Documents for construction projects, the Offeror shall assume responsibility for any conclusions Offeror may draw from such data. Offeror may employ its own consultants to analyze available information and to conduct

additional tests and examinations of site conditions and shall be responsible for any conclusions drawn from such information, tests, and examinations. The College does not warrant and specifically disclaims any responsibility for the interpretation by any Offeror of any such data or information.

7. **Qualifications of Offerors**

A. Before the Offer is considered for award, the College reserves the right to request the Offeror to complete a Responsible Bidder Determination Form; the College reserves the right to reject the Offer of any Offeror who fails to furnish this information when requested by the College. Offeror's qualifications to be listed upon the Responsible Bidder Determination Form will include as a minimum:

1. A listing of Offeror's previous contracts of similar technical complexity, operations and size to that being currently offered to College;
2. A listing of Offeror's key staff, including any superintendent, principal in charge, project management and technical employees, and a summary of their relevant experience and length of employment with Offeror;
3. A summary of Offeror's equipment available for use in the execution of the Contract;
4. A listing of the projects to which Offeror is currently obligated or anticipates being obligated during this work;
5. A listing of any projects for which there was an actual or alleged breach of contract on the part of the Offeror;
6. A listing of any contracts, which were awarded to the Offeror but not completed, including an explanation for lack of completion.

B. College may make such other investigation as is necessary to determine Offeror's qualifications, including consulting Offeror's references. Any determination that an Offeror is unqualified will be made by the College. A letter will be sent to the Offeror deemed unqualified, stating the reasons for such determination, and the Offeror's right to request a review of this determination by appeal pursuant to ORS 279C.445.

C. Offeror's representations concerning its qualifications will be construed as a covenant under the Contract. Should it appear the Offeror has made a material misrepresentation, the College shall have the right to terminate the Contract for Contractor's breach, and the College may then pursue such remedies as exist elsewhere under this Contract, or as otherwise provided in law or equity.

D. *Financial Status*
All Offerors shall make available upon request a current audited financial statement, a current audited financial report, or a copy of a current federal income tax return. Failure or refusal to provide this information within five (5) business days after communication of this request by the College shall be sufficient grounds for the College to reject an Offer, and/or to declare an Offeror as nonresponsive and/or nonresponsible.

If an Offeror is currently involved in an ongoing bankruptcy as a debtor, or in a reorganization, liquidation, or dissolution proceeding, or if a trustee or receiver has been appointed over all or a substantial portion of the property of the Offeror under federal bankruptcy law or any state insolvency law, the Offeror must provide the College with that information as part of its Offer. The College may consider that information during evaluation of the Offer. The College reserves the right to take any action available to it if it discovers a failure to provide such

information to the College in an Offer, including, but not limited to, determination that the Offeror should be declared nonresponsible and/or nonresponsive, and suspension or debarment of the Offeror.

By submitting an Offer in response to this Solicitation Document, the Offeror agrees that, if during the term of any contract it has with the College it becomes involved as a debtor in a bankruptcy proceeding or becomes involved in a reorganization, dissolution or liquidation proceeding, or if a trustee or receiver is appointed over all or a substantial portion of the property of the Offeror under federal bankruptcy law or any state insolvency law, the Offeror will immediately provide the College with a written notice to that effect, and will provide the College with any relevant information it requests to determine whether the Offeror will meet its obligations to the College.

8. **Duration, Modification, or Withdrawal of Offer**

A. Each Offer shall be irrevocable for a period of 60 days from date of Opening, unless otherwise indicated.

B. Award of a contract to any Offeror shall not constitute a rejection of any other Offer.

C. An Offeror may withdraw its Offer from consideration, if the price Offered was substantially lower than the other Offers due solely to a mistake therein, provided: (1) the Offer was submitted in good faith; and (2) the mistake was a clerical mistake as opposed to a judgment mistake, and; (3) the mistake was actually due to an unintentional arithmetic error or an unintentional omission of a quantity of work, labor, or material made directly in the compilation of an Offer, which unintentional error or omission can be clearly shown by objective evidence drawn from inspection of original work papers, documents, and materials used in the preparation of the Offer sought to be withdrawn. The Offeror shall give notice in writing via email to procurement@chemeketa.edu of its claim of right to withdraw its Offer within two (2) business days after the conclusion of the Opening procedure.

D. Prior to the time and date designated for receipt of Offers, any Offer submitted may be modified or withdrawn by notice to the party receiving Offers, at the place designated for receipt of Offers. Such notice shall be in writing over the signature of the Offeror and shall be received on or before the date and time set for receipt of Offers, and it shall be so worded as not to reveal the amount of the original Offer.

E. Withdrawn Offers may be resubmitted, up to the time designated for the receipt of the Offers, provided that they are then fully in conformance with these Instructions to Offerors.

F. Bid security, if required, shall be expressly indicated in the Solicitation Document, and shall be in an amount sufficient for the Offer, as modified or resubmitted.

G. A decision denying withdrawal of Offer shall be final and conclusive, unless the Offeror appeals the decision to College's Procurement Services office within ten (10) days after receipt of the decision.

H. If, upon appeal, it is determined that the decision refusing withdrawal of the Offer was arbitrary or capricious, the sole relief shall be withdrawal of the Offer and return of the Bid security.

9. **Detailed Offer Breakdown**

Upon notification from the College to the successful Offeror, who submitted the apparent lowest responsive Offer, the Offeror shall, within forty-eight (48) hours, provide a detailed breakdown of its Offer in a form acceptable to the College.

10. **Contract and Bond**

A. Unless otherwise indicated by the College, within ten days after receipt of notice of award, any Offeror to whom a contract is awarded shall execute a formal written contract and shall furnish a corporate surety bond (if required), in form and with a surety satisfactory to the College, in an amount equal to the full contract sum, for the faithful performance of said contract and all provisions thereof; provided, the formation of said contract shall not be complete and the College shall not be liable thereon until said formal written contract has been executed both by the successful Offeror and by the College, and said performance/payment bonds, properly executed, have been delivered to and accepted by the College.

B. The certified check, cashiers check, Bid bond or irrevocable letter of credit of the Offeror will be returned, when the contract has been properly executed by the Offeror and the College and the surety bond, properly executed, has been delivered to and accepted by the College. The certified check or Bid bond of each Offeror who was not awarded a contract will be returned immediately after the properly executed contract and bond of the successful Offeror has been delivered to and accepted by the College. The surety bond shall be written by a bonding company authorized and licensed by the Oregon Insurance Commissioner. The bonding company must be listed on the most current U.S. Government Treasury list, Department Circular 570, or approved prior to edition, or the edition which is included in the project manual. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified copy of the power of attorney.

C. Any Offeror or Offerors to whom a contract is awarded and who shall default in executing said formal written contract or in furnishing a satisfactory surety bond within the time and in the manner required by these Instructions to Offerors shall forfeit its bid security as liquidated damages and not as a penalty pursuant to ORS 279C.385, for failure to execute the contract and bond, and shall also be liable to the College for the College's expenses and attorney's fees incidental thereto, and also for whatever expenses and attorney's fees may be incurred by the College in recovering the same. The subsequent re-awarding of the contract to another Offeror or Offerors, whether by a single action or by successive actions, shall not operate to release any defaulting Offeror from said liability.

D. *Performance/Payment Bonds*
If required by the College, prior to the issuance of a Notice to Proceed, the Contractor shall provide the College with Bonds covering the faithful performance/payment of the contract, including payments of all obligations under the contract. The premium shall be paid by the Contractor. The bonding must be listed on the most current US Government Treasury list, Department Circular 570 or approved PRIOR TO BID SUBMISSION by the College. The amount of the bond shall be equal to 100 percent of the contract sum. Failure to adhere to these requirements may be grounds for rejection of the bid.

E. *Award of Contract*
The successful Offeror shall enter into a Contract as it is defined in the Solicitation Document. After the College determines that a Contract is to be awarded, it will award the Contract to

either: 1) the Lowest Responsible Bidder, whose Bid is determined by the aggregate amount of the Base Bid, plus or minus any alternatives selected by the College; or 2) the Responsible Proposer whose Proposal has been determined, in writing, to be the most advantageous to the College based on the evaluation process and evaluation factors described in the Request for Proposals (ORS 279B.060).

(1) No exception to delivery dates shall be allowed unless prior written approval is first obtained from the Procurement Services office. The College reserves the right to cancel any undelivered portion of this order.

(2) Time of delivery is of the essence, and the College reserves the right to cancel any undelivered portion of this order for failure by the Contractor to deliver on time. Contractor assumes responsibility of delay notwithstanding the cause.

(3) All payments to the contract shall be remitted by mail. The College shall not honor drafts, nor accept goods on sight draft basis. Furthermore, the provisions or monies due under this contract shall not be assignable.

(a) The College's payment terms are Net 30, unless otherwise specified.

(4) Unless otherwise specified hereon, all goods are to be shipped *prepaid, FOB destination, freight prepaid.* Where specific authorization is granted to ship goods *FOB shipping point,* Contractor agrees to prepay all shipping charges, route cheapest common carrier, insure goods for the entire value of replacement cost, and to bill the College as a separate item on the invoice for said charges. Each invoice for shipping shall include the original or a copy of the bill indicating that the payment for shipping has been made.

(5) All goods or materials purchased herein are subject to the approval of the College. Any rejections of goods or materials, whether held by the College or returned, will be at the Contractor's risk and expense.

(6) All invoices, packing lists, packages, shipping notices and any other written document affecting this contract shall contain the applicable purchase order number, contract number, or number of a similar acquisition instrument; packing list(s) shall show the applicable number.

(7) The Contractor agrees to protect the College against all claims, suits, or proceedings for patent, trademark, copyright, or franchise infringement arising from the purchase, installation or use of the goods, materials, and/or intellectual property rights purchased herein. The Contractor further agrees to assume all expenses and damages arising from such claims, suits, or proceedings.

(8) Contractor agrees that the waiver, acceptance, or failure by the College to enforce any provisions, terms, or conditions of this contract shall not operate or be construed as a waiver of prior or subsequent breaches or the right of the College thereafter to enforce such provisions.

(9) The Contractor warrants all articles supplied under this Contract to conform to specifications herein, to be fit and sufficient for the purposes manufactured, merchantable, of good material and workmanship, and free from defects.

(10) In the event that the College is entitled to a cash discount, the period for computation shall commence on the date of delivery, or receipt of correctly completed invoices, whichever is *later*. If an adjustment in payment is necessary due to damage, the cash discount period shall commence on the date final approval for payment is authorized.

(11) Contractor warrants and represents that all the goods and materials contained herein are free and clear of all liens, claims, or encumbrances of any kind whatsoever.

(12) Contractor agrees to bear all risks of loss, injury, or destruction of goods and materials ordered hereon which occur prior to delivery and such loss, injury or destruction shall not release Contractor from any obligation hereunder.

(13) In the event of a breach by the Contractor of any of the provisions of the Contract, the College reserves the right to cancel and to terminate this contract forthwith upon giving oral or written notice to the Contractor.

(14) Contractor agrees to accept for credit, repair, or replacement, at no charge, any items received defective by the College or proven defective during the agreed warranty period and to be responsible for ALL transportation costs for return to the Contractor, and when repaired or replaced, returned to the College.

(15)

In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following descending order of precedence:

1. Contract amendments and Change Orders, with those of later date having precedence over those of an earlier date;

2. The Supplemental General Conditions;

3. The Chemeketa Community College Public Improvement Agreement Form, or Chemeketa Community College Public Works Improvement Agreement Form;

4. The General Conditions;

5. The Plans and Specifications;

6. The Solicitation Document and any addenda thereto;

7. The accepted Offer.

(16) Termination for Convenience
Unless otherwise expressly indicated by the College, this agreement may be terminated by the College upon 10-day's notice, in writing, and delivered by mail or in person. Any such termination of this agreement shall be without prejudice to any obligations or liabilities of either party already accrued prior to such termination.

(17) RESERVED

(18) RESERVED

(19) RESERVED

F. The Lowest Responsible Offeror is determined by the aggregate amount of the Base Bid or Proposal, plus or minus any Alternatives selected by the College or Project Manager.

11. **Conflict of Interest**

A. No officer, agent, or employee of the College shall be permitted any interest in the contract. The College may, by written notice to the Contractor, cancel the contract if it is found by the College that gratuities, in the form of entertainment, gifts or otherwise, were offered or given by the Contractor, or any agent or representative of the Contractor, to any officer, agent or otherwise (irrespective of whether the person is compensated for services by the College), or employee of Chemeketa Community College with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing of such contract.

B. At the discretion of the Chief Financial Officer or her/his designee, employees declaring a conflict of interest—perceived or otherwise, may be ineligible to participate in the bidding and contracting process; the Chief Financial Officer or her/his designee, shall review the facts and render a written decision. Alternatively, Offerors having knowledge of a conflict of interest—apparent or otherwise—of the College's employee(s), shall be required to submit this information prior to the Closing of the Solicitation Document's protest period. Failure to do so will nullify Offeror's right to protest the award of the contract or intent-to-award the contract on the basis of a conflict of interest.

12. **Prohibited Conduct**

A. Officials not to benefit. No person submitting an Offer and no person on behalf of an Offeror shall give or promise anything of value to any person who is a public official, an employee of the College, a member of its governing body, or a member of any evaluation committee to obtain information or to influence or attempt to influence the decision of that person on anything pertaining to this Solicitation Document or any subsequent Contract or subcontract. "Thing of value" includes not only direct gifts or payment but the conferring of a benefit on any such person, person's relative or other person or entity for purpose of influencing the public official.

B. Kickbacks prohibited. No person being an Offeror under this Solicitation Document or a bidder or proposer on any subsequent Contract or an officer, employee or agent of either shall require any kickback, fee, rebate, deduction or payment from any person to be considered as an employee, subcontractor, supplier, service provider or consultant unless the requirement be authorized by law and the amount duly recorded and paid over to the College or the person or entity entitled to receive it.

C. Contingent fees prohibited. No Offeror shall pay or give to any person or entity anything of value for work done on or in connection with the response to this Solicitation Document contingent upon the Offeror being selected to proceed to the second step of this procurement. This prohibition does not prohibit the payment of a bonus to an employee of the Offeror under

a preexisting bonus plan and formula nor does it prohibit the Offeror from engaging services to be performed in the future on a bid or proposal or a contract awarded the performance of which services are contingent upon the Offeror's success.

Submission of an Offer is a representation by the Offeror that the Offeror has not and will not engage in the conduct prohibited.

13. **Reservations**

The Board of Education of Chemeketa Community College expressly reserves the following rights:

A. To reject any or all Offers for good cause upon finding that it is in the public interest to do so, or to waive any minor informalities or irregularities of the Offer.

B. To reject any Offer or Offers not in compliance with all prescribed public contracting procedures and requirements.

C. To consider the competency and responsibility of Offerors in making any award.

D. In the event two or more Offers are for the same amount and for the same work, to award the contract by lot.

E. In the event any Offeror or Offerors to whom a contract is awarded shall default in executing said formal Contract or in furnishing a satisfactory performance and payment bond within the time and in the manner specified, to re-award the contract to another Offeror or Offerors.

14. **Acceptance of Conditions**

Each Offeror, by the submission of its Offer, assents to each and every term and condition set forth anywhere in the Contract documents and agrees to be bound thereby.

A. Each Offeror must acquaint itself thoroughly as to the character and nature of the Work to be done and the conditions under which the Work will be performed. Each Offeror, furthermore, must make a careful examination of the site of the Work and inform itself fully as to the difficulties to be encountered in the performance of the Work, the facilities for delivering, storing and placing materials and equipment, existing and available services and utilities, environmental and access constraints, permit requirements and other conditions as relating to construction and labor.

B. No plea of ignorance of conditions that exist or may hereafter exist on the site of the Work, or difficulties that may be encountered in the execution of the Work, as a result of failures to make necessary investigations and examinations, will be accepted as an excuse for any failure or omission on the part of the successful Offeror to fulfill in every detail all the requirements of the Contract documents and to complete the Work for the consideration set forth herein, or as a basis for any claim whatsoever.

C. Insofar as possible, the successful Offeror, in carrying out its work, must employ such methods or means as will not cause interruption of or interference with the Work of the College or any separate Contractor.

D. If the Contract includes excavation on an unclassified basis, the cost of all excavation and backfill required under this Contract is a part of the Base Bid/Offer. No distinction will be made insofar as payment is concerned between earth and rock.

E. The apparent silence of the Solicitation Document's specifications and/or supplemental specifications as to any detail, or the apparent omission of a detailed description concerning any point, shall be regarded as meaning that only the best commercial practice is to prevail and that only materials and workmanship of first quality are to be used.

1. However, if any omitted specification results in ambiguity as to material characteristics of the item being solicited by the College, and clarification is necessary to enable a reasonable Offeror in the particular industry to properly identify such characteristics, Offeror shall seek a formal request for clarification as set forth in section marked "Protest Process." Failure to make such a request is at Offeror's risk, and the Offeror awarded the resultant contract shall be required to provide goods meeting the College's needs with regard to any omitted specification for which clarification was not sought.

2. The Offeror awarded the contract shall provide all components, hardware, and parts necessary for proper assembly, installation, and operation, even though certain items may not be specifically described in the Solicitation Document's specifications. This includes all fittings, couplers, brackets, adapters, etcetera. Offeror shall include the cost of such components, hardware, and parts in the Offer.

15. **Bid Results**

After Solicitation Documents have been opened and Offers have been evaluated, information regarding Contract award or intent-to-award may be obtained by telephoning the Procurement Services office or by accessing the College's Procurement Services website at https://go.chemeketa.edu/procurement.

16. **Protest Process**

A. *Protest of Solicitation Document Specifications or Contract Terms (i.e., Request for Clarification or Change)*

1. Time for Submission of Protest: Unless otherwise indicated herein, any objections to or comments about the Solicitation Document's specifications, contract terms, and/or conditions must be submitted via email to procurement@chemeketa.edu with "Question – ITB #2505 YVC Building 2 Tenant Improvement" in the subject line no later than May 21, 2025, 1:00 pm, Local Time.
Such protest or request for change shall include the reasons for protest or request, and any proposed changes to specifications or terms. No protest against award because of the content of Solicitation Document specifications, contract terms, and/or conditions shall be considered after the deadline established for submitting such protest.

2. Extension of Opening Date: If any Solicitation Document specification protest is received in accordance with section (1) above, the Solicitation Document Opening date may be extended, if the College finds an extension is necessary to allow consideration of the protest and issuance of any addenda to the Solicitation Document.

B. *Protest of Award*

1. Right to Protest: Any actual Offeror who is adversely affected or aggrieved by the College's "Notice of Award," "Recommendation for Award" or "Intent to Award" of the Contract to another Offeror on the same solicitation, shall have five (5) working days or seven (7) calendar days, whichever is later, after the date appearing on the "Notice of Award," "Recommendation for Award," or "Notice of Intent to Award" to submit to the College a written protest vie email to procurement@chemeketa.edu. The written protest shall specify the grounds upon which the protest is based, including the specific citation of law, rule, regulation, or procedure upon which the protest is based. In order to be an adversely affected or aggrieved Offeror with a right to submit a written protest, an Offeror must itself claim to be next in line for award, i.e. the protester must claim that *all* lower Offers are ineligible for award because they are non-responsive or non-responsible. The College shall not entertain a protest submitted after the time period established by this Article.
   The person to whom Offers are submitted on behalf of the Chemeketa Community College Procurement Services office and is named in the Public Notice (if applicable), will review any written protest received and make the Initial Determination and Findings, which will be communicated to the protester in writing within three (3) working days of the College's receipt of the protest. Failure to protest the College's "Notice of Award," "Recommendation for Award" or "Intent to Award" the Contract shall be considered the Offeror's failure to pursue an administrative remedy made available to the Offeror by the College.
   The Initial Determination and Findings shall constitute the College's Final Decision and Order, unless the protester, within five (5) calendar days of the Initial Determination and Findings files an appeal with the College's Board of Education, through the Chief Financial Officer, unless otherwise designated in the solicitation document (Request for Quotation, Request for Proposal, or similar method of competitive solicitation).

2. Notice to Proceed: The written Notice to Proceed of the contract, shall constitute a Final Decision and Order of the College to award the contract if no written protest after the "Notice of Award," "Recommendation for Award," or "Intent to Award" is filed with the College's Procurement Services office within five (5) working days or seven (7) calendar days, whichever is later, of the "Notice of Award," "Recommendation for Award," or "Intent to Award."

3. Authority to Resolve Protests: The College's Board of Education shall have the authority to settle or resolve a written protest submitted, in accordance with the requirements of this Section.

4. Decision: If appeal of the Initial Determination and Findings is timely filed, the College's Board of Education shall review the Protest, and the Board's determination shall constitute the College's Final Decision and Order on the protest.

C. *Protest Process Period/Calendar Days*

If a period in this protest process ends in a Saturday, Sunday, other Legal holiday, or College designated closure day, it shall be deemed extended through the next following business day.

17. **Offeror's Questions, Addenda, Unforeseen Closures, Substitutions**

A. Offerors and/or sub-Offerors shall promptly notify the College, through the design professional identified in the Public Notice, or the Purchasing Management Analyst if a design professional is not identified in the Public Notice, of any ambiguity, inconsistency or error which they may discover upon examination of the Solicitation Documents or of the site and local conditions. No interpretation of the meaning of the drawings, specifications, or portions of the Solicitation Documents will be made to any Offeror orally. Neither the College nor the design professional will be responsible for any other explanations or interpretations of the proposed documents.

B. Any necessary corrections will be made in the form of formal addenda; if such corrections/changes are issued, an acknowledgement of receipt of addenda must be noted either with submission of the Offer or separately prior to the opening of the Offer(s). All addenda, with the exception of addenda to the Closing date and time, will be issued not less than 72 hours before the specified Closing date and time. Addenda specifically related to the Closing date and time may be issued with less than 72 hours notice. Failure of any Offeror to receive any such addenda or interpretation shall not relieve the Offeror from any obligation under its Offer as submitted.

C. If the Offeror (or any person submitting an Offer to the Offeror and/or subsequently in contact with the Offeror, relating to the subject project) knows, or should have known, that an ambiguity, discrepancy, error, omission or conflicting statement exists in the Solicitation Document, said Offeror has an obligation to seek a clarification thereof from the Architect/Engineer, or the Purchasing Management Analyst if a design professional is not identified in the Public Notice, prior to the Closing of the Solicitation. The College will welcome such a clarification request, and, if deemed necessary by the College, the design professional or Purchasing Management Analyst will issue a written addendum on behalf of the College's Procurement Services office clarifying the matter in question.

D. In the event the College is closed due to unforeseen circumstances such as, but not limited to, inclement weather, power outages, and/or acts of God, all prospective Offerors known to have obtained the Solicitation Document will be notified by telephone as soon as possible of a revised Closing date and time, followed by a written addendum.

18. **Affirmative Employment Practices**

A. Pursuant to the equal opportunity and affirmative action provisions of Section 202 of Executive Order 11246, Section 504 of the Rehabilitation Act of 1973, Title VI of the Civil Rights Act of 1964, the Age Discrimination Act, and the Americans with Disabilities Act of 1990, the Americans with Disability Act Amendment of 2008, and amendments thereto, to the extent the same are applicable to the manufacture and/or sale of the goods purchased hereunder, or the contracting and/or subcontracting of services or work hereunder, the Offeror agrees not to discriminate against or harrass any client, employee, or applicant for employment or for services, because of race, religion, color, sex, age, national origin, ethnic origin, sexual orientation, gender identity, marital status, citizenship status, pregnancy and related conditions, family relationship, veteran's status, disabilities, tobacco usage during work hours, whistle blowing, victim of domestic violence and genetic information in any educational

programs, activities or employment with regard to, but not limited to, the following: employment upgrading, demotion, or transfer; recruitment or recruitment advertising; layoffs or termination; rates of pay or other forms of compensation; selection for training; rendition of services. It is further understood that any Offeror who is in violation of this clause may be barred forthwith from receiving awards of any purchase order, purchase agreement, Contract, or similar acquisition instrument, from the College unless a satisfactory showing is made that discriminatory practices have terminated and that a recurrence of such acts is unlikely.

Persons having questions about equal opportunity/affirmative action should contact the Affirmative Action Officer at 4000 Lancaster Drive NE, Salem, Oregon 97309-7070, or call 503.399.4784. To request this publication in an alternative format, please call 503.399.5192.

19. **Subcontractors**

A. All Subcontractors proposed for the Work must be acceptable to the College.

B. Contractor shall comply with ORS 279C.580.

C. The College reserves the right to request the proposed Subcontractor(s) to complete an Offeror Qualification Form. This form will be similar to those required of an Offeror under these Instructions to Offerors.

D. The Contractor shall require all Subcontractors to provide and maintain general liability, automobile liability, professional liability (if applicable), and workers' compensation insurance for the coverage equivalent to those required of the general contractor. The Contractor shall require Certificates of Insurance from all subcontractors as evidence of coverage.

20. **Prevailing Wage Rates**

When Prevailing Wage Rates for public works established by the State of Oregon, Bureau of Labor and Industries are cited or contained herein, they are required to be incorporated as a portion of the Offer provided in response to this Solicitation Document.

21. **Nonassignability**

Once a Contract has been entered into between the successful Offeror and the College, the contract shall not be transferable to another contractor or subcontractor without the full and written consent of the College. The original Contractor's responsibility for the performance of the Contract shall remain, even if the College should agree to the assignment of a subcontractor.

22. **Noninterference with College Operations**

The entire work shall be executed in such a manner as to not interfere with the continued free and comfortable use of existing structures, walks, and/or grounds for College purposes.

A. At the time of completion of the Work, the Contractor shall remove all rubbish in and about the building, and all his/her tools, scaffolding, and surplus materials and shall leave his/her work "broom clean." In case of failure to do so, the College may remove the rubbish and charge the cost to the Contractor.

23. **Use of College Facilities/Resources**

To ensure equitability and fairness to all Offerors, the use of College facilities and/or resources for preparation of Offer(s) is limited to those facilities and/or resources available and accessible to the general public (e.g. pay telephones, restrooms, public access/meeting areas).

24. **Gratuities/Gifts**

The College may, by written notice to the Contractor, cancel this Contract if it is found by the College that gratuities, in the form of entertainment, gifts or otherwise, were offered or given by the Contractor, or any agent or representative of the Contractor, to any officer, agent or otherwise (irrespective of whether the person is compensated for services by the College), or employee or agent of Chemeketa Community College. In the event this contract is canceled by the College pursuant to this provision, the College shall be entitled, in addition to any other rights and remedies, to recover or withhold the amount of this cost incurred by the Contractor in providing such gratuities/gifts.

25. **Cancellation for Lack of Funding**

The Contract awarded as a result of this Solicitation Document may be cancelled without any further obligation on the part of Chemeketa Community College, its officers, directors, and employees in the event that sufficient appropriated funding is unavailable to assure full performance of its terms. The successful Offeror shall be notified in writing of such non-appropriation at the earliest opportunity.

26. **Independent Contractor Status**

The service or services to be rendered under this Contract are those of an independent contractor. Contractor is not an officer, employee, or agent of Chemeketa Community College as those terms are used in ORS 30.265.

Successful Offeror agrees that it is an independent contractor as defined by ORS 701.025 and not an agent or employee of the College. Successful Offeror agrees to defend, indemnify, and hold the College harmless from and against any and all claims, demands, and causes of action of any kind or character arising in favor of any person, on account of personal injuries, or death, or damage to property occurring, growing out of, incident to, or resulting directly or individually from, the operations or activities of the successful Offeror, its employees, or sub-contractors and to pay all claims, damages, legal costs or other expense or liability related thereto.

27. **Equipment and Materials (Construction)**

Successful Offeror shall be responsible for any loss, damage or destruction of its own property, equipment, and/or materials used in conjunction with the Work.

28. **Professional Services (Lawyers, Design Professionals, Physicians, etc.)**

If this Contract is deemed to be a “Professional Services Contract,” the Contractor shall maintain professional liability insurance for errors and omissions including personal injury. If coverage is written on a Claims Made Form, the successful Offeror shall: maintain insurance policy for a duration of three (3) years for projects valued $1 million or less, and five (5) years for projects valued over $1 million or the maximum time period available to the Contractor in the marketplace,

if this is less than the required time period based on project size. Any deductible shall not exceed $50,000 per claim.

29. **Hold Harmless and Indemnification Clause**

    Successful Offeror shall indemnify, defend and hold harmless Chemeketa Community College, its officers, agents, board members, volunteers, and employees from any claims, actions, liability or cost, including attorneys' fees and/or cost of defense arising out of or in any way relating to the Work performed under this agreement, and arising from the sole or joint negligence of the successful Offeror, except to the extent otherwise void under ORS 30.140.

30. **Waivers or Exceptions**

    Any exceptions or waivers to these requirements shall be subject to review and approval by the College, in writing.

31. **Official Notice**

    All official notices shall be mailed to the Chief Financial Officer, Chemeketa Community College, PO Box 14007, Salem, Oregon 97309.

32. **Insurance Carrier**

    The College shall have the right to approve all insurers under this Contract. The College reserves the right to reject any or all insurance companies with an unacceptable financial rating.

33. **Laws Governing**
    Contract(s) and/or disputes arising out of the Solicitation Document and/or Contract Documents shall be governed by and construed according to the laws of the State of Oregon. Venue for any action related to this agreement shall be in the Circuit Court for the County of Marion, Oregon; provided, however, if the claim must be brought in a federal forum, then it shall be brought and conducted solely and exclusively within the United States District Court for the District of Oregon. Contractor hereby consents to the *in personam* jurisdiction of said courts.

Exhibit K

Drawings

And

Specifications

Chemeketa Community College – Yamhill Valley Campus
Building 2 – DHS TI

PROJECT MANUAL

April 25, 2025

REGISTERED ARCHITECT
ANGELA M. FLORES
SALEM, OREGON
STATE OF OREGON

FACET ARCHITECTS
Formerly Carlson Veit Junge Architects
3095 River Road N Salem, OR 97303 / 503.390.0281

Project Address:
368 NE Norton Lane
McMinnville, Oregon 97128

Architect's Project Number:
00524

PROJECT DIRECTORY
CHEMEKETA COMMUNITY COLLEGE
YAMHILL VALLEY CAMPUS
BUILDING 2 – DHS TI

Owner:
Chemeketa Community College
4000 Lancaster Drive NE
P.O. Box 14007
Salem, Oregon 97309-7070

Architect:
Facet Architects
3095 River Road N
Salem, Oregon 97303
503 390-0281

Structural Engineer:
MSC Engineers, Inc.
3470 Pipebend Place NE, Suite 120
Salem, Oregon 97301
503 399-1399
Fax 503 399-8259

Mechanical/Electrical Engineer:
PAE Consulting Engineers
5520 SW Fifth Avenue, Suite 1500
Portland, Oregon 97204
503 226-2921

Commissioning Agent:
Elevate Building Commissioning
1028 SE Water Avenue, Suite 215
Portland, Oregon 97214
503 477-7123

The following Specifications have been organized under the format of the Construction Specifications Institute (CSI). Section numbers listed are for identification, and may not be consecutive. The Contractor shall check his copy of the Specifications against the Table of Contents to be sure his copy is complete.

Section No.	Section Title	Pages
DIVISION 00 – PROCUREMENT AND CONTRACTING		
Provided under separate cover by Chemeketa Community College.		
DIVISION 01 - GENERAL REQUIREMENTS		
01 11 00	Summary of Work	3
01 25 00	Substitution Procedures	1
	Substitution Request Form	1
01 31 19	Project Meetings	2
	Request for Information	1
01 33 00	Submittal Procedures	3
01 42 00	References	3
01 45 00	Quality Control	2
01 50 00	Temporary Facilities and Controls	4
01 60 00	Product Requirements	2
01 71 23	Field Engineering	1
01 73 29	Cutting and Patching	2
01 74 19	Recycling and Environmental Requirements	1
01 74 23	Final Cleaning	1
01 91 13	General Commissioning Requirements	13
DIVISION 02 – EXISTING CONDITIONS		
02 41 19	Selective Structure Demolition	2
DIVISION 03 - CONCRETE		
03 11 00	Concrete Forming	3
03 20 00	Concrete Reinforcing	2
03 30 00	Cast-In-Place Concrete	7
DIVISION 04 - MASONRY		
Not Used.		
DIVISION 05 - METALS		
05 12 00	Structural Steel Framing	3
DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES		
06 05 73	Wood Treatment	2
06 10 00	Rough Carpentry	2
06 41 16	Plastic Laminate-Clad Architectural Cabinets	4
06 61 00	Solid Surfacing Fabrications	4
DIVISION 07 - THERMAL AND MOISTURE PROTECTION		
07 21 00	Thermal Insulation	2
07 25 00	Weather Barriers	4
07 60 00	Flashing and Sheet Metal	4
07 92 00	Joint Sealants	3
DIVISION 08 - OPENINGS		
08 11 13	Hollow Metal Doors and Frames	3
08 14 00	Wood Doors	3
08 31 13	Access Doors & Frames	2
08 41 13	Aluminum Framed Entrances & Storefronts	4
08 71 00	Door Hardware	19

08 71 13 Power Door Operators 2
08 80 00 Glazing 5

DIVISION 09 -FINISHES
09 29 00 Gypsum Board 5
09 30 13 Ceramic Tiling 4
09 51 00 Acoustical Ceilings 3
09 65 00 Resilient Flooring 4
09 68 00 Carpeting 4
09 72 00 Wallcoverings 3
09 90 00 Painting & Coating 4

DIVISION 10- SPECIALTIES
10 11 16 Marker Boards and Tack Boards 2
10 14 00 Signage 2
10 21 13 Toilet Compartments 2
10 22 26 Operable Partitions 2
10 28 13 Toilet Accessories 2
10 80 00 Other Specialties 3

DIVISION 11 - EQUIPMENT
Not Used.

DIVISION 12 - FURNISHINGS
12 24 00 Window Shades…. 3

DIVISION 13 - 14
Not Used.

DIVISION 21 – FIRE SUPPRESSION
21 05 00 Common Work Results for Fire Suppression 6
21 10 00 Water Based Fire Suppression Systems 12

DIVISION 22 - PLUMBING
22 05 00 Common Work Results for Plumbing 6
22 05 18 Plumbing Expansion Compensation 2
22 05 19 Meters and Gauges for Plumbing 1
22 05 23 General Duty Valves and Specialties for Plumbing 3
22 05 29 Hangers, Supports, and Anchors Plumbing 3
22 05 53 Identification for Plumbing Piping and Equipment 2
22 05 90 Pressure Testing for Plumbing Systems 1
22 05 93 Testing, Adjusting, and Balancing for Plumbing 2
22 07 00 Insulation for Plumbing 5
22 08 00 Plumbing Commissioning Requirements 5
22 21 13 Pipe and Pipe Fittings Plumbing 5
22 40 00 Plumbing Fixtures 4

DIVISION 23 – HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
23 05 00 Common Work Results for Heating, Ventilation, and Air Conditioning 11
23 05 19 Meters and Gauges for HVAC 2
23 05 23 General Duty Valves and Specialties for HVAC 5
23 05 29 Hangers and Supports for HVAC Piping and Equipment 4
23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment 10
23 05 53 Identification for HVAC Piping and Equipment 2
23 05 90 Pressure Testing for HVAC Systems 2
23 05 93 Testing, Adjusting, and Balancing for HVAC 10
23 07 13 Duct Insulation… 4
23 07 19 HVAC Piping Insulation 5
23 08 00 HVAC Commissioning Requirements 6

23 09 13 Instrumentation and Control Devices for HVAC 9
23 09 23 Direct-Digital Control System for HVAC 16
23 21 13 Hydronic Piping. 5
23 21 14 Hydronic Specialties 4
23 23 00 Refrigerant Piping 4
23 31 00 HVAC Ducts and Casing 4
23 33 00 Air Duct Accessories 4
23 34 13 Axial HVAC Fans 2
23 34 16 Centrifugal HVAC Fans 3
23 36 00 Air Terminal Units 4
23 37 00 Air Outlets and Inlets 2
23 63 13 Air Cooled Refrigerant Condensers 3
23 81 26.13 Small-Capacity Split-System Air Conditioners 4
23 82 16 Air Coils……. 2

DIVISION 26 - ELECTRICAL
26 05 00 Common Work Results for Electrical 13
26 05 05 Selective Demolition for Electrical 2
26 05 19 Low Voltage Electrical Power Conductors and Cables 8
26 05 26 Grounding and Bonding for Electrical Systems 5
26 05 29 Hangers and Supports for Electrical Systems 4
26 05 33.16 Boxes for Electrical Systems 6
26 05 33.13 Conduit for Electrical Systems 8
26 05 48 Vibration and Seismic Controls for Electrical Systems 6
26 05 53 Identification for Electrical Systems 8
26 05 73 Power System Studies 5
26 05 80 Electrical Testing 3
26 08 00 Electrical Commissioning Requirements 5
26 09 23 Lighting Control Devices 12
26 09 43 Network Lighting Controls 7
26 24 16 Panelboards 8
26 27 13 Electricity Metering 6
26 27 26 Wiring Devices 5
26 33 23 Central Battery Equipment 6
26 50 00 Lighting…… 14

DIVISION 27 – COMMUNICATIONS
27 05 00 Common Work Results for Communications 14
27 05 26 Grounding and Bonding for Communication Systems 7
27 05 28 Pathways for Communication Systems 14

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY
28 46 00 Fire Detection and Alarm 8

DIVISION 31 – EARTHWORK
Not Used.

DIVISION 32 – EXTERIOR IMPROVEMENTS
32 31 13 Chain Link Fences and Gates 2

DIVISION 33 – UTILITIES
Not Used.

END OF CONTENTS

PROJECT DESCRIPTION

In general, the project comprises a 31,636 SF new office building for the Health and Human Services department.

CONTRACT

In event work described herein is awarded, successful Bidder and Owner shall execute the following Contract:

Chemeketa Community College Standard Construction Contract.

WORK FURNISHED AND INSTALLED BY OWNER

Concurrently with Work of this Contract:

Telecommunications equipment
Computer equipment, unless otherwise noted
Systems Furniture
Furniture, unless otherwise noted.

PRODUCTS FURNISHED BY OWNER AND INSTALLED BY CONTRACTOR, IF ANY

Delivery:

By Owner.

Unloading:

By Owner.

Owner's Duties:

Arrange for and deliver necessary shop drawings.
Deliver product to site in accordance with approved construction schedule.
Inspect deliveries jointly with Contractor.
Submit claims for transportation damage.
Arrange for replacement of damaged, defective, missing, or otherwise unacceptable Items.
Arrange for manufacturer's required warranties, bond, service, and inspections.

Contractor's Duties:

Designate required delivery date for each Owner-furnished product.
Review any shop drawings, samples, and product data, and notify Architect about any anticipated discrepancies or problems.
Promptly inspect delivered products, and report any damage, defective items, or missing items.
Handle at site, including uncrating and storing.
Protect products against damage and discoloration.
Install, connect, adjust, and where scheduled, finish products.
Clean, repair and touch-up, or replace when directed, products including those of other sections which have been soiled, discolored, or damaged by this work.

OWNER’S PROJECT REPRESENTATIVE

The Owner’s representative during the project will be:

Rory Alvarez, Director, Facilities & Operations
Chemeketa Community College
Phone 503 399-2594

Allow access by the Project Representative to the project at all times.
Coordinate scheduling, personnel access, and equipment access to the building with the Project Representative.
Owner’s Project Representative will provide contract administration services throughout project construction. All communications to the Owner shall be through the Owner’s Project Representative.

WORK SEQUENCE

Work sequence shall be the responsibility of the contractor. The Work shall be phased in two timeframes, as shown on the Drawings. Coordinate with Owner prior to start of construction. The building will remain occupied and the portion of the space that is not under construction will remain fully operational. Maintain egress paths at all times.

Phase I Final Completion: December 1, 2025.
Phase II Final Completion: June 1, 2026.

WORK HOURS

Contractor shall schedule work during regular business hours, 7:00 a.m. to 6:00 p.m., Monday through Friday.

Disruptive work that creates excessive noise, traffic, or odors shall be scheduled after hours or on Saturday or Sunday. Before hours, after hours, or weekend work shall be prearranged and scheduled with the Owner's Project Representative.

Contractor may be asked to cease daytime work and to reschedule if it is found to interfere with the Owner's operations.

CONTRACTOR USE OF PREMISES

Coordinate with Owner for Contractor Staging and Parking for support areas. Do not use other areas around building without approval from Owner's Project Representative.

Contractor to provide site plan showing staging, storage, trailer locations, contractor parking, etc. for review by Owner's Project Representative.

Except as noted on Drawings, do not use Owner's parking lot, driveways, and walks without prior approval from Owner.

Provide a schedule/diagrams regarding the construction for review by Owner's Project Representative.

GRADE LINES AND LEVELS

Contractor shall verify all setbacks, grades, and levels; and stay within the limits thereof.

PROTECTION OF PUBLIC

Construction site is to be isolated from the public by temporary chain link fencing. Contractor to adjust fencing as needed throughout construction to keep site secure.

Provide barriers around equipment located on the ground.

Provide warning signs where necessary to alert pedestrians and vehicle operators to potential hazards.

PROTECTION OF PROPERTY

Protect existing building, building contents, trees, shrubs, planting beds, pavement and other exterior areas from damage.

Protect building occupants, pedestrians, building, and building contents from damage due to work of this project.

Replace damaged property, where directed, at no additional cost to Owner.

Owner shall deduct the value of any damage from amount owed Contractor, or at Owner's option, Contractor may pay for repair or replacement directly.

PROTECTING EXISTING UTILITIES

Drawings indicate approximate location of any known, concealed utility lines. Before starting work, Contractor shall determine exact location of any of these lines that could be damaged by contract work.

Contractor shall assume that other, unknown utility lines do exist, and Contractor shall proceed with caution when working in areas that could conceal unknown utilities. If such utility lines are encountered, immediately request disposition instructions from Architect.

If utility lines are damaged; remove, repair or replace lines as directed. Additional compensation and/or extensions of time, if any, caused by removing, repairing, or replacing lines will be determined in accordance with the General Conditions.

PROJECT COORDINATION

General Contractor is responsible for overall coordination of trades. Mechanical and electrical contractors are responsible for coordinating with each other and making provisions in their work for the other's trade.

CODES

All work shall be in compliance with current state and local codes. General Contractor shall make available to all Sub-contractors, all reports and requirements issued by the building permit or subsequent inspections by the building officials.

PERMITS AND FEES

The Owner will pay the plan review fee, general building permit fee and systems development charges.

The Contractor shall pay all other permit and use fees including, but not limited to: Specialty contractor fees and permit costs; public works fees and permits; plumbing, mechanical, electrical and related permits

and fees; business license fees; permits and fees for work in public rights-of-way, temporary work, street closures, and utility taps. The Contractor shall be responsible for violations of law for any cause in connection with the completion of the work. The Contractor shall be responsible for obstruction or damage to streets, sidewalks, utilities and other public or private improvements done in connection with completion of the work. Conform to applicable state, city and local codes and ordinances.

UNACCEPTABLE EXISTING CONDITIONS

Exposed to View:

Repair or replace as part of this work.

No additional payment by Owner will be made.

Concealed:

Repair or replace where necessary.

Upon notification from Contractor, Owner will issue change order authorizing Contractor to perform this work and contract sum will be adjusted accordingly.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES

Contractor's requirements in the selection of products, manufacturers and procedures for consideration of proposal substitutions.

RELATED DOCUMENTS

“Chemeketa Community College Invitation to Bid”

“Chemeketa Community College General Conditions for Public Improvement Contracts”

QUALIFICATIONS

Only approved substitutions may be used on contract work.

Each request for substitution approval shall include:

- Identity of product for which substitution is requested; include Specification page number.
- Identity of substitution; include product description, drawings, photographs, performance and test data, and any other information necessary for evaluation.
- Quality comparison of proposed substitution with specified product.
- Changes required in other work because of substitution.
- Effect on construction Progress Schedule.
- Cost comparison of proposed substitution with specified product.
- Any required license fees or royalties.
- Availability of maintenance service.
- Source of replacement materials.

SUBSTITUTIONS DURING BID PERIOD

Refer to “Chemeketa Community College Invitation to Bid” Section C.2 for requirements.

Requests for substitution shall be written and submitted on standard form bound herein.

SUBSTITUTIONS AFTER CONTRACT AWARD

Refer to Chemeketa Community College “General Conditions for Public Improvement Contracts” for additional information on substitutions after contract award.

END OF SECTION

SUBSTITUTION REQUEST

TO:

PROJECT:

SPECIFIED ITEM:

Section **Page** **Paragraph** **Description**

PROPOSED SUBSTITUTION:

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request including identification of applicable data portions.

Attached data also includes description of changes to Contract Documents and proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on drawings.
2. Undersigned pays for changes to building design, including engineering design, detailing, and
3. construction costs caused by proposed substitution.
4. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
5. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies function, appearance, and quality of proposed substitution are equivalent or superior to specified item.

Undersigned agrees, if this page is reproduced, terms and conditions for substitutions found in Bidding Documents apply to this proposed substitution.

Submitted by:

Name (Printed or typed)	General Contractor (if after award of Contract)
Signature	For use by A/E ☐ Approved ☐ Approved as noted ☐ Not Approved ☐ Received too late
Firm Name	
Address	
City, State, Zip	By
Date	Date
Tel: Fax:	Remarks

July 1999
The Construction Specifications Institute
Northwest Region

Advancement of Construction Technology

_____
Owner (if after award of Contract)
Date _____

SECTION INCLUDES

Pre-bid meeting, pre-construction meeting, pre-installation conferences, progress meetings, and Requests for Information.

PRE-BID MEETING

Meeting Requirements:

Meeting is mandatory for general contractors.

Attendees:

Owner, Architect, Bidders, Sub-bidders, and Suppliers.

A written list of attendees will be prepared (sign-in sheet).

Agenda:

Introduction of parties involved, review of scope of project, overview of project requirements, review of project schedule, review of project budget, and questions from Bidders.

A walk-through of the project site will be conducted.

Architect will record meeting minutes and distribute minutes and copy of sign-in sheet to Owner and Bidders. Copies will be sent to other attendees upon request.

PRE-CONSTRUCTION MEETING

Meeting Requirements:

Owner, Architect, Contractor schedule date and time for a Preconstruction Site Meeting as soon as possible after Contractor receives signed contract or Notice to Proceed.

Attendees:

Contractor, Subcontractors, Suppliers, and Consultants deemed necessary by Architect and Contractor.

Agenda:

Schedule Progress Meetings.

Discuss lines of communication and methods on how to reduce possible miscommunications between parties involved. Reach conclusions and abide by them. Maintain communication and cooperation.

Discuss waste management plan and indoor air quality management plan.

Discuss hazardous materials.

Review list of subcontractors and suppliers.

Discuss Construction Progress Schedule and agree on date of publication.

Discuss critical scheduling requirements.

Discuss Contractor requirements.

Discuss Design-Build requirements if applicable.

Discuss procedures for Contractor's RFIs. Requirements as follows:

Contact Architect for items apparently requiring immediate attention.

If Contractor requires additional information, clarification, unforeseen conditions are encountered or suggestions for betterment of project, document apparent item, provide a due date and indicate whether additional time/cost or savings are involved and submit RFI on form at end of this Section. Prepare each RFI for a single subject matter.

Record each RFI in a Log, identifying each RFI by number, subject, date submitted, date of response and disposition.

Contractor may prepare RFI by copying or scanning form at end of this Section. Number each RFI numerically and record in log. Architect answers RFIs in a timely manner by written response on submitted RFI. If Change Order is indicated change order request prepared and forwarded to Contractor.

Design Clarification/Verification Request (DCVR) or other forms are unacceptable.

Review procedures for processing shop drawings, product data, samples, field decisions, and change orders.

Review procedures for maintaining project record documents, security, deliveries, safety, housekeeping, and first aid.

Discuss procedures of work forces and working relations with Owner's staff and others.

Review use of site for parking, staging, temporary buildings and construction activities.

Schedule future meeting dates and times.

PRE-INSTALLATION CONFERENCES

Meeting Requirements:

Conduct Pre-installation Conference before each activity that requires coordination with other construction activities.

See each Specification Sections to verify if a pre-installation conference is required.

Attendees:
Architect, Contractor, Subcontractor(s) involved, manufacturer's representative if required by manufacturer and/or specifications. Code enforcement personnel if required by local codes.
Agenda:
Review progress of other activities and preparations for activity under consideration, including time schedules, manufacturer's preparation and installation recommendations, safety requirements, weather limitations, substrate acceptability, compatibility problems, and inspection and testing requirements.
Contractor conducts and records significant discussions, agreements and disagreements of each conference. It is recommended that this meeting be held before or after Progress Meeting.
Number and record meetings sequentially. Distribute meeting record to concerned parties including Architect and Owner within 72 hours after meeting.

PROGRESS MEETINGS
Meeting Requirements:
Contractor conducts Progress Meetings at weekly intervals.
Contractor prepares agenda and provides meeting minutes.
Weekly meetings, or as scheduled, conducted at jobsite.
Attendees:
Owner, Architect, Contractor, Consultants and Subcontractors deemed necessary by Architect and Contractor.
Agenda:
Review construction progress schedule.
Review last Meeting Minutes for accuracy. Correct items if needed.
Discuss old business and new business agenda items.
Review RFI log, ASI log, change order requests, and submittal log for current status.
Contractor distributes written minutes of each meeting to concerned parties, as determined, within 72 hours.

END OF SECTION

REQUEST FOR INFORMATION

FACET ARCHITECTS
3095 River Road North
Salem, Oregon 97303
503 390-0281

RFI NO.: _____

DATE: _____

CONTRACTOR'S PROJECT NO.: _____

ARCHITECT'S PROJECT NO.: 03523

PROJECT: CCC – Yamhill Valley Campus Bldg 2 DHS TI

OWNER: Chemeketa Community College

TO: _____

INITIATED BY:_____

QUESTION:

Potential Cost Impact: _____

Potential Time Impact: _____

Response needed within _____ days

RESPONSE:

Signature:_____ Date: _____

PART 1 - GENERAL

SECTION INCLUDES
Submit shop drawings, product data, and samples required by Contract Documents.

RELATED DOCUMENTS
"Chemeketa Community College General Conditions for Public Improvement Contracts".

DEFINITIONS
Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
Action Submittals: Written and graphic information and physical samples that require the Architect's responsive action. Action submittals are those submittals indicated in individual specification sections as action submittals.
Informational Submittals: Written and graphic information and physical samples that do not require the Design Professional's responsive action: Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual specification sections as informational submittals.

SPECIAL REQUIREMENTS
General:
Shop Drawings and Product Data shall be forwarded as electronic submittals in the form of PDF files. Electronic files may be forwarded by e-mail, or by interactive website services such as an FTP site, Smartsheet, or BlueBeam, established by the Contractor or the Contractors Project Information Management (PIM) software.
The electronic submittal process is not intended for color samples, color charts, or physical material samples.
Commissioning Authority will review submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the Architect's review and approval.
Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
Submittal Schedule:
Designate in Construction Schedule, or in separate coordinated schedule, submission dates and dates that reviewed Shop Drawings, Product Data and Samples will be needed.
Once the submittal schedule has been developed by the Contractor, the Owner's Project Representative will identify those submittals that will require Marion County review.
Shop Drawings:
Identify Shop Drawing details by reference to drawing sheet, detail, schedule, or room number shown on contract drawings.
If shop drawings are not submitted as three-dimensional, provide detailed two-dimensional drawings.
Paper Copies: Sheet Size 8 1/2 X 11 inch, or folded to that size to facilitate filing.
Product Data:
Clearly mark each copy to identify pertinent products.
Show performance characteristics and capacities.
Show dimensions and required clearance.
Show wiring and piping diagrams, and controls.
Manufacturer's standard schematic drawings and diagrams:
    Modify to delete information not applicable to work.
    Supplement standard information to provide information specifically applicable to work.
Samples:
Size and quantity: See respective specification sections.
Show full range of color, texture, and pattern.
Deliver to Architect's office, unless otherwise specified.

Costs:
Cost of the project interactive website services shall be included in the Contractor's bid.
If using an FTP website or PIM software, Contractor shall provide training for Owner's representatives, Architect, and Architect's consultants, regarding use of website or PIM software.
Internet Service and Equipment Requirements:
- Email address and Internet access at Contractor's main office.
- Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other similar PDF review software for applying electronic stamps and comments. As an option, the project's interactive website provider shall provide free of charge to any party requesting it, a free downloadable PDF review software from their website.

CONTRACTOR'S RESPONSIBILITIES
Review Shop Drawings, Product Data, and Samples prior to submission.
Determine and verify:
- Field measurements.
- Field construction criteria.
- Catalog numbers and similar data.
- Conformance with specifications.

Comply with Contract Documents.
Coordinate each submittal with requirements of work.
Notify Architect in writing, at submission time, of any deviations in submittals from Contract Document requirements.
Contractor is responsible for providing submittals in one fully complete and vetted package. Failure to comply will cause the submittal to be returned to the Contractor for correction for proper submittal.
Perform no work or fabrication requiring submittal until Architect approves submittal.

SUBMISSION REQUIREMENTS
Make submittals promptly in accordance with approved Progress Schedule, and in such sequence as to cause no work delay.
Shop Drawings:
Submittal shall contain:
- Project title and names of Contractor, Supplier, and Manufacturer.
- Project identification complete with specification section number.
- Field measurements, clearly identified as such.
- Relation to critical features and adjacent work.
- Applicable standards, such as ASTM or Federal Specifications numbers.
- Identification of deviations from Contract Documents.
- Identification of resubmittal revisions.
- At least 6 X 8 inch space on each page for Contractor's and Architect's stamps.
- Contractor's stamp, signed and certifying that products, field measurements, field construction criteria, and information submitted has been reviewed and accepted by him as accurate and conforming with Contract Documents.

Product Data:
Submittal shall contain:
- Project title and names of Contractor, Supplier, and Manufacturer.
- Project identification complete with specification section number.
- Applicable standards, such as ASTM or Federal Specifications numbers.
- Identification of deviations from Contract Documents.
- Identification of resubmittal revisions.
- At least 6 X 8 inch space on the first page for Contractor's and Architect's stamps.

Contractor's stamp, signed and certifying that products and information submitted has been reviewed and accepted by him as accurate and conforming with Contract Documents.
Samples:
Submit number stated in respective specification section.
Submittal shall contain:
- Project title and names of Contractor, Supplier, and Manufacturer.
- Project identification complete with specification section number.
- Field measurements, clearly identified as such.
- Relation to critical features and adjacent work.

Applicable standards, such as ASTM or Federal Specifications numbers.
Identification of deviations from Contract Documents.
Identification of resubmittal revisions.
At least 6 X 8 inch space on each page for Contractor's and Architect's stamps.
Contractor's stamp, signed and certifying that products, field measurements, field construction criteria, and information submitted has been reviewed and accepted by him as accurate and conforming with Contract Documents.

RESUBMISSION REQUIREMENTS
Make any corrections or changes in submittals required by Architect and resubmit until approved.
Contractor to be allowed a single original submittal review and a follow up submittal for corrections.
Beyond the two reviews, the Contractor may be penalized to pay for the Architect and Owner review time.
Shop Drawings and Product Data:
Revise initial drawings or data, and resubmit as specified for initial submittal.
Identify any changes made other than those requested by Architect.
Samples:
Submit new samples as required for initial submittal.

ARCHITECT'S RESPONSIBILITIES
Review submittals with reasonable promptness.
Affix signature, and indicate approval or requirements for resubmittal.
Return submittals to Contractor for distribution, or resubmission.

REQUIRED SUBMITTALS
Refer to individual sections in this Project Manual.

DEFERRED SUBMITTALS
As required in other specification sections, submit to the Authority Having Jurisdiction (AHJ) shop drawings and design professional’s engineering calculations as required by the AHJ for those products required to be bidder designed based on performance criteria noted.
Submit the number of paper copies required by the AHJ. Upon receiving approval by the AHJ, make submittal to the Architect for his review and approval. Obtain Architect’s approval before fabricating work.

SUBMITTAL ADMINISTRATIVE REQUIREMENTS
Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals, subject to execution of an AIA E201 – 2007 Digital Data Protocol Exhibit and the Architect’s Digital File Disclaimer/Waiver Form.

END OF SECTION

REFERENCED SPECIFICATIONS AND STANDARDS

For products or workmanship specified by Referenced Specification or Standard, comply with requirements of the Specification or Standard, except when more rigid requirements are specified or are required by governing codes.

Except where a specific date is specified, the date of Referenced Specification or Standard is that in effect as of the date of Owner-Contractor Agreement.

Obtain a copy of all Referenced Specifications and Standards, and maintain at jobsite during the specific work until Substantial Completion of the Project.

Wherever referenced Standard Specifications or Standards issued by manufacturers or other similar organizations contain provisions which conflict with the Contract Documents the Contract Documents shall govern.

REFERENCED REGULATORY AGENCIES

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities Office on the Americans with Disabilities Act Civil Rights Division U.S. Department of Justice Washington, D.C. 20530 www.access-board.gov
AASHTO	American Association of State Highway and Transportation Officials 444 North Capital Street, NW Washington, D.C 20001 www.aashto.org
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018 www.ansi.org
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers 1791 Tullie Circle NE Atlanta, GA 30329 www.ashrae.org
ASCE	American Society of Civil Engineers 1801 Alexander Bell Drive Reston, VA 20191 www.asce.org
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103 www.astm.org
CS	Commercial Standards of the Commodities Division of the Department of Commerce Washington, D.C. 20006 www.doc.gov
EPA	Environmental Protection Agency Ariel Rios Building 1200 Pennsylvania Avenue, N.W. Washington, DC 20460 www.epa.gov
Fed. Spec.	Federal Specifications of the United States General Services Administration Specifications and Consumer Information Distribution Section (WF SIS)

	Washington Navy Yard, Building 197 Washington, D. C. 20407 www.apps.fss.gsa.gov/pub/fedspecs/iindex.cfm
FMG	FM Global [formerly Factory Mutual (FM)] 1301 Atwood Avenue P.O. Box 7500 Johnston, RI 02919 www.fmglobal.com
IBC	International Building Code Published by International Code Council (see ICC below)
ICBO	International Conference of Building Officials 5360 Workman Mill Road Whittier, CA 90601-2298
ICC	International Code Council 5203 Leesburg Pike, Suite 708 Falls Church, VA 22041-3401 www.intlcode.org
IMC	International Mechanical Code Published by International Code Council (see ICC above)
LEED	Leadership in Energy and Environmental Design U.S. Green Building Council 1015 18th Street NW, Suite 805 Washington, D.C. 20036 www.usgbc.org
NEC	National Electric Code published by the National Fire Protection Association (See NFPA below)
NFPA	National Fire Protection Association International Battery March Park Quincy, MA 02269 www.nfpa.org
OSHA	Occupational and Safety Health Administration U.S. Department of Labor Occupational Safety & Health Administration 200 Constitution Avenue Washington, D.C. 20210 www.osha.gov
OSSC	2022 Oregon Structural Specialty Code (based on the 2021 International Building Code) Building Codes Division 1535 Edgewater Street NW Salem, OR 97310 www.oregonbcd.org
PS	Product Standards of the Commodities Division of the Department of Commerce Washington, D. C. www.doc.gov

SMACNA	Sheet Metal & Air Conditioning Contractors National Association 4201 Lafayette Center Drive Chantilly, Virginia 20151-1219 www.smacna.org
UFAS	Uniform Federal Accessibility Standards United States Architectural and Transportation Barriers Compliance Board 1111 Eighteenth Street NW, Suite 501 Washington, D.C. 20036-3894 www.access-board.gov
UL	Underwriter's Laboratories 333 Pfingston Road Northbrook, Illinois 60062 www.ul.com
USGBC	U.S. Green Building Council 1015 18th Street NW, Suite 805 Washington, D.C. 20036 www.usgbc.org

TRADE ASSOCIATION REFERENCES

See specific Specification Sections.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Inspection and testing laboratory qualifications, duties, and responsibilities. Contractor's quality control requirements. Contractor's and Owner's responsibilities.

COSTS
Paid by Owner:
For Testing Laboratory Services specified in this section and as noted on Structural Drawings.
For special inspections of concrete, masonry, welding, and post-installed anchors specified in building code.
Paid by Contractor
For inspection and testing required by laws, ordinances, regulations, and orders of Public Authorities, but not specified in this section.
For re-inspections and retesting required because of defective work of ill-timed notices.

QUALIFICATIONS OF LABORATORY
Independent laboratory acceptable to Architect and Building Official.
Meet "Recommended Requirements for Independent Laboratory Qualification," latest edition, published by American Council of Independent Laboratories, 1050 17th Street NW, Suite 1000, Washington, D.C. 20038, (202) 887-5872.
Meet ASTM E-329 latest edition, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as used in Construction."

LABORATORY'S DUTIES
Provide qualified personnel for specified inspections, sampling, and testing.
Ascertain and certify compliance with contract documents.
Promptly submit written inspection and test reports to Owner's Representative, Building Official, Contractor, and Architect.
Include the following on test reports:
- Date issued.
- Project title and locations.
- Testing laboratory name and address.
- Inspector's name.
- Date of inspection or sampling.
- Record of temperature and weather.
- Date of test.
- Identification of product tested.
- Test location in project.
- Type of inspection or test.
- Observations regarding compliance with contract documents.
- Laboratory is not authorized to:
- Release, revoke, alter, or enlarge on contract document requirements.
- Approve or accept any portion of work.
- Perform any duties for Contractor.

CONTRACTOR'S RESPONSIBILITIES
Cooperate with laboratory personnel, provide access to work and to manufacturer's operations.
Provide to laboratory, representative samples of materials to be tested, in required quantities.
Furnish casual labor and facilities:
- Provide access to work to be tested.
- To obtain and handle test samples at site.
- To facilitate inspections and tests.
- For laboratory's exclusive use for storage and curing of test samples until removed to laboratory.

Notify laboratory at least 24 hours in advance of operations to allow for personnel assignments and test scheduling.
Repair test holes to match original conditions.

LIABILITY
Laboratory service is provided for Owner's self-assurance and in no way relieves Contractor's responsibility to comply with Contract Documents.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

SLAB MOISTURE
Testing Standard: ASTM F 1869-98 standard test method for measuring vapor emission rate at interior concrete slabs on grade requiring floor covering using anhydrous calcium chloride.
Testing Procedure: Sinak Dome Test vapor emission measuring system; Sinak Corporation, 861 Sixth Avenue, Suite 411, San Diego, CA 92101, phone 800-523-3147.

SLAB PH LEVEL
Method: ASTM F 710 “Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
Provide tests at area for each new flooring type.

EARTHWORK DENSITY
Method: ASTM D 1557 (AASHTO T-180).
Provide tests for each 800 tons of gravel and 1 per 2,000 sq. ft. subgrade for each layer of fill and backfill, for pavement beds in cuts if any, and to any other earthwork construction which will support finished surfaces or structures.

CAST-IN-PLACE CONCRETE
Test Concrete Slump as follows:
Follow ASTM C-143 and C-172.
Prepare tests from same batch as that employed in preparing strength test specimens, unless otherwise directed.
If measured slump falls outside specified limits retest immediately from another portion of same load. In event of second failure concrete shall be considered as failing specification requirements.
Test Concrete Compressive Strength as follows:
Follow ASTM C-31, C-39, and C-172.
Prepare not less than 4 test cylinders for each 100 cubic yards or less for each strength of concrete cast in any one day.
Break 2 cylinders at 7 days of age, and unless otherwise directed break remainder at 28 days.
If any one set of two cylinders does not develop full design strength at 28 days of age, cores may be called for. All coring costs paid by Contractor.
If tests indicate concrete has failed to meet specifications, replace substandard material when directed by Architect.
Test Concrete Air Content as Follows:
Follow ASTM C-231.
Test each cylinder containing air entrainment.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Temporary utilities and miscellaneous temporary facilities required during construction.

JOB CONDITIONS
Establish and initiate use of each temporary facility at time first reasonably required for proper performance of the work. Terminate use and removal of temporary facilities at earliest reasonable time when no longer needed.
Comply with governing codes and regulations.
Pay required fees and easement assessments.
Enforce safe and sanitary practices.
Maintain clean facilities.
Prevent interference with Owner's normal use of his own facilities.
Prevent wasteful utility uses.
Should Owner occupy part of facility, Owner will pay his proportional utility cost.

PART 2 - PRODUCTS

MATERIALS AND EQUIPMENT
Materials and equipment may be new or used, but must be suitable and adequate in capacity for required usage.

PART 3 - EXECUTION

FIELD OFFICE
General:
Provide substantial weathertight office building on premises where directed.
Office building to be of sufficient size to serve the construction project needs, including space for weekly progress meetings.
Provide heat, electric light, and janitor service.
Provide internet and phone access, service provided by Contractor.
At Contractor's option, portable buildings suitable for office use may be used.
Do not use field office for storage buildings or personnel housing.
Required Furnishings:
- 1 plan table large enough to hold open set of contract drawings.
- 1 plan rack large enough to store contract drawings, including record drawings.
- 1 shelf large enough to store project manuals and other similar documents.
- 1 standard lockable, legal size, metal filing cabinet to store shop drawings and other project correspondence.
- One waste basket.

TELEPHONE
Provide wall-mounted directory at each instrument listing name and business phone number of at least the following:
- Each Contractor and Subcontractor
- Architect
- Architect's Consulting Engineers
- Testing laboratories
- Physicians
- Hospitals
- Ambulance
- Local Fire Department

ENVIRONMENTAL PROTECTION
General:
Establish procedures among subcontractors to prevent environmental harm (air pollution, water pollution, soil erosion, excessive noise, excessive odors and similar problems).
Comply with environmental regulations.

Complete construction operations by methods that minimize pollution and contamination.

Noise:

Avoid construction operations that produce harmful noise levels. Restrict use of noisy equipment and operations to hours that will have minimum effect on workers and neighboring buildings.

Dust Control:

Provide dust-tight enclosures and/or sprinkle with water where necessary to control dust.
Do not use enough water to cause flooding, icing, or contaminated runoff.
Protect existing return air duct systems against demolition dust by providing filter media across duct openings. Replace dirty media with clean when necessary to protect systems.

Water Run-off Control:

Provide erosion control measures as required by Construction Documents. Provide additional measures if necessary to control erosion.
If high water table is encountered during construction, and water removal is necessary from excavations, lower water table by means of pumping, trenching below water table or other acceptable means to ensure drainage, proper soil compaction and placement of materials.
Dispose of excess water legally.
Where practical, direct excess water to storm water drainage system. Pre-treat water if necessary.
Conform to anti-pollution laws and regulations.

TEMPORARY WATER

Mechanical contractor shall provide and maintain water for the following purposes:

- Service standpipe equipped with sufficient 3/4 inch hydrants that any work Center can be reached with 100 ft. extension hose. Each Contractor shall provide his own extension hoses.
- Drinking water dispensed in single-service containers or sanitary fountains.
- Maintain cool as practicable, clean and fresh.

Maintain adequate volume.
Protect against freezing.
Water, in quantities judged reasonable by Architect, will be furnished without charge by Owner.
Ascertain where water service is available, provide required connections, and extend system to work area.

TEMPORARY TOILET FACILITIES

General Contractor shall provide at the rate of one fixture for each 40 workers.
Type: Comply with Building Code.
For enclosures accommodating more than one person, provide privacy screens for each toilet fixture.
If both men and women are working, provide separate facilities for each sex.
Maintain sufficient light and ventilation.
Maintain each toilet with toilet tissue on suitable dispenser.
Remove temporary toilets and use building fixtures as soon as feasible.
Disinfect premises after removal and restore to specified condition.
Do not use Owner's existing facilities.

TEMPORARY ENCLOSURES

Provide sufficient enclosure to prevent infiltration of rainwater, wind and other elements, and prevent undue heat loss from within enclosed area.

TEMPORARY BARRICADES

Provide all necessary to protect public against injury and protect project against damage and unauthorized intrusion.

TEMPORARY FIRE PROTECTION

Provide and maintain necessary facilities and equipment to safeguard project against fire damage.

TEMPORARY FENCING

Provide as shown on drawings to secure work area, 6 ft. high galvanized steel chain-link fencing.

TEMPORARY ELECTRICITY

Power:

Electrical Contractor shall provide and maintain structurally and electrically sound temporary power

distribution system as follows:

- Sufficient 20 amp load centers that any work area can be reached with 100 foot extension cord.
- Each Contractor shall provide his own grounded, UL approved extension cords.
- Load centers shall include:
  - Weatherproof distribution boxes.
  - Circuit breakers for each outlet.
  - Equipment grounding continuity for entire system.
  - Power at proper voltage for:
    - Temporary field offices.
    - Temporary storage and construction buildings.
    - Temporary lighting and power.
    - Temporary heating and ventilating.
    - Pumping.
    - Testing and checking equipment.
    - Owner's facilities continuous operation during electrical services change over.

General Contractor and Subcontractors shall provide their own power and distribution system for field welders and any other special power beyond that specified herein.

Lighting:

Provide and maintain temporary lighting as follows:

30 ft. candles measured 3 feet above floor in spaces during work. Energize permanent lighting fixtures prior to painting, except where fixtures are mounted on walls or ceilings to be painted. Maintain from 14 minutes prior to until 15 minutes past scheduled work hours. Maintain 5 ft candles measured 3 feet above floor as necessary to prevent damage or injury. Maintain when authorized Personnel are present. Provide light control switches at area entrances, or successive areas, so personnel access to project can be through lighted areas.

Wiring:

Prevent conflict with General Construction.

Maintain cords clear of walkways and other heavy traffic areas.

Power Source:

Contractor to utilize a temporary connection on the Owner’s power system. Power use will be tracked monthly and the Contractor will pay the power costs over the duration of the project.

Ascertain where electrical service is available, provide required connections, and extend system to work area.

TEMPORARY EXTERIOR ENCLOSURES

Provide temporary weather-tight closure of exterior openings to accommodate acceptable working conditions and protection of products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification Sections, and to prevent entry of unauthorized persons.

Provide access doors with self-closing hardware.

Provide temporary roofing as required.

After work is started, Contractor shall provide a watertight roof enclosure at the end of each day’s work.

TEMPORARY HEATING AND VENTILATING

Provide temporary heat and ventilation throughout enclosed construction areas to:

- Facilitate work progress.
- Protect work and products against dampness and cold.
- Prevent moisture condensation on surfaces.
- Provide suitable ambient temperatures and humidity levels for installation and curing of products.
- Provide adequate ventilation to meet health regulations for safe working environment.

Mechanical Contractor shall expedite work so permanent facilities will be structurally, mechanically, and electrically sound throughout and ready to provide "temporary" service as soon as possible.

Operate no permanent heating, ventilating, or air conditioning equipment without Mechanical Engineer's authorization that equipment is properly installed, has clean air filters, and is otherwise properly prepared. Replace temporary air filters with new units and restore system to like-new condition immediately prior to turning project over to Owner.

Temporary portable heaters, as may be required, shall be provided by General Contractor.

Continue temporary heating and ventilation until Owner occupies or finally accepts project, which ever the sooner.

Maintain ventilated areas in clean condition to avoid undue circulation of dust and air-borne particles.
Minimum temperatures to be maintained:

Generally, 24 hours a day: 40° minimum.

Temperatures required for work of various trades: See technical specific specification sections.

Fuel costs for temporary heating shall be paid by General Contractor.

TEMPORARY VERTICAL TRANSPORTATION

General Contractor shall provide and pay costs for temporary stairs, ramps, personnel hoists, chutes, etc., required for execution of work of all trades. Subcontractors shall provide their own material hoists and scaffolds.

VEHICLE PARKING AND MATERIAL STORAGE

Coordinate with Owner's Representative.

TEMPORARY EQUIPMENT

Thermometer:

Maintain one 10 inch minimum size outdoor thermometer. Mount at convenient location not in direct sunlight.

Temperature Range: Minus 20°F to plus 110°F.

FACILITIES REMOVAL

Remove temporary facilities, at project completion, or sooner, if directed.

Repair damage, if any, resulting from temporary facilities.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
General requirements for transportation, handling, storage and protection of materials and equipment.
Contractor’s options in selection of products, manufacturers and procedures.

PERFORMANCE REQUIREMENTS
Materials and Equipment incorporated into work shall:
- Conform to applicable specifications and standards.
- Comply with size, make, type, and quantity specified, unless otherwise approved in writing.

Manufactured and Fabricated Products:
- Manufactured like parts of duplicate units to standard sizes and gauges, to be interchangeable.
- Two or more items of same kind shall be identical, and by same manufacturer.
- Products shall be suitable for service conditions.
- Equipment shall comply with capacity, sizes, and dimensions shown or specified, unless otherwise approved in writing.

Do not use Materials or Equipment for any purpose other than that for which designed or specified.

CONTRACTOR'S OPTIONS
For products specified only by referenced standard, select any product meeting standard.
For products specified by naming several products, select any one complying with specifications.
For products specified by naming one or more products and "or accepted substitute," select any one specified product or submit request for substitution as required below.

INAPPROPRIATE PRODUCTS AND METHODS
If Contractor believes that any specified product, method, or system is inappropriate for use he shall, if possible, so notify Architect at least 5 working days prior to bid opening, and if not possible such notice shall be given before performing work in question.
If notice of objection is not received within the specified time limits, it will be assumed by the Owner that Contractor agrees that specified products, methods, and systems are not inappropriate for use on this project.

SALVAGE MATERIAL
All salvageable material will remain the property of the Owner, unless otherwise noted or released for the disposal by the Contractor.

NUMBER OF PRODUCTS REQUIRED
Wherever in Specifications a product is referred to in singular number, such reference shall include as many such products as are shown on Drawings or are required to complete the work.

PRODUCTS LIST
Before Contractor's first request for payment, submit to Architect complete list of major products proposed for use; include proprietary product names, Manufacturer's name, and installing Subcontractor's name.

MANUFACTURER'S INSTRUCTIONS
Perform work in accord with Manufacturer's instructions.
Do not omit preparatory or installation procedures required by Manufacturer, unless specifically modified or exempted by Contract Documents.
When Contract Documents require work to comply with Manufacturer's instructions, obtain and distribute such instructions to parties performing work including two copies to Architect. Maintain one set at job site during installation and until acceptance.
Handle, install, connect, clean, condition, and adjust products in strict accord with such instructions and in conformance with specified requirements.
Should job conditions or specified requirements conflict with Manufacturer's instructions, consult Architect for further instructions.
Do not proceed with work without clear instructions.

TRANSPORTATION AND HANDLING
Arrange product deliveries in accord with construction progress schedule; coordinate to avoid conflict with

work and site conditions.
Deliver products undamaged, in Manufacturer's original containers or packaging, and with legible identifying labels intact.
Immediately upon delivery, inspect shipments to assure that products are properly protected and undamaged.

STORAGE AND PROTECTION
Follow Manufacturer's instructions.
Maintain product identity labels legible and intact.
Store products subject to weather-damage in weathertight enclosures.
Maintain storage room temperature and humidity within ranges required by Manufacturer's instructions.
Maintain reasonable protection against product theft and vandalism.
Exterior Storage:
Store fabricated products above ground, on blocking or skids; prevent product damage and discoloration.
Cover products subject to deterioration with impervious sheet coverings; provide adequate ventilation to prevent condensation.
Store loose granular materials in well-drained area on solid surface to prevent mixing with foreign matter.
Storage of Materials Off-site:
Not allowed unless previously approved by Owner.
Inspection of Stored Products:
Arrange storage to permit easy access for inspection.
Make periodic inspections of stored products to assure that products are maintained as specified and are free from damage, discoloration, and deterioration.
Protection after Installation:
Provide substantial coverings as necessary to protect installed products against damage and discoloration. Remove covering when no longer needed.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Provide Field Engineering required for project, including the following:
- Layout survey work required for execution of project.
- Civil, structural, and other engineering necessary to execute Contractor's construction methods.

SUBMITTALS
Submit Engineer's names and addresses to Architect.
When requested, submit documentation to verify engineering accuracy to Architect.
Submit certificate signed by Surveyor certifying whether or not work layout conforms to Contract Documents.

QUALITY ASSURANCE
Engineer's Qualifications:
Land Surveyor: Oregon State Registered Land Surveyor.
Engineers: State-licensed in specific engineering to be performed.
Records:
Maintain complete and accurate log of control for survey work as it progresses.

PART 2 - PRODUCTS

EQUIPMENT
Maintain at project site the following:
- Complete transit or laser level
- Leveling rod
- Plumb bob
- 6 ft. and 10 ft. straight edges
- 100 ft. long measuring tape

PART 3 - EXECUTION

SURVEY REFERENCE POINTS
Existing Points: See Drawings.
Locate existing points prior to starting site work, and preserve during construction.
Make no changes to existing points without Architect's approval.
Notify Architect when any point is lost or destroyed, or requires relocation.
Employ Registered Surveyor to replace any lost, destroyed, or relocated points.

PROJECT LAYOUT
Establish at least two permanent bench marks on the site referenced to existing control points.
Record bench mark locations, with horizontal and vertical dimensions, on Project Record Drawings.
Using surveying instruments establish lines and levels for the following:
- Site improvements.
- Stakes for grading, fill, and topsoil placement.
- Utility slopes and invert elevations.
- Batter boards for structures.
- Building wall and column locations, floor elevations, and similar elements.

Periodically verify layout accuracy.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Procedures and limitations for cutting, removing, replacing or refinishing products or materials after initial installation of such products or materials.

REFERENCES
Section F.3, Chemeketa Community College “General Conditions for Public Works Improvement Contracts”.

EXTENT OF WORK
Perform all cutting, fitting, and patching, including attendant excavation and backfill, required to complete work or to:
- Make work fit properly together.
- Uncover work for installation of ill-timed work.
- Remove and replace defective work and work not conforming to Contract Documents.
- Remove samples of installed work for testing.
- Provide penetrations through non-structural surfaces for mechanical and electrical work.

SUBMITTALS
Submit written request for cutting approval to Architect well in advance of any cutting which affects:
- Work of Owner
- Structural value or integrity of any completed or existing work.
- Waterproof value or integrity of any weather-exposed or moisture-resistant work.
- Visual qualities of any sight-exposed work.

Request shall include:
- Project identification.
- Description of affected work.
- Necessity for cutting, alteration, or excavation.
- Effect on Owner's work.
- Effect on structural or weatherproof integrity on completed or existing work.
- Description of proposed work including:
  - Extent of cutting, patching, alteration, or excavation.
  - Trades who will execute work.
  - Products proposed for use.
  - Extent of required refinishing.
- Alternatives to cutting and patching.
- Cost proposal, when applicable.

Submit written notice to Architect designating date and time work will be performed.

PART 2 - PRODUCTS

MATERIALS
Products similar to those specified elsewhere in this Project Manual:
Follow those specifications.
Other Products:
Follow Architect's instructions.

PART 3 - EXECUTION

EXISTING CONDITIONS
Inspect existing conditions and identify work subject to damage or movement caused by proposed cutting and patching.
After uncovering work, inspect conditions affecting products installation or performance. Report unsatisfactory and questionable conditions to Architect in writing; do not proceed with work until Architect provides further instructions.

PREPARATION
Maintain adequate temporary support necessary to assure structural integrity of affected work.

Protect other portions of project work against damage and discoloration.
Protect work exposed by cutting against damage and discoloration.

PERFORMANCE
Provide proper surfaces for repairs.
Employ original installer or qualified contractor to perform cutting and patching for:
- Weather-exposed or moisture-resistant surfaces.
- Sight-exposed finished surfaces.

Restore cut or removed work with new products to provide work complete in accordance with Contract Documents.
Fit work air-tight to pipes, sleeves, ducts, conduits, and other surface penetrations.
Where patching occurs refinish entire surface to provide even finish to match adjacent work as follows:
- Continuous Surfaces: Refinish to nearest intersection.
- Assemblies: Refinish entire unit.

CUTTING STRUCTURAL FRAMING
Not permitted at any location, unless shown on Drawings or otherwise approved.
Exposed Members:
Not permitted, unless shown on Drawings or otherwise approved.
Concealed Framing Members:
Verify with Structural Engineer.

CLEANING AND REPAIRING
Including work of this section, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section. Remove debris from project site upon work completion or sooner, if directed.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Special procedures for waste recycling, material and equipment recycling, and requirements for indoor air quality prior to building occupancy.

REGULATORY AGENCY REQUIREMENTS
Comply with governing codes, regulations, ordinances, and anti-pollution requirements.
Comply with Environmental Protection Agency standards for indoor air quality as they apply to this project.
Comply with State Department of Environmental Quality standards.

COORDINATION
Coordinate with other trades affecting or affected by Work of this section.
Cooperate to maintain continuous operation of Owner's activities.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

WASTE RECYCLING
Recycle waste materials resulting from construction operations to the greatest extent possible unless otherwise specified herein.
Deliver recyclable waste materials, or arrange for transportation to, a construction materials waste recycling company or enterprise.
Provide designated on-site containers for disposal of recyclable and salvageable materials.
Instruct employees and subcontractors on proper sorting and disposal of recyclable materials.
Periodically remove recyclable materials from site.
Dispose of at Contractor's expense at appropriate recycling centers.
Maintain recycling area clean and clearly marked in order to avoid contamination and co-mingling of materials.
Materials to be recycled include, but are not limited to, the following:

- Demolition lumber and wood waste
- Dimensional lumber waste
- Plywood, OSB and particle board
- Cardboard, paper and packaging
- Metals
- Paint
- Glass
- Plastics including foam plastic and film

AIR QUALITY
Minimize dust spread, both to the exterior of the building and within the building, to the greatest extend possible.
Protect existing return air duct systems against demolition dust by providing filter media across duct openings. Replace dirty media with clean when necessary to protect systems.

CLEANING AND REPAIRING
Allow no debris to accumulate in buildings, or on grounds, streets, or walks.
Clean, repair and touch-up, or replace when directed, adjacent property and surfaces which have been soiled, discolored, or damaged by Work of this Section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Cleaning and trash removal during work progress, and at work completion.

REFERENCES
Section F.4, Chemeketa Community College “General Conditions for Public Works Improvement Contracts”.

REGULATORY AGENCY REQUIREMENTS
Comply with governing codes, regulations, ordinances, and anti-pollution requirements.

PART 2 – PRODUCTS

CLEANING MATERIALS
Use only those which will not create hazards to health or property and which will not damage surfaces.
Use only those recommended by Manufacturer of surface to be cleaned.
Use only on surfaces recommended by cleaning material manufacturer.

PART 3 – EXECUTION

GENERAL
Follow cleaning material and surface manufacturer’s instructions.

DURING CONSTRUCTION
Periodically clean to maintain work, site and adjacent properties free from accumulations of waste, rubbish, and windblown debris, resulting from construction operations.
Provide on-site containers for collection of waste, debris, and rubbish.
Periodically remove waste material, debris, and rubbish and legally dispose of away from project site.

DUST CONTROL
Clean interior surfaces prior to painting, and continue cleaning as needed until painting is complete.
Schedule cleaning so that resultant dust and contaminants will not fall on wet or newly coated surfaces.

FINAL CLEANING
Remove waste, debris, and surplus material from project site.
Clean grounds as follows:
- Paved Surfaces: Remove stains, spills, and foreign substances and sweep clean.
- Other Surfaces: Rake clean.

In addition to debris removal and cleaning specified in other sections, clean exposed-to-view interior and exterior surfaces.
Employ skilled workers to perform final cleaning.
Remove any temporary protection and labels not required to remain.
Remove grease, mastic, adhesive, dust, dirt, stains, fingerprints, labels, and other foreign matter from sight-exposed interior and exterior surfaces.
Wash and shine glazing, including mirrors.
Polish glossy surfaces to clear shine.
Vacuum carpet and similar soft materials.
Clean equipment surfaces; remove excess lubricants.
Clean and sanitize food service equipment and plumbing fixtures.
Ventilating system, if used during construction:
- Permanent Filters: Clean
- Disposable Filters: Replace
- Clean Ducts, Blowers, and Coils: Clean

Clean light fixtures and lamps.
Clean Owner provided furniture installed prior to turn-over of the building.
Remove waste, debris, and foreign matter from roofs and roof drainage system.
Maintain structure and components clean until substantial completion.

END OF SECTION

GENERAL

SECTION INCLUDES

Description of the commissioning process to be used for this Project and applies to all commissioned systems.

PERFORMANCE

All systems in the project shall perform in accordance with the design intent and the Owner's operational needs. The process of assuring that such performance is achieved is referred to as "commissioning." Commissioning requires cooperation and direct involvement by all Commissioning Team members throughout the construction process.

PROCESS OVERVIEW

Commissioning during construction begins with a kick-off meeting conducted by the Commissioning Provider where the commissioning process is reviewed with the Commissioning Team members.

Additional meetings will be required throughout construction, scheduled by the Commissioning Provider with necessary parties attending, to plan, coordinate, schedule future activities and resolve deficiencies.

Equipment and system submittals pertaining to the commissioning scope are reviewed by the Commissioning Provider, concurrently with the Design Team, during the construction submittal process.

The Trade Subcontractor schedules and coordinates a start-up plan for selected equipment with review by the Commissioning Provider. The Commissioning Provider develops commissioning checklists from the approved submittals.

The Commissioning Provider performs periodic construction observations and provides updates to the Commissioning Team members.

The Trade Subcontractor, under their own direction, execute and document the manufacturer start-up procedure while performing manufacturer start-up and initial checkout. The Commissioning Provider documents that the start-up was completed through spot witnessing and reviewing Trade Subcontractor's completed manufacturer startup reports.

The Commissioning Provider creates a Deficiency Log to track equipment or system installation or function which is non-compliant with the contract documents.

Testing and balancing is performed for dynamic systems by the Trade Subcontractor. The Commissioning Provider documents that the testing and balancing was completed through spot witnessing and reviewing Trade Subcontractor's completed balancing reports.

The Commissioning Provider develops specific written equipment and system functional test procedures pertaining to the commissioned scope.

The functional test procedures are executed by the Trade Subcontractor, under the direction of, and documented by the Commissioning Provider for most equipment.

Items of non-compliance in installation or function are corrected by the Trade Subcontractor and the equipment or system is re-tested.

COMMISSIONED EQUIPMENT

- Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems (mechanical and passive) and the associated Building Automation System (BAS)
- Plumbing systems including, but not limited to:
  - Domestic hot water system

Electrical systems including, but not limited to:
Lighting and daylighting controls (interior and exterior)

RELATED SECTIONS

Specific commissioning requirements and related issues are given in the following Sections of the Specifications.

Division 22 Section "Plumbing Systems Commissioning": Special Plumbing system requirements and testing requirements by system.

Division 23 Section "Mechanical Systems Commissioning": Special Mechanical system requirements and testing requirements by system.

Division 26 Section "Electrical Systems Commissioning": Electrical component testing requirements.

Division 01 Section "General Requirements", Closeout Procedures: Lists some tasks required for substantial completion and final acceptance.

Division 01 Section "General Requirements", Execution and Closeout Requirements: Lists some tasks required for substantial completion, final acceptance, and training.

Division 01 Section "General Requirements", Closeout Submittals: Lists some tasks required for O&M requirements.

DEFINITIONS

Basis of Design
The basis and assumptions for calculations, decisions, schemes and product selections to meet the project requirements and to satisfy applicable regulatory requirements, standards and guidelines.
Commissioning
Commissioning is a systematic process of ensuring that all building systems perform interactively according to the project contract requirements. The commissioning process encompasses and coordinates the traditionally separate processes of system documentation, equipment start-up, control system calibration, testing and balancing, functional testing and training. Commissioning during the construction phase is intended to achieve the following specific objectives:
Ensure that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing Trade Subcontractors.
Ensure and document that equipment and systems function and perform according to the Contract Documents and Owner requirements.
Ensure that O&M manuals are complete.
Ensure that the operating personnel are adequately trained.
Commissioning Provider (CxP)
An independent party, not otherwise associated with the A/E team members, General Contractor or the Trade Subcontractors. The Commissioning Provider directs and coordinates the day-to-day commissioning activities in concert with the Project Team.
Commissioning Plan
An overall plan, that provides the structure and coordination planning for the commissioning process. The commissioning plan includes details of the commissioning scope; systems to be commissioned; team contact information; roles and responsibilities of all players; communication and reporting protocols; commissioning process overview as well as details of submittal activities; construction observation, commissioning checklist creation and start-up activities; the process for resolving deficiencies; functional test procedure development and execution; O&M manual review and training coordination; warranty period activities; description of commissioning report, description of observation and status logs.
Contract Documents
The documents binding parties involved in the construction of this Project (Drawings, Specifications, Change Orders, Addenda, Contracts, Requests for Information).
Commissioning Checklists

A list of items to include in the installation, start-up and initial checkout of a piece of equipment. Commissioning checklists are static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels, labels affixed, gauges in place, sensors calibrated, etc.). Some commissioning checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system).

Datalogging

Monitoring flows, currents, status, pressures, etc., of equipment using stand-alone dataloggers separate from the control system.

Deferred Tests

Tests that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

Deficiency

A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents.

Deficiency Log

Ongoing record of the deficiencies identified during the commissioning process that require or did require correction. For each entry the log includes a unique identification number, identification date, identification party, a short description of the issue, the equipment or system it is associated with, a detailed description of the issue, assignment of responsibility for correction and a deficiency resolved confirmation column. The Commissioning Provider is responsible to maintain the log.

Documenting Tests

The recording of what actions were taken to perform each individual functional test procedure, along with the results or system response of the process, with any deficiencies noted.

GC

The General Contractor or authorized representative.

Monitoring

The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

Owner Project Requirements

Documentation of the functional requirements of the facility and the expectations of how it will be used and operated. This includes project and design goals, measurable performance criteria, schedules and supporting information.

PlanRadar (or project Cx app)

Commissioning software utilized to track the commissioning process from beginning to end. The commissioning provider will update the project commissioning items as required. The members of the project team will respond to deficiencies and other commissioning items as dictated by responsibility within the software.

Seasonal Tests

Tests that are deferred until the system(s) will experience conditions closer to their design conditions.

Simulated Condition

Condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Specifications

The construction specifications of the Contract Documents.

Start-up

The initial starting or activating of dynamic equipment, including executing manufacturer start-up documentation.

Trade Subcontractor

A sub-tier contractor to the GC

Functional Test Procedures (FTP)

The written procedures and documentation forms used to guide and record commissioning testing. For mechanical systems, for example, FTPs are composed of repeatable, step-by-step procedures and include the test process and the expected outcomes. Recording the results of functional tests are integrally included in the written procedures. Responsibility for functional test procedure development is the Commissioning Provider's.

Trending

Monitoring using the building control system.

Warranty Period

For commissioning purposes and where referenced in a commissioning section, Warranty Period is defined as noted in the separate Warranty Period Division 1 specifications section.

RESPONSIBILITIES

Overview

The responsibilities of the commissioning team members in the commissioning process are summarized in the following. Their responsibilities are listed here to further clarify the commissioning process.

Architect, Design Engineers of Record

All tasks of the designers are applicable only if it is within their contracted scope of services.

Construction Phase

Participate and respond to commissioning related issues by using the Commissioning Provider's web-based commissioning software PlanRadar (or project Cx app).

Attend the commissioning kick-off meeting and selected commissioning team meetings, including the controls coordination meeting, as necessary.

Perform normal submittal review, construction observation, O&M manual review.

Review the coordination drawings.

Assist in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

Witness selected testing.

Coordinate resolution of commissioning deficiencies and warranty issues identified during commissioning, as necessary.

Provide an overview of system design and function during selected operator trainings.

Provide design basis and design narratives documentation

Warranty Period

Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning activities.

Commissioning Provider

Construction Phase

The primary role of the Commissioning Provider is to develop and coordinate the execution of the process of improved equipment installation and checkout and to verify and document that systems are functioning in accordance with the Contract Documents. The Commissioning Provider is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management, unless specifically stated otherwise in the Contract Documents. The Commissioning Provider may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the GC and Trade Subcontractors.

Update PlanRadar (or project Cx app) commissioning software as required to track commissioning progress as the project progresses. Provide updates through PlanRadar (or project Cx app) to the applicable project team members as required.

Coordinate the commissioning work with the GC to ensure that commissioning activities are being scheduled into the master schedule.

Revise, if necessary, the construction phase commissioning plan developed during design.

Plan and conduct commissioning meetings including the kick-off meeting and controls integration meeting, as needed, and distribute minutes.

Controls Integration Meeting

Coordinate the final approval process for the control system submittal via a meeting attended by the Controls Contractor, Owner, and Mechanical Engineer. The meeting shall occur after the controls submittal is issued for initial review, but prior to final approval.

Request and review additional information required to perform commissioning tasks, including Trade Subcontractor start-up and checkout procedures. Before start-up, gather and review the current control sequences and work with Trade Subcontractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed functional testing procedures.

Equipment Log.

Develop an equipment log of commissioned equipment in a spreadsheet in a grouped and organized format.

Include:

Brief equipment or system name
Tag or ID number

Track status of commissioned equipment in the equipment log for: commissioning checklist development, startup, functional test development and execution.

Review normal Trade Subcontractor submittals applicable to systems being commissioned concurrent with the A/E reviews for compliance with commissioning.

Review requests for information and change orders for impact on commissioning.

Write and distribute commissioning checklists for commissioned equipment.

Review Trade Subcontractor start-up schedule and plan with Trade Subcontractors for selected equipment.

Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for items relating to the commissioning process.

Document selected equipment or system start-up by reviewing manufacturer start-up reports and by selected site observation.

Write step-by-step functional test procedures for commissioned equipment and systems. Functional test procedures will include active testing, and may include energy management control system trending and stand-alone data-logger monitoring.

Coordinate functional testing for all commissioned systems. Witness and document functional tests performed for all commissioned systems, except: a) some smaller equipment may be tested and documented by the Trade Subcontractors, at the Commissioning Provider's discretion, b) electrical equipment testing and regulated testing may be directed and documented by the Trade Subcontractor with only spot witnessing and report review by the Commissioning Provider. The functional testing shall include operating the system and components through each of the written sequences of operation, and other significant modes and sequences, including start-up, shutdown, unoccupied mode, “Hand” mode, staging, miscellaneous alarms and interlocks with other systems or equipment. Sensors and actuators shall be calibrated during checkout by the installing Trade Subcontractors, and verified by the Commissioning Provider during testing. Analyze performance trend logs and monitoring data to verify performance, if necessary. Coordinate retesting as necessary until satisfactory performance is achieved.

After functional testing and initial deficiency resolution is complete, monitor system operation and performance for selected data points for up to 2 weeks by requesting trend logs from the Trade Subcontractor from the building automation system. Analyze monitored data to verify operation and performance.

Update commissioning related issues by using the web based commissioning software PlanRadar (or project Cx app).

Maintain a Deficiency Log. Report all issues as they occur. Provide directly to the project team written progress reports and test results.

Compile a commissioning report.

HVAC and Mechanical-Specific Tasks for the Commissioning Provider
Witness HVAC piping pressure test and flushing, sufficient to be confident that proper procedures were followed.

Witness any ductwork testing and cleaning sufficient to be confident that proper procedures were followed.

Review air and water systems balancing by selected site observation, by reviewing completed reports and by spot testing.

Owner/Owner Representative

Construction Phase
Furnish a copy of all construction documents, addenda, requests for information, change orders and approved submittals and shop drawings related to commissioned equipment to the Commissioning Provider for their permanent retention.
Facilitate the coordination of the commissioning work by the Commissioning Provider.

With the GC and Commissioning Provider, ensure that commissioning activities are being scheduled into the master schedule.

Participate in deficiency resolution as necessary.

Provide final approval for the completion of the commissioning work.

Warranty Period
Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

GC

Construction Phase
Participate and respond to commissioning related issues by using the Commissioning Provider's web based commissioning software PlanRadar (or project Cx app).

Execute pre-functional system checks using the Commissioning Provider's created forms on the web based commissioning software PlanRadar (or project Cx app).

The GC shall designate a Commissioning Coordinator to organize, schedule and coordinate the execution of the GC's and Trade Subcontractor's commissioning responsibilities. The Commissioning Coordinator shall have experience in project management, scheduling and in the technical aspects of mechanical and electrical systems.

With the Commissioning Provider ensure that commissioning activities are being scheduled into the master schedule.

Furnish a copy of all submittals and Shop Drawings related to commissioned equipment to the Commissioning Provider for their permanent retention during the normal submittal review cycle.

Notify the Commissioning Provider when the installation will begin for static systems that are being commissioned, dates for pipe and duct system testing, flushing, cleaning, start-up of each piece of equipment and starting of testing adjusting and balancing. Notify the Commissioning Provider ahead of time, when commissioning activities not yet performed or not yet scheduled may delay construction.

Provide time in selected construction meetings to cover commissioning-related issues.

Warranty Period

Schedule and coordinate the Trade Subcontractors in correcting outstanding commissioning tasks and deficiencies.

GC and Trade Subcontractors

Construction Phase

Participate and respond to commissioning related issues by using the Commissioning Provider's web based commissioning software PlanRadar (or project Cx app).

Execute pre-functional system checks using the Commissioning Provider's created forms on the web based commissioning software PlanRadar (or project Cx app).

Coordinate with the Commissioning Provider to facilitate the commissioning work.

Be proactive in seeing that commissioning processes are executed and that the requirements of the Commissioning Provider for the commissioning work are coordinated into the over-all construction schedule.

Attend the commissioning kick-off meeting and other necessary meetings scheduled by the Commissioning Provider to facilitate the commissioning process.

Participate in the controls integration meetings coordinated by the Commissioning Provider, prior to finalizing the controls submittal.

The GC and Trade Subcontractors shall respond to deficiencies identified during the commissioning process, making required corrections or clarifications and returning prompt notification to the Commissioning Provider.

When completion of a task or other issue has been identified as holding up any commissioning process, particularly functional testing, the Trade Subcontractor shall notify the GC. The GC shall notify the Commissioning Provider and provide an expected date of completion or resolution of the issue. It is not the responsibility of the Commissioning Provider to obtain this status information through meeting attendance, asking questions or field observation.

Trade Subcontractors

Construction Phase

Participate and respond to commissioning related issues by using the Commissioning Provider's web based commissioning software PlanRadar (or project Cx app).

Execute pre-functional system checks using the Commissioning Provider's created forms on the web based commissioning software PlanRadar (or project Cx app).

Provide additional requested documentation, prior to normal O&M manual submittals, to the Commissioning Provider for development of commissioning checklists.

Typically this will include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures, fan and pump curves, full factory testing reports, if any, and full warranty information. In addition, the manufacturer installation, start-up and checkout materials that are shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Provider.

The Trade Subcontractor shall provide the Commissioning Provider additional documentation necessary for the commissioning process, when requested.

Assist in clarifying the operation and control of commissioned equipment or systems in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed functional testing procedures.

Notify the GC when the installation will begin for static systems that are being commissioned, dates for pipe and duct system testing, flushing, cleaning, start-up of each piece of equipment and starting of testing adjusting and balancing. Notify the GC ahead of time, when commissioning activities not yet performed or not yet scheduled may delay construction.

During the start-up and initial checkout process, document the execution of manufacturer start-up and initial checkout with parties having direct knowledge of the equipment or system and provide a copy to the Commissioning Provider.

During construction, maintain red-line documents for Trade Subcontractors-generated coordination drawings. Update after completion of commissioning (excluding deferred seasonal testing).

Record all deficiencies that arise during the testing, adjusting and balancing work, such as damaged or missing duct or insulation, sensors, wiring, valves, dampers, controls, programming, equipment, components, etc. or items that will reduce the effectiveness of the installation or prevent accurate air and water balancing or systems or building control.

Review functional test procedures developed by the Commissioning Provider to ensure feasibility.

Execute functional testing for selected systems under the direction of, and documented by the Commissioning Provider.

Assist and cooperate with the Commissioning Provider by putting all commissioned equipment and systems into operation and continuing the operation during each working day of testing, as required.

Remedy outstanding Architect “punch list” items that may affect equipment operation before testing. Air and water testing adjusting and balancing shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.

Provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for portable data-loggers, which shall be supplied and installed by the Commissioning Provider.

Provide skilled technicians and perform testing under the direction of the Commissioning Provider for equipment and systems specified for testing in this section. In particular, the individual tasked with operating the controls system during functional testing shall be familiar with this building and control strategy.

Ensure that they are available and present during the agreed upon schedule and for a sufficient duration to complete necessary functional tests, adjustments and problem-solving. For larger mechanical equipment, provide the services of the manufacturer start-up technician for the beginning of the testing of the equipment.

Ensure that the local authorities having jurisdiction are available to witness any acceptance test (e.g., fire alarm testing, smoke cycle testing, fire damper acceptance testing, sprinkler system hydro-testing, etc.) that is a condition of occupancy for the building.

Provide assistance to the Commissioning Provider in interpreting apparent system performance problems from monitored and test data.

Respond in writing to each deficiency. Correct deficiencies (differences between specified and observed performance) as interpreted by the Commissioning Provider and retest the equipment.

Train facility operating personnel using expert qualified personnel according to the Contract Documents.

Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions and submit a copy to the Commissioning Provider for review.

<u>Warranty Period</u>
Correct deficiencies and make necessary adjustments to O&M manuals and red-line documents for applicable issues identified in any seasonal or warranty period testing.

SUBMITTALS

Standard Equipment and System Submittals.
The submittals reviewed may be done in parallel with A/E reviews or in series with them, depending on protocol set by the Owner.

The reviews will consist of commenting relative to conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment, adequacy for developing test procedures and for O&M issues. The reviews are intended to aid in the development of testing procedures and aid in verification of compliance with equipment specifications.

Other Equipment and System Information.
When not included with the standard submittals, the Trade Subcontractors shall provide to the Commissioning Provider requested shop drawings, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures and control drawings. In addition, the manufacturer installation and checkout materials that are shipped inside the equipment and the field checkout forms to be used by the factory or field technicians shall be submitted to the Commissioning Provider. This documentation may be required prior to the normal O&M manual submittals.

All equipment and system documentation requested by the Commissioning Provider shall be included by the Trade Subcontractors later in the O&M manuals.

The Trade Subcontractors shall submit startup forms and procedures. If manufacturer startup forms are unavailable, Trade Subcontractors are responsible to document baseline operation of their equipment including but not limited to:

- Operational electrical data
- Seasonal operational mechanical performance data
- Photos of installation conditions
- Deficiencies found and resolved during startup

QUALITY ASSURANCE

Test Equipment
All standard testing equipment required for the Trade Subcontractors to perform installation, start-up and initial checkout and required functional testing shall be provided by the Trade Subcontractors.

Special tools and instruments, only available from vendor, specific to a piece of equipment, required for testing equipment according to these Contract Documents shall be provided.

Datalogging equipment required for testing equipment in support areas shall be provided and used by the Commissioning Provider.

COORDINATION

Commissioning Team
The members of the commissioning team consist of the Commissioning Provider, the Owner/Owner Representative, the GC, the Architect and Design Engineers, the mechanical contractor, the electrical contractor, the plumbing contractor, the testing adjusting and balancing contractor, the controls contractor, any other installing subcontractors or suppliers of commissioned equipment or systems and the facility or plant operator/engineer.

Management
The Commissioning Provider directs and coordinates the commissioning activities and the reports to the Owner/Owner Representative or to the parties as agreed to during the commissioning kick-off meeting. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

Scheduling

The GC shall provide sufficient notice to the Commissioning Provider regarding the installation of static systems being commissioned and the schedule for the start-up and initial checkout of all commissioned dynamic equipment and systems.

PRODUCTS NOT USED

EXECUTION

MEETINGS

Kick-off Meeting

The Commissioning Provider will schedule, plan and conduct a commissioning kick-off meeting with the entire commissioning team in attendance, including the controls, electrical, plumbing, mechanical, adjusting and balancing and other appropriate Trade Subcontractors and the facility operator or Owner Representative in attendance. Prior to this meeting, the commissioning plan will be distributed to all members. The commissioning plan, the overall commissioning process and general responsibilities of each team member, reporting and communication protocols and next steps will be discussed. Meeting minutes will be distributed to all parties by the Commissioning Provider.

Miscellaneous Meetings

Deficiencies identified through the commissioning process shall be discussed, as needed, in portions of regular construction meetings. Meetings dedicated to deficiencies or commissioning: status, coordination and planning shall also be conducted, if needed. The Commissioning Provider will plan, conduct and take minutes at commissioning meetings. When practical, commissioning meetings will be an appendage to regular construction meetings. All commissioning meetings shall be attended by the GC, the mechanical and the controls subcontractor. Selected meetings shall require the attendance of the electrical, plumbing, fire alarm, TAB or other trades of commissioned systems.

Controls Integration Meeting

The Commissioning Provider coordinates the meeting to go over the control drawings, sequences of operation included in the controls submittal. This meeting is held prior to the approval of the controls submittal. The intent is to clarify control related issues for the controls contractor, mechanical, fire alarm, plumbing and electrical contractor, facility staff and Commissioning Provider prior to startup, testing and balancing and functional testing.

The controls contractor shall attend the meeting. The mechanical, electrical and general contractor shall attend when issues regarding equipment they are responsible for are discussed. The control technicians attending the meetings must be the same technicians that are/will install and program the DDC system.

Primary issues discussed and clarified are:

- Control drawing content
- Point database (points (monitored points, software points, naming conventions, alarms, report format)
- Sequences of operation and setpoints
- Interlocks to packaged controls and other systems
- Operator workstation graphics
- Field sensor and panel locations

The Commissioning Provider takes minutes at these meetings.

COMMISSIONING CHECKLISTS, START-UP, AND INITIAL CHECKOUT

Commissioning Checklists

GC and Trade Subcontractors are to execute pre-functional system checks using the Commissioning Provider's created forms on the web based commissioning software PlanRadar (or project Cx app).

The Commissioning Provider develops and completes the commissioning checklists and procedures for commissioned equipment and systems.

The construction checklists will contain requirements for calibrations when applicable. The Trade Subcontractors is responsible to calibrate all field-installed sensors and actuators using checkout documentation methods approved by the Commissioning Provider.

Manufacturer Installation and Startup Procedures

The Trade Subcontractors shall complete the pre-start procedures in the manufacturer startup forms prior to starting equipment, including but not limited to verification of completion of wiring, safeties, lubrication, drive rotation and proper electrical test readings. Startup shall be conducted under supervision of responsible manufacturer representatives for major pieces of equipment. The GC shall notify the Commissioning Provider at least 5 days in advance of any equipment start-up, providing the Commissioning Provider a copy of the start-up plan at that time.

The Commissioning Provider shall observe startup and checkout of selected systems.

The Trade Subcontractors and manufacturer representatives shall execute start-up and provide the Commissioning Provider with a signed and dated copy of the completed start-up documentation. The Trade Subcontractors shall clearly note any items that have not been completed and the plan for their completion.

The Trade Subcontractors shall operate each commissioned device or system to the full extent of its capability, from minimum to maximum, under automatic and manual control and verify that the equipment, system and assembly is functioning according to the specifications, manufacturer recommendations and good operating practice.

The manufacturer startup reports and procedures for a given system shall be successfully completed and submitted prior to testing, adjusting and balancing of the equipment.

The Commissioning Provider will review startup documentation and identify incomplete areas.

The Trade Subcontractors shall correct all areas that are deficient or incomplete in the startup documentation in a timely manner.

FUNCTIONAL TESTING

Functional tests for a given system shall not be conducted until they are fully operational under normal and reliable control with control calibrations, programming and control system graphics complete and checked out and the Trade Subcontractors have:

Submitted completed documented, applicable startup reports (all commissioning divisions), satisfactory to the Commissioning Provider

Submitted completed documented, applicable TAB reports, satisfactory to the Commissioning Provider

Submitted completed documented, applicable controls (all commissioning divisions) point to point device checkout noting that all controlled points and devices are functional, calibrated and confirmed by the controls trade subcontractor

Objectives and Scope

The objective of testing is to demonstrate that each system is operating according to the documented Contract Documents. During the functional testing process, areas of deficient performance are identified and corrected.

In general, functional testing shall include testing each sequence in the sequence of operations, and other significant modes; including, but not limited to startup, shutdown, unoccupied and manual modes, modulation up and down the unit's range of capacity, alarms, component staging and backup upon failure, interlocks with other equipment, and sensor and actuator calibrations. Interlocks and interactions between systems shall be tested. Larger equipment shall be individually tested. Units or systems that are numerous (many smaller rooftop packaged units, air terminal units, exhaust fans, windows, etc.) may have an appropriate sampling strategy applied. Heating equipment must be tested appropriately during winter and air conditioning equipment must be tested appropriately during summer to demonstrate performance under near-design conditions.

Development of Functional and Performance Test Procedures

Test procedures and documentation forms are not finalized until after equipment and control system submittals and shop drawings are approved.

The Commissioning Provider writing the test procedures obtains needed documentation which generally includes equipment Specifications, testing requirements, O&M manuals, approved submittals and shop drawings, start-up instructions, sequences of operation, and mechanical, electrical and control drawings and writes detailed step-by-step testing procedures to comply with the testing requirements.

DEFICIENCIES AND NON-CONFORMANCE

Deficiency Management

The Commissioning Provider will record the results of document reviews, field observations, tests conducted or reviewed and trend logs or monitoring. All deficiencies will be recorded on a Deficiency Log kept by the Commissioning Provider. The Deficiency Log will be kept updated by the Commissioning Provider.

A current copy of the Deficiency Log will be provided to the GC and Owner/Owner Representative on a regular basis, as requested. New deficiencies will be identified.
Items that are incomplete or are requiring Designer input will be sent to the Designer and Owner/Owner Representative by the Commissioning Provider via appropriate channels.

When completion of a deficiency has been identified by the Commissioning Provider as holding up or is likely to delay any commissioning process, particularly functional testing, the GC, shall be required to notify the

Commissioning Provider providing the planned actions and an expected date of completion. The GC shall notify the Commissioning Provider listing the actions taken to resolve the issue. It is not the responsibility of the Commissioning Provider to obtain this status information through meeting attendance, asking questions or field observation.

The Commissioning Provider documents resolutions in the Deficiency Log and schedules retesting and back-checking as needed.

Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Provider will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so.

The time for the Commissioning Provider to direct, document and evaluate any retesting required because a specific construction checklist or start-up test item, reported to have been successfully completed, but determined during testing to be faulty, will be charged to the GC.

The GC shall reimburse the Commissioning Provider for costs when a scheduled test cannot be completed due to:

- Failure of the GC to schedule the test with all parties required to perform the test or with regulatory authorities required to witness the test.
- Failure of the GC to provide required notice for tests that have been cancelled or rescheduled.
- Failure of the GC or Trade Subcontractors to have in place test equipment, support equipment, instrumentation, permits, or other ancillary equipment or systems required for successful execution of the test.\
- Failure of the Trade Subcontractors to complete pre-start or start-up procedures or other work required as a prerequisite for execution of the test.

The GC shall respond in writing to the Commissioning Provider at least as often as commissioning meetings are being scheduled concerning the status of each outstanding deficiency identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

Approval and Acceptance: The Commissioning Provider will note each satisfactorily demonstrated function on the test form. Functional testing or acceptance of a system is indicated after all testing and monitoring is

complete and there are no outstanding deficiencies for that equipment or system in the Commissioning Provider's Deficiency Log.

DEFERRED TESTING

Unforeseen Deferred Tests

If any functional test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of functional testing may be delayed.

ADDITIONAL DOCUMENTATION

Documentation required of the Trade Subcontractors shall consist of the following:

Submitted completed documented, applicable startup reports (all commissioning divisions), satisfactory to the Commissioning Provider

Submitted completed documented, applicable TAB reports, satisfactory to the Commissioning Provider

Submitted completed documented, applicable controls (all commissioning divisions) point to point device checkout noting that all controlled points and devices are functional, calibrated and confirmed by the controls trade subcontractor

Record of deficiencies and incomplete items for tests they are responsible for documenting.

Summary of Written Work Products

Written work products generated as part of the commissioning process are described in various parts of the specifications and in the commissioning plan. In summary, the written products are:

	Product	Developed By
1.	Owner requirements and objectives	Architect per Owner Project Design Requirements
2.	Design narratives and design basis	Architect, Design Team
3.	Final commissioning plan	Commissioning Provider (CxP)
4.	Commissioning meeting minutes	Commissioning Provider
5.	Commissioning schedules	GC with input from the CxP
6.	Equipment/system submittals	Trade Subcontractors
7.	Sequence clarifications	Trade Subcontractors and Design Team
8.	Commissioning checklist forms	Commissioning Provider
9.	Start-up and initial checkout plan	Trade Subcontractors and CxP
10.	Start-up and initial checkout forms	Trade Subcontractors
11.	Deficiency Log	Commissioning Provider
12.	Commissioning Observations	Commissioning Provider
13.	Functional test forms	Commissioning Provider and Trade Subcontractors
14.	Commissioning Report	Commissioning Provider

TRAINING FACILITY PERSONNEL

The Trade Subcontractors are responsible to provide training for facility personnel per the Contract Documents.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Interior demolition such as removing partitions, doors, equipment, fixtures and components, identify and cap utilities, clean up and preparation, temporary partitions.

SALVAGE
To Owner:
The following material remains property of Owner:
Finish hardware.
Store in building where directed.
To Contractor:
All other salvage becomes property of Contractor. It may be re-used on work if Architect judges it equal to new products specified.
Remove other debris from site.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.
Cooperate to maintain continuous operation of Owner's activities.

PART 2 - PRODUCTS

PLYWOOD
Sound; thickness as required to satisfy installation and use conditions.

PLASTIC SHEETING
Clear or translucent polyethylene sheets, minimum 6 mil thickness.

FILTER MEDIA
Fiberglass, 8 inch minimum thickness, or accepted substitute.

WHEELING EQUIPMENT
Use only pneumatic-tired equipment.

PART 3 - EXECUTION

EXAMINATION
Verify that area to be demolished is vacant and not in use.
Do not start work until conditions are satisfactory.

PREPARATION
General:
Arrange for, and verify utility service termination including capping active lines.
Remove Salvage and store where directed.
Protect existing portions which are to remain against damage and discoloration.
Allow no leaks, even temporary, in existing building.
Barriers, Safety Guards, and Warning Lights:
Provide where necessary for public protection.
Utilities:
Keep active utilities intact and in continuous operation.
Party Walls:
Exercise extreme care not to damage party walls and adjacent construction.

DUST-PROOF PARTITIONS
Build where necessary to prevent dust-spread.
Fasten plywood solidly to studs and cross blocking.
Cover joints with reinforced kraft paper cemented in place.
Maintain dust-proof; remove only when no longer needed.
Provide access and egress doors as required to maintain fire escape routes.

DUST CURTAINS
Construct of plastic sheeting.
Provide where necessary or where directed to prevent dust-spread.
Install continuously from floor to ceiling.
Fasten to existing construction in such a manner to prevent sagging and accidental damage or removal.
Do not damage existing construction to remain.
Cover joints with tape.
Provide temporary supports for sheeting as required.
Maintain dust-proof; remove only when no longer needed.
Provide access and egress curtains as required to maintain fire escape routes.

CLEANING AND REPAIRING
Allow no debris to accumulate in buildings, or on grounds, streets, or walks.
Haul away from site as soon as removed. Do not burn or bury materials on site.
Dispose of at Contractor's expense.
Clean, repair and touch-up, or replace when directed, adjacent property and surfaces which have been soiled, discolored, or damaged by work of this section.

PROTECTION
Protect work specified herein against damage and discoloration.
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Permanent and temporary formwork and accessories for placing of structural and architectural cast-in-place concrete.

WORK INSTALLED BUT FURNISHED BY OTHERS
Build in as directed by those Contractors, without weakening or defacing formwork.

SUSTAINABILITY REQUIREMENTS
Comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24):
Concrete Form Release Agents: 0g/L

DESIGN AND ENGINEERING
Formwork design and engineering, as well as construction are Contractor's responsibility.

DELIVERY, STORAGE, AND HANDLING
Protect against damage and discoloration.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

PLYWOOD FORMS
APA B-B Plyform grade plywood, Class 1.
Thickness: As required by concrete placement rate.
Provide at all vertical concrete work.

FORM TIES
For all Work:
Plastic cone type, Burke, Bowman, Richmond, Dayton, or approved, with standard breakback, and type recommended by manufacturer for conditions of installation.
Wire ties and wood spacers not permitted.

EMBEDDED ITEMS
Steel Reinforcement:
Refer to Section 03 20 00.
Anchor Bolts:
Furnished by steel fabricator.

FORM TREATMENT
For Plywood Forms:
Coat with approved stainless form oil, using minimum quantity required for satisfactory form removal.

PART 3 - EXECUTION

PREPARATION
Conform to shapes, lines, and dimensions shown on Drawings.
Brace and tie together to insure that position and shape are maintained.
Make tight to prevent mortar leakage.
Arrange joints as indicated or directed.
Form for surface indentations, as shown on Drawings.
Provide access openings as required for cleaning and inspection of forms and embedded Items prior to placing concrete. Locate where not exposed to view.
Anchor as required to prevent upward or lateral formwork movement during concrete placement.

PLYWOOD FORMS
Prevent plywood end grain from forming concrete exposed to view.
Construct beam side forms for removal without disturbing bottom forms or shoring.

BRACING
Provide as required to meet load requirements.
Protect against undermining or settlement when placed on ground.
Anchor as required to prevent upward or lateral formwork movement during concrete placement.

OPENINGS AND CHASINGS
Provide openings and chasings of slabs and walls for mechanical and electrical work.
Sizes and locations as directed by mechanical and electrical trades.

CHAMFERS
Except at flush joints between adjacent materials, chamfer exposed external corners of concrete with 3/4 inch triangular wood strips placed in forms.

TREATMENT OF FORMS
Plywood Forms:
Apply coating to contact surfaces in accordance with manufacturer's directions.
When treating previously set forms, prevent coatings from covering reinforcing steel or existing concrete where bond is required.
Prohibit coatings from collecting in puddles.

EMBEDDED ITEM INSTALLATION
Steel Reinforcement:
Refer to Section 03 20 00.
Anchor Bolts:
Secure in accordance with approved setting drawings. Set with templates to assure accurate bolt positioning.

TOLERANCES
Variation of Building Lines:
1/4 inch in any bay or 20 ft. maximum.
Variation in Cross-Sectional Dimensions:
Minus 1/8 inch; plus 1/4 inch.
Variation in Surface Tolerance:
1/8 inch in any 10 ft. measured with 10 ft. straight-edge.
Deflection of Form Facing Material between Supports:
0.0025 x span, maximum.
Crossing Property Lines:
Regardless of tolerances specified above, no construction shall extend beyond the Legal Boundary of the Project.
Openings, Columns, Beams, and Slabs:
Accurately sized and located within 1/8 inch plus or minus.

ADJUSTMENTS
Reposition to true alignment prior to, during, and after concrete placement, if necessary.
During concrete placement, in areas where formwork develops weakness, settlement or distortion, stop placement and remove or strengthen formwork.

FORM CLEANING
Remove debris and foreign matter from formwork prior to concrete placement.
Remove loose rust and foreign matter from reusable hardware prior to installation into formwork.

FORM REMOVAL
Leave forms and shoring in place until concrete has attained sufficient strength to safely support own weight and imposed loads.
Remove forms at time and in manner to insure safety of structure, and without concrete surface damage.

FORM RE-USE

Withdraw projecting nails; clean concrete from contact surfaces. Replace with new material when necessary or when directed.

Re-use forms only when contact surfaces equal those specified for original use.

CLEANING AND REPAIRING

Remove formwork and debris from project site upon work completion or sooner, if directed.

Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.

PROTECTION

Protect other work against damage and discoloration caused by work of this section

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Reinforcing steel and required supports for cast-in-place concrete and reinforced masonry.

REFERENCES
“2014 Oregon Structural Specialty Code (OSSC) based on the International Building Code (IBC) 2012 Edition”, published by the International Code Council (ICC).
"Manual of Standard Practice for Detailing Reinforced Concrete Structures Standard 315" (ACI Manual 315), published by American Concrete Institute, Box 19150, Redford Station, Detroit, Mich. 48219.
"Manual of Standard Practice" (CRSI Manual), published by Concrete Reinforcing Steel Institute, 180 N. LaSalle Street; Chicago, Ill. 60601.

SUBMITTALS
Submit in accordance with Section 01 33 00.
Shop Drawings:
Follow ACI Manual 315.

PRODUCT DELIVERY, HANDLING AND STORAGE
Protect against damage, rust, mud, grease, and oil.
Tag each piece or bundle; indicate size, grade, and location.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

BARS
ASTM A 615, #3 and smaller: Grade 40; #4 and larger: Grade 60.

SMOOTH WIRE REINFORCING
ASTM A 615, Grade 60.

TIE WIRE
Black, annealed steel 16 ga. minimum; Fed. Spec.QQ-W-461.

ACCESSORIES
General:
Conform to CRSI “Manual of Standard Practice.
Include all devices necessary for proper reinforcement placement, spacing, supporting, and fastening.
Fabricate from concrete ceramics, metal or plastic. Galvanize metal accessories in contact with finished concrete surfaces.
Slab-on-grade Bar Supports:
Precast concrete spacer blocks at bars placed over vapor retarders; wire chairs permitted only where vapor retarders are not scheduled.

FABRICATION
Follow CRSI "Manual of Standard Practice."

TOLERANCES
Fabrication;
Sheared length: Plus or minus 1 inch.
Stirrup, Spiral, and Tie dimensions: 1/2 inch plus or minus.
All other bend dimensions: Plus or minus 1 inch.

PART 3 - EXECUTION

EXISTING CONDITIONS
Verify that surfaces to receive reinforcement are accurately sized and located, square, plumb, rigid,

secure, and otherwise accurately prepared.
Prior to starting work notify general contractor of defects requiring correction.

INSTALLATION
General:
Conform to Building Code and the following:
Bending:
Bend bars without heat.
Field bending partially embedded bars not permitted without Architect's approval.
Placing:
Secure against displacement.
Do not displace or damage vapor barrier.
Spacing:
Clear distance between parallel bars, including splices, unless otherwise permitted by Code, not less than:

- Nominal Bar diameter.
- 1-1/2 times maximum concrete aggregate size.
- 1 inch.

Splicing:
Do not weld or tackweld reinforcement splices.
Minimum Lap at Splices at Bar Reinforcement: 24 bar diameters.
Protective Concrete Covering:
At principal structural members cast directly against the ground, including footings: 3 inches minimum.
At principal structural members in direct contact with the ground after formwork removal: 2 inches minimum.
All other locations: 1-1/2 inches minimum, or bar diameter, whichever larger.

SPECIAL REINFORCEMENT, unless otherwise shown on Drawings
At Corners and Intersections:
Splice horizontal wall reinforcing with corner bars; same size and spacing. Extend beyond corner or intersection 40 bar diameters, minimum.
At Openings:
Provide 1 each #5 bars around openings; extend 24 inches minimum beyond corners.
At Slab Re-entrant Corners:
Provide 1 each, 48 inch long, #4 bar diagonally across corner.

TOLERANCES
Placement:
Concrete cover: Plus or minus 1/4 inch.
Spacing between Bars: 1/4 inch.
Top Bars in Slabs and Beams:

- Members 8 inches deep or less: Plus or minus 1/4 inch.
- Members from 8 to 24 inches deep: Plus or minus 1/2 inch.
- Members more than 24 inches deep: Plus or minus 1 inch.

Stirrups and Transverse Bars: Space evenly within 2 inches of stated separation.
Bar relocation to avoid interference with other reinforcement, conduits, or embedded Items: 1 Bar diameter, unless otherwise approved by Architect.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

CLEANING AND REPAIRING
Prior to concrete placement, remove loose flaky rust, mud, oil, and other bond-reducing coatings; conform to IBC, Chapter 19.
Remove debris from project site upon work completion or sooner, if directed, including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Cast-in-place or in-situ concrete for structural building frame, slabs on fill or grade, and other concrete components associated with the construction.

RELATED SECTIONS
03 11 00 Concrete Forming
03 20 00 Concrete Reinforcement
32 13 16 Decorative Concrete Paving
32 16 00 Concrete Curbs and Sidewalks

SUBMITTALS
Submit in accordance with 01 33 00.
Shop Drawings:
For any location where layout and detailing has been provided in the Contract Documents, submit Shop Drawings indicating understanding for architect's approval.
Product Data:
Design Mixes: Submit for each type and class of concrete specified.
Include prior laboratory test data and compressive strength results in accordance with ACI 301 and ASTM standards.
Indicate amounts of mixing water to be withheld for later addition at Project site.

QUALITY ASSURANCE
Perform work in accordance with ACI 301.
Obtain materials from same source throughout the work.
Installer Qualifications:
A qualified installer and supervisor with a minimum of 5 years of experience.
Manufacturer Qualifications:
A firm with a minimum of 3 years of experience in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94 M requirements for production facilities and equipment."
Pre-Installation Meeting:
Convene one week before starting work of this section to verify project requirements, coordinate with installers of other work, embedded items and penetrations required by other trades.
Establish condition and finish of concrete surfaces, including exposed form finish concrete.
Review construction joint layouts at walls and slabs.
Review control joint layouts at slabs.

SUSTAINABILITY REQUIREMENTS
Volatile Organic Compounds:
Comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24):
Concrete Curing and Hardening Compounds: 60 g/L
Concrete Sealer: 10 g/L

PRODUCT DELIVERY, HANDLING, AND STORAGE
Protect against deterioration, foreign matter intrusion, contamination, and dampness.
Conform to ASTM C 94.

ENVIRONMENTAL REQUIREMENTS
Cold Weather:
Place no concrete on frozen subgrade.
Remove ice and snow from reinforcing, forms, and embedded items.
Raise temperature of all surfaces in contact with concrete above freezing prior to concrete placement.
Minimum concrete temperature during placement: 65°F.
Minimum concrete temperature for 72 hours after placement: 55°F.
Maximum air temperature drop during first 24 hours after protection removal: 55°F.
Use of salts or chemical admixtures to prevent concrete freezing prohibited.
Do not permit temporary heaters to locally over-heat or over-dry concrete.

Assume responsibility, including costs, for testing suspected frozen concrete.
Remove and replace freeze-damaged concrete at contractor's expense.
Warm Weather:
When air temperature exceeds 90°F and when wind exceeds 20 mph place concrete in accordance with the following requirement:
Maximum concrete temperature at time of placement 75°F.
Mix concrete minimum possible time, and place as soon as possible thereafter.
Sprinkle forms, reinforcing, embedded items, and subgrade with cool water immediately prior to concrete placement.
Protect unstripped formwork and exposed concrete surfaces against excessive drying with water spray, or other approved method.
Assume responsibility, including costs, for testing suspected damaged concrete.
Remove and replace damaged concrete at contractor's expense.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

PORTLAND CEMENT
ASTM C 150, Type 1.
Use one brand only for exposed concrete.

AGGREGATE
Conform to ASTM C 33.
Maximum size: 1-1/2 inch, and not more than one-fifth of narrowest space between forms, one-third of slab depths, nor three-fourths of minimum clear space between reinforcing bars.
Use same source for course and fine aggregate used in exposed concrete.
Minimum 60% of surface of course aggregate to have crushed faces.

ENTRAINED AIR
ASTM C 260, non-toxic after 30 days, not containing chloride.
Provide in exterior curbs, walks, and flatwork that are subject to freezing while wet.

WATER REDUCING ADMIXTURES (PLASTICIZER)
ASTM C 494, Type A.
Provide at all concrete slabs on grade.
Provide with dosages high enough to reduce water by minimum 10% from the same mix without admixture.

CALCIUM CHLORIDE
Not approved for use.

BONDING AGENT
Euclid “Flex-Con”, W.R. Meadows “Interlock 1059”, Sika “Sika Bond”, Tammsweld, Larsen “Weld-Crete”, Nox-Crete “Vinl-hesive”, Dayton Superior J-40, or accepted substitute.

EXPANSION JOINT FILLER
W.R.Meadows Fibre Expansion Joint #320-F, 1/2 inch thick, conforming to ASTM D 1751.
Depth as required to bring top to within 1/4 inch of surface of slab.

NON-SHRINK GROUT
Heavy-duty, high early strength, non-shrink, non-metallic, non-staining type, conforming to ASTM C 1107 and CRD-C621; Sonneborn “Sonogrout 14K”, Dayton Superior “1107 Advantage Grout”, “Tammsgrout Supreme", Sika “Sikagrout 121”, or accepted substitute.
Provide as Follows:
Under column base plates.
Elsewhere shown on Drawings.

STANDARD GROUT

Parts by volume:

Cement	1
Lime	1/4
Fine Aggregate	3
Pea Gravel, as graded below	1 1/2

Sieve Size	% Passing
3/8	95-100
#3	45-75
#4	10-20
#8	0-5

Water: Minimum amount to produce required compressive strength at 28 days, and to provide pouring consistency without aggregate segregation.

Provide around pipes, conduit and ducts passing through floors and walls, and elsewhere necessary to prevent air and sound passage through walls and floors.

FLOOR FILLER

Dowman "Fix-All", or accepted substitute.

Provide over concrete floor slabs which are too rough or uneven to provide satisfactory base for resilient covering or carpeting.

CURING AND HARDENING COMPOUNDS

Interior Flatwork to receive Finish Covering:

Clear, colorless, with fugitive dye, approved by covering contractor; meet or exceed ASTM C 309, Type 1.

Interior Flatwork without Finish Covering:

Water-based chemical hardener; Dayton Superior "Day-Chem Hardener J-15", Tamms "Hornolith," Euclid "Surfhard", Sonneborn "Lapidolith," Nox-crete "Harbeton," or accepted substitute.

Do not apply curing compound to surfaces scheduled to receive ceramic or stone tile. Wet cure only.

Exterior Flatwork:

Non-yellowing, resin cure, water-based, meet or exceed ASTM C 309, Type 1, Class A and B; Tamms "Horncure WB 100", Dayton Superior "Day-Chem Rez Cure J-11-W", BASF "Master Cure 100", W.R. Meadows "1100 Clear", Euclid "Kurex VOX", or accepted substitute.

CONCRETE SEALER

At interior flatwork without finish covering, provide topcoat sealer, Prosoco "Consolideck LS" or accepted substitute.

OTHER INGREDIENTS

Conform to Building Code.

CONCRETE MIX DESIGN

General:

Conform to ACI Code 318-02 and 201 OSSC Section 1905.

Selection of concrete proportions shall be based on required average compressive strength of concrete f'cr stated in table below unless concrete production facility has 15 or more test records meeting the requirements of ACI-11 5.3.1.

Documentation that proposed concrete proportions will produce an average compressive strength equal to or greater than required average compressive strength f'cr shall consist of more than 30 but not less than 10 consecutive test records which encompass a period of time not less than 45 days. Such records shall represent materials and conditions similar to those expected. When an acceptable record of field test results is not available, concrete proportions may be established based on trial mixtures meeting the requirements of ACI-11 5.3.3.2.

Concrete Strength and Minimum Cement Content:

Location	f'c	Max w/c ratio	Min. cement (sacks/cu. yd.)
Slabs-on-grade, Curbs	3500 psi	0.44	5.5
Footings, all other	3000 psi	0.46	5.0

Note: One sack of cement equals 94 lbs.

Engineer may order cement content for any class of concrete to be increased over the quantity specified if determined that such increase is necessary to attain required strength. Increased quantities of cement

ordered to be furnished by contractor at no additional cost to owner.
Air Entrainment:
Footings: 2% to 4% of concrete volume.
Walls, Exterior Slabs: 4% to 6% of concrete volume.
Concrete Slump:
Minimum: 2 inches.
Slabs-on-grade, Curbs: Maximum 4 inches, 7 inches maximum with plasticizers.
Footings: 6 inches.
Verify that design mix test results reflect the slumps to be used and adequate slump is produced to properly transport and place the mix.

PART 3 - EXECUTION

EXISTING CONDITIONS
Verify that formwork, reinforcement, and embedded items are accurately and securely placed, clean, water and frost-free, and ready to receive concrete.
Verify that vapor retarder is not punctured or otherwise damaged. Repair all damage.
Remove water from vapor retarder with portable high-speed air blowers just prior to slab-on-grade pour.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

SURFACE PREPARATION
Remove foreign matter from surfaces and areas to receive concrete.
If vapor retarder is wet, blow water off with power blower.
Sprinkle subgrades and other porous surfaces with water to eliminate suction.
Install slab-on-grade screeds without penetrating vapor retarder.

PLACING
Convey and place by methods which will prevent material separation and loss.
Deposit continuously, or in layers that will not form seams or weakened planes; where seams or weakened planes are unavoidable provide construction joints as specified hereunder.
Do not convey pneumatically placed concrete through aluminum pipe.
Do not retemper or use set concrete.
Maximum height of vertical drop without use of trunk, placement ports in sides of formwork, or other approved method is five (5) feet. When under-water concrete placement is approved, deposit fresh concrete into mass of previously placed concrete causing water to be displaced with minimum concrete surface disturbance.

COMPACTION
Employ mechanical high frequency vibrators to consolidate concrete around reinforcement, into corners and angles of forms, and to exclude rock pockets, air bubbles, and honey comb.
Hold vibrator in one spot no longer than 30 seconds; keep in constant motion, insert and withdraw at points approximately 18 inches on center.
Maintain vibrator in vertical position when penetrating concrete.
Transporting concrete with vibrator not permitted.
Maintain spare vibrator at jobsite during concrete placement.

CURING
Curing Period:
Not less than 7 days at 50°F minimum.
Exterior Flatwork:
Treat with curing compound applied immediately after slabs are finished in accordance with manufacturer's directions.
Interior Flatwork:
Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
Avoid alternate wetting and drying and fluctuations of concrete temperature.

Curing compound prohibited at interior slabs-on-grade installed over vapor retarder.
Moist cure interior slabs-on-grade installed over vapor retarder only when weather conditions involve high temperatures, wind, or both. Moist cure for minimum 48 hours.
Cure concrete slabs scheduled to receive ceramic tile by keeping the surface continuously moist for minimum 48 hours. Do not use curing compounds.
Immediately prior to occupancy clean interior floors to remain exposed and treat with hardener.

CONSTRUCTION JOINTS IN FLATWORK
General:
Form to true, straight lines, with slabs flush at joints.
Locate under walls wherever possible.
Spacing:
At Interior Flatwork:
Spacing shown on Drawings.
At Exterior Flatwork:
Maximum spacing, unless otherwise shown on Drawings:
At Walks and Drives: 15 ft. apart, both ways.
At Curbs: 30 ft. apart.
Fill alternate joints and joints where flatwork abuts vertical construction with expansion joint filler.

CRACK CONTROL JOINTS IN FLATWORK
General:
Form to true, straight lines, with slabs flush at joints.
Spacing:
At Interior Flatwork:
Maximum slab area without joints: 300 sq. ft.
Maximum spacing, unless otherwise shown on Drawings:
At uncovered Flatwork: 15 ft. apart, both ways.
At covered Flatwork: 15 ft. apart, both ways.
At Exterior Flatwork:
Maximum spacing, unless otherwise shown on Drawings:
At Walks and Drives: 15 ft. apart, both ways.
At Curbs: 15 ft. apart.

VOIDS AND GRAVEL POCKETS
Repair as directed wherever, in Architect's opinion, it is necessary.

CONCRETE SLAB FINISHES
General:
Screed all slabs, for whatever finish, to true levels or slopes.
Bull-Floated Surface:
Provide, to ensure bond, wherever applied ceramic or quarry tile are indicated on Drawings or specified.
Non-Slip Finish:
Screed and tamp to bring fine particles to surface.
Float with wood or carpet float to true surfaces.
Slightly roughen surfaces with hair broom before tooling edges.
Mark off slabs as shown or directed; round edges to 1/4 inch radius.
Provide at exterior driveways and walks unless otherwise indicated.
Troweling:
At interior slabs-on-grade installed over vapor retarder: Provide single finish troweling.
Do not absorb wet spots with Neat cement or mixture of cement and sand.
Wait until surfaces are dry enough for proper troweling.
Chemical dryers not permitted.
Trowel floors level to true slopes.
Provide at all concrete slabs unless otherwise noted.
Slopes to Drains:
True to line, evenly graded, 1/8 inch per foot unless otherwise shown on Drawings.

NON-SHRINK GROUT
Follow manufacturer's directions. Do not retemper set grout.
Saturate concrete contact surfaces prior to grouting; remove excess water.
Thoroughly compact grout free of air pockets. Do not vibrate.
Do not remove leveling shims, if any, until 48 hours after grout placement.
After shim removal fill voids with standard grout.
After grout which is exposed to final view has reached initial set, rake out exposed edges approximately one inch and point with mortar as follows: 1 part Portland cement, 2 parts sand, and 1/2 part water by weight.
Cure with moisture for 24 hours minimum.

STANDARD GROUT
Saturate concrete contact surfaces prior to grouting. Remove excess water.
Thoroughly compact grout free of air pockets. Do not vibrate.
Cure with moisture for 24 hours minimum.
Do not retemper set grout.

FLOOR FILLER
Prime floor with asphalt emulsion prior to filler application.
Mix filler with asphalt emulsion as required to improve bond.

TOLERANCES
Troweled Surfaces: True within 1/8 inch per 10 ft.
Non-Slip Surfaces: True within 1/4 inch per 10 ft.
All Other Surfaces: True within 1/4 inch per 2 ft.

FIELD QUALITY CONTROL
Tests:
Average minimum test results for lab-cured concrete cylinders, compression:

Design Strength	Lab-Cured Value
3,000 psi	3,750 psi
3,500 psi	4,400 psi
4,000 psi	5,000 psi

If a test cylinder shows manifest evidence of damage, improper sampling, molding, or testing, it shall be discarded and the remaining cylinders strengths averaged.
During the progress of the work, if lab-cured values shown for each concrete design strength and quality as determined by compression test cylinders and tests fail to attain the requirements specified, suspend all concrete work until new mixes are designed and reviewed as outlined.
Concrete that has been placed and does not meet specified requirements will be reviewed by the Architect and Contractor.
Any field testing such as core drilling required to verify in-place concrete strengths shall be at the Contractor's expense.
Correct or remove defective work in a manner approved by the Architect with no additional cost to the Owner.
Inspection:
Notify Architect at least 24 hours before intended concrete placement.
Place no concrete until formwork and reinforcement have been inspected.

DEFECTIVE WORK
Remove and replace, when directed by Architect, loose topping, surfaces which show excessive cracks, any slabs which do not drain properly, and other defective concrete. On surfaces scheduled to receive floor or wall coverings remove, by grinding if necessary, defects of magnitude to show through covering.
Remove honeycombed and other defective concrete down to sound concrete. If chipping is necessary, shape edges perpendicular to surface or slightly undercut.
Feathered edges not permitted.

CLEANING AND REPAIRING
Remove debris from project site upon work completion or sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed, products which

have been soiled, discolored, or damaged by work of this section.

PROTECTION

Protect work specified herein against damage and discoloration.

Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Shop fabricated structural steel framing members including supports, bracing, struts, welds and fasteners.

PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION
Anchor bolts and loose bearing plates.

REFERENCES
ASTM A 36: Structural Steel.
ASTM A 53: Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
ASTM A 307: Low-Carbon Steel Externally and Internally Threaded Fasteners.
ASTM A 325: High Strength Bolts for Structural Steel Joints.
ASTM A 500: Cold-formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
AWS D1.1: Structural Welding Code.
Follow AISC Specifications and Code of Standard Practice, except as modified by these Specifications.
Code may be obtained from Institute.

SUBMITTALS
Provide in accordance with Section 01 33 00.
Shop Drawings:
Indicate shop and erection details, including cuts, copes, connections, holes, threaded fasteners, and welds.
Show critical dimensions, required clearances, construction details, installation methods including splices, attachments, and anchoring.
Indicate shop and field welds by ASW A2.0 welding symbols. Indicate net weld lengths.
Furnish anchor bolt templates, setting drawings and installation details.

QUALIFICATIONS
Structural Steel Fabricator:
Not less than 5 years experience in work of this type.
Structural Steel Erector:
Not less than 5 years experience in work of this type.
Welders:
Qualified for welds to be performed in accordance with AWS Article 5 within previous year.

DELIVERY, STORAGE, AND HANDLING
Deliver to jobsite in accordance with approved schedule and in proper erection sequence.
Include all required bolts, and other fastening devices.
Store structural steel members above ground on platforms, skids, or other approved supports.
Store other materials in weather-tight and dry locations.
Store packaged materials in original unbroken containers.
Protect against corrosion and damage.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

STEEL SHAPES, BARS, AND PLATES
Conform to ASTM A 36.

STRUCTURAL STEEL PIPE
Conform to ASTM A 53, Type S where exposed to view and Type E elsewhere, Grade A.

STRUCTURAL STEEL TUBING

ASTM A 500, Grade B, fy: 46 ksi.

THREADED FASTENERS

Standard Strength Fasteners:

Bolts and Nuts: Conform to ASTM A 307, Grade A.

High Strength Fasteners:

Nuts and Bolts: Conform to ASTM A 325, Type 1.

ANCHOR BOLTS

Conform to ASTM A 307, Grade A.

CONCRETE EXPANSION ANCHORS

See Drawings

FABRICATION

General:

Fabricate connections not specifically detailed on Drawings consistent with balance of design and strong enough to develop fully members involved.

Stress relieve welded assemblies by heat treatment.

Form to accurate sizes and shapes, with sharp lines and angles, and in accordance with AISC Minimum Fabrication Standards.

Punch and shear to leave clean surfaces.

Weld permanent connections; grind exposed welds smooth. Ease exposed edges to small uniform radius.

Provide holes and connections for work of other trades.

Cut abutting structural members to fit with full bearing contact.

Miter and cope member intersections within 2°, fit to within 0.02 inches, and weld all around.

Where exposed to weather, form to exclude water; allow for expansion and contraction.

Do not use screws or bolts when they can be avoided; when used, countersink heads, draw up tight, and nick threads to prevent loosening.

Columns:

Fabricate columns of single piece, full length. Shop fabricate with base plates, column caps, and other members.

Bearing and Base Plates:

Provide bearing plates under footings, piers, walls, and where indicated on Drawings.

Plates attached or shipped loose at Contractor option.

FINISHING

Before treating metal fabrications, remove grease, oil, dirt, loose rust, loose mill scale, and any other bond-reducing materials.

Do not prime galvanized steel, surfaces encased in concrete, surfaces to be welded, and contact surfaces to be connected with high strength friction type bolts.

Prime paint other surfaces with fabricator's standard rust inhibiting paint, medium dry film thickness: 1.0 mils.

Galvanizing:

Hot-dip process conforming to ASTM A123.

Provide galvanized finish at masonry lintels, pipe bollards, exterior ladders, tie-off stanchions, service enclosure gates and parapet screen posts & horizontal framing.

TOLERANCES

Maximum deviation of individual members from dimensions shown on Drawings as follows:

- Overall length of members with both ends finished for compact bearing: 1/32 inch.
- Overall length of members without finished ends:
  - For members up to 30 ft. long: 1/16 inch.
  - For members over 30 ft. long: 1/8 inch.
- Compressive member straightness: 1/1000 of axial length between lateral support points.

Twist, bends, kinks: Unacceptable.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive structural steel are accurately sized and located, sound, true, even, and otherwise properly prepared.
Prior to starting work notify General Contractor about defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
Verify field measurements prior to fabrication.
If field measurements differ slightly from Drawing dimensions modify work as required for accurate fit. If measurements differ substantially notify Architect prior to fabrication.
Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for their installation. Coordinate delivery of such items to project site.

BEARING AND BASE PLATE INSTALLATION
Set plates attached to members.
Align and level with leveling nuts.

STRUCTURAL STEEL ERECTION
Follow AISC Specifications specified above, except as modified herein.
Make provisions for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.
Clean contacting bearing surfaces prior to assembling.
Accurately assemble to lines and elevations indicated.
Bring abutting surfaces of compression members into contact prior to fastening splices.
Prior to fastening align and adjust frame components within specified erection tolerances.
Splices permitted only where indicated.
Erection bolts used in welded construction may be tightened and left in place, or removed and holes plug-welded at Contractor's option.
Field cutting or alteration of structural members permitted only with Architect's approval.

STRUCTURAL STEEL ERECTION TOLERANCES
Maximum deviation of individual members from plumb, level, or true alignment: 1/8 inch per story.
Column centerline displacement of exterior columns not more than 1 inch inward nor 2 inches away from building line at any point.

FIELD INSPECTION
Do not remove staging or platforms before field connections are inspected or tested.
Do no welding until surface to be welded and filler metal to be used have been inspected and approved.
Refer to Section 01 45 00 for inspection and testing details.

TOUCH-UP PAINTING
Touch up field connections and damaged shop treatment areas as erection proceeds.
Immediately prior to final covering remove rust and retreat any structural steel members showing evidence of rust through shop treatment over approximately 25% or more of total shop treatment areas.

CLEANING AND REPAIRING
Remove loose rust, heavy mill scale, oil, dirt, and other bond-reducing foreign substances from members scheduled to receive finish painting.
Including work of other Sections, clean, repair and touch-up, or replace when directed products which have been soiled, discolored, or damaged by work of this section.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 -GENERAL

SECTION INCLUDES
Treatment of wood products to increase their durability against decay or retard burning characteristics.

PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION
Deliver to General Contractor sufficient preservative solution for field-cut treatments.

REFERENCES
Pressure Treatments specified hereunder refer to quality mark designations of American Wood Protection Association, P.O. Box 361784, Birmingham, Alabama 35236-1784, and hereinafter referred to as AWPB. Specifications may be obtained from Association.

SUBMITTALS
Certification:
Indicate moisture content of treated wood, chemical used, and retention obtained.

DELIVERY, STORAGE, AND HANDLING
Protect against damage, moisture, and discoloration.

EXTRA MATERIAL
Deliver to General Contractor sufficient brush treatment material for field-cut treatments.

COORDINATION
Protect other work against damage or discoloration caused by work of this section.

PART 2 - PRODUCTS

PRESERVATIVE TREATMENT
Provide AWPA, Standard P5, Use Standard UC4A, Copper Azole – (CA-C) treatment using CA-C dissolved in a solution of ethanolamine in water for wood preservative in the following locations:
In contact with masonry, concrete, roofing, and elsewhere shown on drawings.
Minimum Retention:
Above Ground: 0.10 pcf CA-C.
Ground or Fresh Water Contact: 0.21 pcf CA-C.
Preservative-treated lumber with chromated copper arsenate (CCA) treatments is not permitted.

BRUSH TREATMENT MATERIAL
Material: Recommended by preservative treatment manufacturer for application to field cut treated lumber.
Treat any field cuts to pressure-treated wood.

FIRE RETARDANT TREATMENT
Treatment Chemical: Free of halogens, sulfates, and ammonium phosphate; Lonza “Dricon FR” or accepted substitute.
Manufacturing Standard: AWPA C-20 for lumber and C-27 for plywood.
Surface Burning Characteristics: Maximum smoke developed 450; flame spread 25 when tested per ASTM E-84, NFPA 255 or UL 723.
Wood Moisture Content: Kiln dry after treatment to maximum moisture content of 19% for lumber and 15% for plywood.

PART 3 - EXECUTION

EXAMINATION
Verify that material to receive treatment does not exceed moisture content specified for similar untreated wood.
Prior to starting work notify General Contractor of conditions requiring correction.
Do not start work until conditions are satisfactory.

APPLICATION - PRESERVATIVE TREATED WOOD

General:

Follow referenced specifications.

Incise members prior to treatment.

Field Cuts and Brush Treatment:

Apply 2 liberal coats of brush treatment material to field cut surfaces.

INSTALLATION – FIRE RETARDANT TREATED WOOD

Do not rip or mill fire retardant treated wood. Only end cuts, drilling holes and joining cuts are permitted unless the material carries a UL approved milling treatment classification.

Install fire retardant treated wood with hot-dipped galvanized fasteners and hardware.

Provide at all structural wood, blocking, backing, bracing, other wood located in concealed spaces and elsewhere shown on Drawings.

PROTECTION

Protect other work against damage or discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Construction of wood framework using lumber, plywood, and other sheathing materials. Miscellaneous blocking and curbing, concealed wood framing and furring. Includes rough hardware to join members and anchor framework.

QUALITY ASSURANCE
Framing Lumber:
Grade mark and trademark of association listed below and having jurisdiction must appear on each piece of material.
On members scheduled to receive transparent finish do not place grade mark stamp where exposed to view. In lieu thereof stamp where concealed, or submit Certificate of Inspection.
WWPA: Western Wood Products Assn., 522 SW Fifth Avenue, Portland, OR 97204-2122.
APA: American Plywood Assn., 1119 A Street; Tacoma, WA 98401.

DELIVERY, STORAGE, AND HANDLING
Protect against moisture, damage, and discoloration.
Do not store wood materials in wet or damp areas, or in contact with ground.
Avoid overloading floor and roof framing with stored materials.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

FRAMING LUMBER
Material:
Douglas fir, surfaced 4 sides to standard nominal dimensions except where rough sawn stock or special shapes are indicated.
Grade:
Comply with current WWPA Standard Grading Rules as follows:
Framing Lumber: Standard and better.
Furring, Bracing and Blocking: Utility grade.
Maximum moisture content when delivered to project:
All wood materials: 19%.

PLYWOOD
US Product Standard 1-07, exterior type where exposed to moisture.
Each piece shall bear APA Grade mark.
Unless otherwise specified use Group 1 Douglas Fir; Grade "A" for exposed surfaces, "C" or better elsewhere.

FASTENERS
Bolts: Fed. Spec. FF-B-575.
Nuts: Fed. Spec. FF-N-836.
Expansion Shields: Fed. Spec. FF-S-325.
Lag Screws and Lag Bolts: Fed. Spec. FF-B-561.
Wood Screws: Fed. Spec. FF-S-111.
Nails and Staples: Fed. Spec FF-N-105B.
Provide washers under bolt heads, lag heads, and nuts.
Provide all necessary for installation of work specified herein.
Hot-dip galvanize steel fasteners exposed to moisture.

WOOD BLOCKING
Provide 2 inch nominal framing lumber behind cabinets, doors, windows, finish hardware including door stops, toilet room accessories, mirrors, miscellaneous specialties, building equipment, drapery track, and mechanical and electrical work. Verify exact location.

ADHESIVE
Glue conforming with APA Spec. AFG-01.
Approved manufacturers: Evans, Franklin, Georgia-Pacific, Glidden-Durkee, 3M, Weldwood, Willhold, Weyerhaeuser.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive work specified herein are rigid, secure, accurately sized and located, and otherwise properly prepared.
Prior to starting work notify General Contractor of surfaces requiring correction.
Do not start work until conditions are satisfactory.

VERIFICATION OF CONDITIONS
Where necessary verify field measurements prior to fabrication.
If field measurements differ slightly from drawing dimensions, modify work as required for accurate fit. If measurements differ substantially, notify Architect prior to fabrication.

INSTALLATION - GENERAL
Install proprietary products in accordance with manufacturer's directions.
Use additional fasteners to those specified herein where necessary to insure rigidity and permanence.
Provide washers under nuts and heads when making bolted or lag screwed connections.
Provide for installation and support of plumbing, heating, ventilating, and electrical work.
Accurately, located, cut, fit, and install work secure rigid, to true lines, plumb, and level, unless otherwise indicated.

CLEANING AND REPAIRING
Including work of other sections, clean, repair and touch-up or replace when directed, products which have been soiled, discolored, or damaged by work of this section.
Leave surfaces ready for finishing specified in other sections.
Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Protect other work against damage or discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Shop fabricated institutional casework including base, full-height, and wall-mounted cabinets, countertops, wardrobes, and other similar units.

SYSTEM DESCRIPTION
Casework modules of reveal overlay design with continuous countertops.
Exposed cabinet exterior finished with high-pressure plastic laminate.
Exposed cabinet interior overlaid with low-pressure plastic laminate.
Edges of case bodies, doors, drawers, and shelves finished with color coordinated protective edge.
Hardware of institutional type and quality.

SUBMITTALS
Submit in accordance with Section 01 33 00.
Product Data:
Include manufacturer's descriptive literature for specialty items.
Identify each item as to location, material grade, workmanship grade, construction, finishes, and hardware.
Provide manufacturer’s product data for composite wood and agrifiber products (including but not limited to particleboard, wheatboard, strawboard, agriboard products, engineered wood components, solid-core wood doors, OSB, MDF, and plywood products) verifying that these products contain no urea-formaldehyde resins.
Provide product data for field-applied paints and coatings which have a potential impact on indoor air, including manufacturer’s MSDS sheets or other Product Data listing VOC content.
Provide product data for adhesives and sealants which have a potential impact on indoor air, including manufacturer’s MSDS sheets or other Product Data listing VOC content. Provide manufacturers’ documentation verifying all adhesives used to apply laminates, whether shop-applied or field-applied, contain no urea-formaldehyde.
Shop Drawings:
Show profiles, joint details, and other pertinent items.
Show connections to adjacent work, and complete assembly, whether or not manufacturer furnishes materials.

EMISSIONS STANDARDS
Conform to the following minimum standards for adhesive emissions:

Adhesive Type	VOC Limits	Standard
Adhesive Primer for Plastic:	550 g/L	SCAQMD Rule #1168
Contact Adhesive:	80 g/L	SCAQMD Rule #1168
Special Purpose Contact Adhesive:	250 g/L	SCAQMD Rule #1168
Wood Adhesive:	140 g/L	SCAQMD Rule #1168
Top & Trim Adhesive:	250 g/L	SCAQMD Rule #1168

Aerosol Adhesives: Green Seal Standard for Commercial Adhesive GS-36 requirements.
Submit manufacturer’s product data listing volatile organic compound (VOC) content of products specified herein.
Provide manufacturer’s documentation verifying that adhesives and sealants contain no urea-formaldehyde.

QUALITY STANDARDS
Except as herein modified, material and workmanship grades shall be determined by Quality Standards of Architectural Woodwork Institute, current edition, published by Architectural Woodwork Institute, 5055 S. Chesterfield Road; Arlington, VA 22206. Institute hereinafter referred to as "AWI".
Qualifications - General:
Work of this Section shall be provide by a shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
Fabricator/installer qualifications:
Fabricator/installer shall have a minimum of ten (10) years experience in architectural casework

manufacturing and have successfully performed a minimum of five (5) projects of similar size.

DELIVERY, STORAGE, AND HANDLING
Do not deliver products to job site until notified by General Contractor that project is conditioned and prepared to handle and store products without damage or discoloration.
Protect against damage and discoloration.

PROJECT CONDITIONS
Illumination:
Perform no work with less than 30 ft. candles of light measured 3 ft. above floor.
Temperature:
Maintain 50ºF minimum in interior spaces where casework and shelving are located and installed.

COORDINATION
Coordinate with other trades regarding work of this section.

PART 2 - PRODUCTS

LUMBER
Concealed: Poplar or Alder, vertical grain.
Exposed (if any): Douglas fir, hemlock or poplar, AWI Custom grade, vertical grain.

PLYWOOD
Type:
Douglas fir, US Product Standard PS 1-07, exterior type where exposed to moisture or around sinks.
Roseburg Forest Products ¾ inch thermally fused melamine sides, bottoms, shelving, interior doors and stretchers.
Melamine Color: White.
Face:
Rotary cut veneer, AWI Custom Grade.

PLASTIC LAMINATE (HPDL)
Manufacturing Standard: Conform to NEMA Standard LD-3.
Exposed Surfaces: NEMA GP28, 0.030 inch thickness, unless noted otherwise.
Post-Forming Grade: 0.042 inch material thickness for coved countertops and other forming.
Manufacturer, Color and Pattern: As noted on finish legend on sheet A-701.
Locations as noted on interior elevations.
Primer, Sealer and Adhesive: Water-resistant type made or recommended by plastic laminate manufacturer.

PVC EDGE BANDING
Impact resistant, machine applied with hot melt adhesive.
Standard 3mm thick at doors and drawer fronts and vertical case ends, 0.030 inch thick at bottoms, shelves, and sub-tops.
Color: To match plastic laminate, architect to approve prior to ordering.

HARDWARE
Hinges: Salice 200 Series.
Magnetic Catches: EPCO 1000LS, or accepted substitute.
Adjustable Shelf Hardware: Nickel plated steel brackets, 5mm diameter.
Door and Drawer Pulls: Wire type, 4 inches wide, brushed nickel finish.
Drawer Slides: Roller type, full extension, epoxy coated; Knape & Vogt 8400; Blum 430E series.
Casework Locks: CompX DualAxess combination locks with key override. One master key for entire space.
Door and Drawer Bumpers: Hemisphere 0.335 inch diameter by 0.085 inch height, clear finish.
All Other Hardware: Manufacturer's standard.

FABRICATION

General:

Conform to AWI 400B standards for laminate clad cabinets, Premium Grade.
Construction: Overlay reveal, unless indicated otherwise.
Surfaces: Laminated plastic.
All shelves adjustable unless otherwise shown.
Verify dimension of sinks and other items to be built into cases and counters.
Assemble at factory where feasible.
Use concealed fastenings wherever possible.
Use screws and bolts in addition to adhesive where required for strength and rigidity.
Install finish hardware specified herein at factory.

Materials, unless specifically noted otherwise:

Bases: Exterior grade 3/4 inch plywood with thermally fused melamine.
Countertops: 3/4 inch plywood with 0.050 plastic laminate, backed with 0.020 balancing sheet.
Exposed materials: HPDL clad plywood.
Semi-exposed materials: LPDL clad plywood.
Concealed materials: Softwood.
Casework Bottoms, Ends, and Vertical Standards: 3/4 inch thick plywood with thermally fused melamine.
Back and Side Splash: 3/4 inch plywood with 0.050 plastic laminate.
Fixed Shelving at Breakroom 1142: 3/4 inch plywood with 0.050 plastic laminate. Overall thickness per drawings.
Fixed Shelving elsewhere: 3/4 inch plywood with 0.050 plastic laminate. Overall thickness per drawings.
Adjustable Shelving: 3/4 inch plywood with thermally fused melamine.
Adjustable Shelf Hardware: Provide bracket holes at 32 mm centers to within 6 inches of top and bottom of space where adjustable shelves are shown.
At Sink Cabinets: Hold shelves 3/4 inch back from rear face of door to provide space for ventilation.
Swinging Doors: 3/4 inch thick plywood with 0.050 plastic laminate.

Casework Backs:

- Concealed Base Cabinets: 1/4 inch prefinished hardboard.
- Exposed Backs: 3/4 inch plywood with 0.050 plastic laminate.
- Semi-exposed Backs: 3/4 inch plywood with thermally fused melamine.
- Upper Wall Cabinets: 3/4 inch plywood with thermally fused melamine.

Drawers:

- Exposed Fronts: 3/4 inch prefinished plywood with 0.050 plastic laminate.
- Semi-exposed Fronts: 3/4 inch prefinished plywood with thermally fused melamine.
- Sides: 1/2 inch thick plywood with thermally fused melamine.
- Backs: 1/2 inch thick plywood with thermally fused melamine.
- Bottoms: 1/2 inch plywood with thermally fused melamine.

Drawer Stops: Integral side type. Do not use drawer front as stop.
Edge Banding: Provide at exposed plywood and particle board edges in accordance with AWI Standards and as specified herein.

PART 3 - EXECUTION

EXAMINATION

Verify that surfaces to receive casework and shelving are straight, plumb, true, solid, rigid, and otherwise properly prepared.
Prior to starting work, notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

FIELD MEASUREMENTS

Verify prior to fabricating casework and shelving.
If field measurements differ slightly from drawing dimensions modify Work as required for accurate fit. If measurements differ substantially, notify Architect prior to fabricating work.

INSTALLATION

Casework to be installed factory-trained personnel.

Bases secured to floor and cases secured to each other and tight to adjacent walls.
Countertops fastened to cases and secure tight to walls.
Provide continuous bases under in-line base casework, unless otherwise indicated.
Secure casework in place plumb, square, true, level, and without distortion; level where necessary with concealed shims. Provide sealant at intersection of differing materials.

PLASTIC LAMINATE COUNTERTOPS
No "L" shaped pieces at countertop corners or longitudinal seams permitted; cross seams 12 ft. apart minimum and at least 24 inches away from any counter sinks.
Provide cut-outs for sinks and other openings; verify size and location

ADJUSTMENTS
Adjust moving parts to operate satisfactorily at time of final project acceptance and during warranty period.

CLEANING AND REPAIRING
Including Work of other Sections, clean, repair, and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this Section.
Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Protect other surfaces against damage or discoloration caused by Work of this Section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Non-structural plastic fabrications formed to various profiles for a variety of purposes.

SUBMITTALS
Provide in accordance with Section 01 33 00.
Product data:
Submit manufacturer's specifications and installation instructions for each type of product indicated.
Shop drawings:
Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
Show full-size details, edge details, thermoforming requirements, attachments, etc.
Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in solid surface.
Samples:
For each type of product indicated submit minimum 6-inch by 6-inch sample in specified gloss.
Cut sample and seam together for representation of inconspicuous seam.
Indicate full range of color and pattern variation.
Approved samples will be retained as a standard for work.
Product certificates:
For each type of product, signed by product manufacturer.
Fabricator/installer qualifications: Provide copy of certification number.
Manufacturer certificates: Signed by manufacturers certifying that they comply with requirements.
Maintenance data:
Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
Maintenance kit for finishes shall be submitted.
Include in project closeout documents.

QUALITY ASSURANCE
Qualifications - General:
Work of this Section shall be provide by a shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
Fabricator/installer qualifications:
Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.
Applicable standards:
Standards of the following, as referenced herein:
American National Standards Institute (ANSI)
American Society for Testing and Materials (ASTM)
National Electrical Manufacturers Association (NEMA)
NSF International
Fire test response characteristics:
Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
Flame Spread Index: 25 or less.
Smoke Developed Index: 450 or less.
Mock-up:
Prior to fabrication of architectural millwork, erect sample unit to further verify selections made under sample submittals and to demonstrate the quality of materials and execution.
Build the mock-up to comply with the contract documents and install in a location as directed by the Architect.
Mockup locations:

1. Casework, including integral backsplash/side splash and sink at Clean-up 1138.
2. Casework at location of sink and flipper slider cabinet in Breakroom 1143.

Notify the Architect one week in advance of the date of when the mock-up will be delivered.

Should mock-up not be approved, re-fabricate and reinstall until approval is secured.
Remove rejected units from project site.
After approval, the mock-up may become a part of the project.
Approved mock-up shall serve as a standard for judging quality of all completed units of work.

DELIVERY, STORAGE, AND HANDLING
Protect against damage and discoloration.

ENVIRONMENTAL REQUIREMENTS
Illumination:
Perform no work with less than 30 ft. candles of light measured 3 ft. above floor.
Temperature:
Maintain 65ºF minimum in interior spaces where solid surfacing fabrications materials are located and installed.
Humidity:
35% minimum, 80% maximum.

WARRANTY
Provide manufacturer's standard warranty against defects in materials.
Warranty shall provide material and labor to repair or replace defective materials.
Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

COORDINATION
Coordinate with other trades regarding work of this section.

PART 2 - PRODUCTS

SOLID SURFACING - QUARTZ (SS-1)
Type: Engineered composite stone slab, composed of quartz minerals and rock bound with resin, pigments and fillers.
Thickness: 3/4 inch unless otherwise shown on Drawings.
Edge Profile: Eased edge.
Finish: Matte.
Manufacturer: Corian
Color and Pattern: Ironstone.

SOLID SURFACING - QUARTZ (SS-2)
Type: Engineered composite stone slab, composed of quartz minerals and rock bound with resin, pigments and fillers.
Thickness: 3/4 inch unless otherwise shown on Drawings.
Edge profile: Eased edge.
Finish: Leathered
Manufacturer: Corian
Color and Pattern: Venetia Cream

SOLID SURFACING - POLYMER (SS-3)
Type: Solid polymer components, cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.
Thickness: 1/2 inch.
Edge Treatment: Eased edge.
Finish: Uniform, matte.
Manufacturer: Corian surfaces from the DuPont company (basis of design).
Color: 9225SS Saharan Night.
Backsplash and Sidesplash: Coved
Integral sink A:
Model number: Baby Bath Bowel AV2213
Color: Calm White

Mounting: Undermount.
Options: Provide overflow drain.
Location: Mother's 1139.

ACCESSORIES
Sink/lavatory mounting hardware: Manufacturer's standard bowl clips, panel inserts and fasteners for attachment of undermount sinks/lavatories.
Joint Adhesive: Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.
Sealant: Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.

FABRICATION
Solid Surfacing - Quartz:
Shop fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with manufacturer's printed instructions and technical bulletins.
Form joints between components using manufacturer's standard joint adhesive with inconspicuous lines.
Provide factory cutouts for plumbing fittings and bath accessories.
Rout and finish component edges with clean, sharp returns.
Rout cutouts, radii and contours to template, smooth edges.
Repair or reject defective and inaccurate work.
Solid Surfacing - Polymer:
Shop fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with manufacturer's printed instructions and technical bulletins and approved shop drawings.
Fabricate backsplashes from solid surfacing material with radius cove where counter and backsplashes meet as indicated on Drawings. Refer to manufacturer's installation instructions for integral splashes.
Form joints between components using manufacturer's standard joint adhesive with inconspicuous lines.
Reinforce with strip of solid polymer material, 2" wide.
Provide factory cutouts for plumbing fittings and bath accessories.
Thermoform corners and edges or other objects to shapes and sizes indicated, prior to seaming and joining. Cut components larger than finished dimensions and sand edges to remove nicks and scratches.
Heat entire component uniformly prior to forming.
Ensure no blistering, whitening and cracking of components during forming.
Rout and finish component edges with clean, sharp returns.
Rout cutouts, radii and contours to template, smooth edges.
Repair or reject defective and inaccurate work.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive solid surfacing are dry, clean, smooth, sound, well-fastened, free from conditions that would damage surfacing or impair adhesive-bond, and otherwise properly prepared.
Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.
Prior to starting work notify general contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

INSTALLATION
General:
Install in accordance with manufacturer's instructions and approved Shop Drawings.
Install plumb, level and rigid, scribed to adjacent finishes.
Solid Surfacing - Quartz:
Install with largest size pieces available.
Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work, exposed joints/seams not permitted.
Reinforce field joints as recommended by manufacturer.
Cut and finish component edges with clean, sharp returns.
Rout radii and contours to template.
Anchor securely to base cabinets or other supports.

Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
Carefully dress joints smooth, remove surface scratches and clean entire surface. Install countertops with no more than 1/8-inch sag, bow or other variation from a straight line.
Keep components and hands clean during installation. Remove adhesives, sealants and other stains.
Adhere undermount mount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.
Coordinate connections of plumbing fixtures with other trades.
Applied Backsplashes and Sidesplashes:
Adhere applied backsplashes and sidesplashes as recommended by manufacturer.
Seal joints using manufacturer’s standard color-matched silicone sealant.
Solid Surfacing - Polymer:
Install with largest size pieces available.
Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.
Fabricate field joints using manufacturer's recommended adhesive, with inconspicuous joints in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints.
Reinforce field joints as specified herein.
Cut and finish component edges with clean, sharp returns.
Route radii and contours to template.
Anchor securely to base component or other supports.
Align adjacent components and form seams to comply with manufacturer’s written recommendations using adhesive in color to match work.
Carefully dress joints smooth, remove surface scratches and clean entire surface.
Install countertops with no more than 1/8" sag, bow or other variation from a straight line.
Adhere undermount mount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.
Seal between wall and components with joint sealant as specified herein and in Section 07 92 00, as applicable.
Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on reviewed Shop Drawings. Adhere to countertops using manufacturer’s standard color-coordinated joint adhesive.
Keep components and hands clean during installation. Remove adhesives, sealants and other stains.
Coordinate connections of plumbing fixtures with other trades.

CLEANING AND REPAIRING
Promptly remove any excess adhesive or sealant.
Remove any stains or markings from surfaces.
Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer’s “Technical Bulletins”.
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.
Remove debris from project site upon work completion, or sooner, if directed.

PROTECTION
Protect other materials against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Thermal insulation organic or inorganic applied to walls, roofs, perimeter of foundations, and other heated spaces.

DELIVERY, STORAGE, AND HANDLING
Deliver to project site in manufacturer's original unopened packages.
Label package wrappers with brand name, insulation type, and thermal rating.
Store materials off ground.
Protect against moisture and damage.
Do not use damaged or damp insulation.

ENVIRONMENTAL REQUIREMENTS
Do not install insulation when surfaces to receive insulation are wet.

SUSTAINABILITY REQUIREMENTS
Product Data:
Provide manufacturer’s product data verifying that fiberglass batt insulation contains no urea-formaldehyde.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

FLEXIBLE BATTS
Manufacturer:
Knauf “EcoBatt”, Certainteed Sustainable Insulation, Owens Corning “EcoTouch”, or accepted substitute.
Material:
Glass wool blankets, full-length, single-piece where practicable, conforming to ASTM C 665, Type I, Class A for unfaced batts.
Facings:
None, separate vapor retarder film as specified in Section 07 25 00.
Extent of Work:
Provide blanket insulation as follows: At exterior of all heated spaces in thickness and locations as shown on Drawings.

WIRE
Noncorrosive steel, 18 ga. minimum.

ADHESIVE
Manufactured or recommended by insulation manufacturer.

MECHANICAL FASTENERS
Type recommended by insulation manufacturer.
Long enough to penetrate substrate 1/2 inch, minimum.

PART 3 - EXECUTION

EXAMINATION
Verify that work of preceding trades is completed.
Verify that surfaces and spaces to receive insulation are accurately sized, located, dry, protected against inclement weather, clean, and otherwise properly prepared.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
Remove, or protect against projections which may damage insulation or prevent proper installation.

Remove bond-reducing coatings, and roughen surfaces, to receive insulation by adhesion as necessary for bond.
Prime surfaces to receive insulation by adhesion.

INSULATION INSTALLATION - GENERAL
Follow manufacturer's directions.
Fit insulation snugly between framing without forcing.
Permit no gaps for air passage.
Carefully cut and fit insulation around pipes, conduits, and other obstructions.
Where pipes, conduit, and other obstructions are located in space to receive insulation, place insulation between cold-in-winter surface and obstruction, compressing insulation where necessary.
Unless indicated otherwise, do not compress insulation more than 10%.

INSTALLATION - FLEXIBLE BATTS
Use full-length, single-piece batts where practicable.
Provide additional wire support as necessary to prevent insulation displacement or sagging.

INSPECTION
Notify Architect at least 24 hours prior to completing insulation work for inspection.

CLEANING AND REPAIRING
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.
Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Maintain the following minimum clearances between insulation and recessing lighting fixtures, metal chimneys, metal gas vents and similar high temperature equipment unless equipment is U.L. labeled for zero-clearance:
Side: 3 inches.
Top: 24 inches.
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Elastic sheet vapor retarders for all exterior thermal insulation and air barrier installed as part of the exterior envelope construction.

SUBMITTALS
Submit in accordance with Section 01 33 00.
Product Data:
Manufacturer's data and details to include installation instructions.
Samples:
Two 8 1/2" x 11" samples of vapor retarder material.

QUALITY ASSURANCE
Subcontract the vapor retarder work of this section to the installer of associated work so there will be undivided responsibility for the related items of work.
Pre-Installation Conference
Convene at least one week before starting work of this section to verify project requirements, coordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturer's installation instructions and warranty requirements. Meeting shall include review of integrated exterior mock-up to confirm installation procedures as required to provide a warrantable assembly. Establish requirements for other trades for patching and repairing any penetrations or damage to water-resistive barrier caused by those trades and material required for use for such repairs.
Representatives of the following shall attend:

- Owner's Project Representative
- Architect
- General Contractor
- Weather Barrier Installer
- Weather Barrier Manufacturer's Representative
- Representatives of other trades requiring coordination with weather barrier installation.

MOCK-UP
Provide water-resistive barriers with related materials as required to complete integrated exterior mock-ups as specified in Section 01 40 00 - Quality Requirements and other Sections. Build mock-up in size and location as directed by Architect.

1. Demonstrate complete installation of water-resistive barrier and treatment of internal and external corners, openings and sill flashings.
2. Establish requirements for patching and repairing any penetration or damage to water resistive barrier caused by Work of other Sections and material required for use for such repairs.
3. Obtain water-resistive barrier manufacturer's acceptance of barrier installation, including flashing installation.

PROJECT CONDITIONS
Proceed with vapor retarder work only after substrate work has been completed.
The contractor shall examine the substrate and the conditions under which the vapor retarder work is to be performed. Do not proceed with the work until satisfactory conditions have been corrected.
Environmental Requirements:
Proceed with vapor retarder work only when weather conditions will permit the materials to be applied in accordance with manufacturer's recommendations.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

VAPOR RETARDERS
Sheet Barrier Below Grade:
Polyolefin geomembrane sheet, 15 mils thickness, maximum permeance = 0.01 perms as tested in accordance with ASTM E1745 Section 7.1 (7.1.1-7.1.5); Stego Industries "Stego Wrap", Fortifiber

"Moistop Ultra 15", Raven Industries "Vapor Block 15", or accepted substitute.
Sheet Barrier Above Grade:
Translucent polyethylene film, 6 mil thickness, maximum permeance = 1.0.
Provide at all interior warm side wall locations.
Sheet Barrier Exposed in Attic Spaces:
Fire resistant type, foil-skrim-kraft facing composition, maximum flame spread rating 25, 0.02 perm rating.

FLEXIBLE FLASHING MEMBRANE
Membrane:
Self-adhering, rubberized SBS asphalt compound integrally laminated to cross-laminated polyethylene film, 40 mils thickness, 0.05 perms maximum vapor permeance; Henry Company "Blueskin SA", or accepted substitute.
Provide at window sills and other opening sills as detailed on Drawings.
Primer:
Quick-drying rubber based adhesive primer; Henry Company "Blueskin Adhesive", or accepted substitute.
Provide over substrate where Flexible air/vapor barrier membrane is applied.

WEATHER-RESISTIVE BARRIER (WRB)
Material: Self-adhered, vapor-permeable, water-resistive, air infiltration and moisture barrier with split-back poly-release film.
Fire Characteristics: Flame Spread Class A, tested in accordance with ASTM E 84.
Manufacturer and Model: Blueskin VP160 or accepted substitute.
Flexible Flashing: Adhesive-backed flexible membrane; Henry "Blueskin SA" specified above. Provide at door, window and other openings as detailed on Drawings.
Sealant: Moisture cured, medium modulus polymer modified sealing compound compatible with WRB and substrate; Henry "HE925 BES", or accepted substitute.
Adhesive: As recommended by WRB manufacturer.
Seam Tape: Adhesive-backed tape recommended by WRB manufacturer.
Through-Wall Flashing: Henry Blueskin TWF or accepted substitute.

ADHESIVE PRIMER
Low VOC, quick setting rubber based adhesive primer for primary self-adhering water resistive barrier membrane and SBS modified bitumen membranes at all temperatures; Henry Company "Blueskin® LVC Adhesive" or accepted substitute.

ACCESSORIES
Vapor Retarder Tape:
Sheet Barrier Below Grade: Polyethylene Tape as recommended by vapor retarder manufacturer.
Sheet Barrier Above Grade: Adhesive-backed polyethylene by Monsanto Plastics & Resins Co. or adhesive-backed polypropylene sheathing tape No. 8086 by 3M Contractor Products, or accepted substitute.
Sheet Barrier Exposed in Attic Spaces: Adhesive-backed, mylar-faced aluminum foil, 1-1/2 inches wide, 0.00 perm rating; Alumiseal Zero Perm.
Sealant:
Vapor Barrier Sealant: Elastic, polyurethane base, flexible sealant used to seal vapor retarder materials together or to other substrates as recommended by vapor retarder manufacturer.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive work specified herein are rigid, secure, accurately sized and located, and otherwise properly prepared.
Prior to starting work notify General Contractor of surfaces requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
Clean substrate of projections and substances detrimental to the work; comply with recommendations of the vapor retarder manufacturer.
Remove ice, snow, grease, dust or other foreign material that may prevent bonding to substrate.

Install cant strips, flashings and similar accessory items as shown, and as recommended by vapor retarder manufacturer. Prime substrate where recommended by the manufacturer.

INSTALLATION - VAPOR RETARDERS

Exterior Walls:

Locate over exterior wall insulation continuously from floor to underside of roof/attic insulation on the warm-in-winter side of wall.

Sequence of insulation and vapor retarder installation: Protect insulation at all times against migration of moisture vapor.

Immediately protect insulation with vapor retarder after insulation installation.

Apply sheets full height in one piece. Lap edges minimum 6"; seal with specified sealant or vapor retarder tape. Make all laps over framing members.

To avoid water vapor migration prior to installation of finish wall material, seal all edges and joints with specified sealant.

Carefully cut retarder around framing members, conduits, and other penetrations; seal edges by lapping a separate piece of vapor retarder material.

Concrete Floor Slabs:

Install underslab vapor retarder over smooth surface substrate, and without puncture under the entire area of floor slab or any accessory concrete on grade construction in accordance with manufacturer's instructions and ASTM E 1643.

Install with the longest dimension parallel with the direction of the concrete pour.

Lap edges minimum 6 inches and seal with vapor retarder tape.

Tape all seams with vapor retarder tape.

Seal all penetrations, including pipes and conduit per manufacturer's instructions. Install vapor retarder boots around all penetrations and seal with vapor retarder tape.

Do not penetrate vapor retarder with screed pins, stakes or other items. No penetration of the vapor retarder is allowed except for reinforcing steel and permanent utilities.

Sand or other granular fill prohibited above vapor retarder.

Coordinate sequence of installation, treatment of penetrations, and sealing of edges identical with that of exterior walls above.

Repair damaged areas, if any, by cutting patches of vapor retarder, overlapping damaged area 6 inches and taping all four sides with vapor retarder tape.

Penetrations:

Carefully seal all penetrations of vapor retarder by lapping additional piece of Vapor Retarder minimum 6" around all penetration edges. Carefully cut center "cut out" to fit the penetration. Seal all edges with specified sealant to ensure continuous vapor retarder performance.

INSTALLATION – ADHESIVE PRIMER

Apply adhesive primer according to manufacturer's recommendations where appropriate surface adhesion cannot be achieved.

Prime substrate with specified primer at a rate of 200-250 sq. ft. per gallon.

Apply adhesive primer on surface of WRB where subsequent WRB membrane will overlap such as selvage edge and end laps

INSTALLATION - FLEXIBLE FLASHING MEMBRANE

Install sill flashing stop.

Install flexible flashing membrane over window sill. Lap up vertical leg of flashing stop, down vertically below opening minimum 6 inches and up opening jambs minimum 6 inches. See detail on Drawings.

Fold side flaps of air infiltration retarder into opening, lapping over flexible flashing and staple in place.

Install window sill flashing and window.

Install 12 inch wide flexible flashing strips over window jamb flanges and air infiltration retarder. Adhere to window flange and air infiltration retarder.

Install window head flashing.

Install 12 inch wide flexible flashing strip over window head flashing and under air infiltration retarder, lapping side strips. Adhere to window head flashing and substrate. See detail on Drawings

INSTALLATION – WEATHER-RESISTIVE BARRIER (WRB)

Install in a consecutive weatherboard method starting at bottom of wall and working up. Maintain minimum 2" side laps and 3" end laps.

Cut to manageable lengths, position membrane for alignment, remove protective poly-film and firmly apply pressure to assure adhesion.
Eliminate fishmouths, wrinkles and gaps.
Roll entire membrane surface (including seams) with a counter top or “J-roller” using minimum 5 lbs. pressure to ensure full contact and adhesion.
Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the WRB and around perimeter edge of membrane terminations at window and door frames with sealant recommended by WRB manufacturer.
Install WRB at rough openings and transitions according to manufacturer’s installation instructions and details.
Flash window and door openings according to manufacturer’s installation instructions and details shown on Drawings.
Use pre-cut rolls of flexible flashing membrane for sill pan flashings per manufacturer’s published window flashing guidelines.
Prime substrate before installation of flexible flashing membrane.
Mechanically fastened insulation clips, brick ties and other through penetrations through the membrane into solid backing and seal with sealant recommended by WRB manufacturer.
Inside and Outside Corners:
Seal inside and outside corners of sheathing boards with a strip of self-adhering vapor permeable membrane extending a minimum of 3 inches on either side of the corner detail.
At inside corners, pre-treat the corner with a continuous ½ inch bead of sealant.
Align and position self-adhering transition membrane, remove protective film and press firmly into place.
Ensure minimum 2 inches overlap at all side laps and minimum 3 inches overlap at all end laps of membrane.
Roll all laps and membrane with a counter top roller to ensure seal.
Transition Areas:
Tie-in to structural beams, columns, parapet curbs, foundation walls, roofing systems and at the interface of dissimilar materials with self-adhering water resistive air barrier transition membrane.
Align and position self-adhering transition membrane, remove protective film and press firmly into place.
Provide minimum 3 inch lap to all substrates.
Ensure minimum 2 inches overlap at all side laps and minimum 3 inches overlap at all end laps of membrane.
Roll all laps and membrane with a counter top roller to ensure seal.
Openings:
Install Flexible Flashing Membrane at opening sill as described above.
Pre-treat inside corners with a bead of termination sealant.
Wrap jamb of rough openings with self-adhering water resistive barrier transition membrane.
Extend self-adhering water resistive air barrier membrane into rough window openings sufficient to provide a connection to interior vapor retarder.
Align and position self-adhering transition membrane, remove protective film and press firmly into place.
Ensure minimum 2 inches overlap at all side laps and minimum 3 inches overlap at all end laps of membrane.
Roll all laps and membrane with a counter top roller to ensure seal.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Shop or field formed sheet metal products with waterproof joints; accessories and trim such as gutters, downspouts, copings, and metal or flexible flashings for roof or wall construction.

SUBMITTALS
Provide in accordance with Section 01 33 00.
Samples:
Submit two samples of pre-finished sheet metal in each color selected.
Shop Drawings:
Submit shop drawings showing profiles, dimensions, location and arrangement of joints, supports, types and locations of fasteners and other anchorage, sealant and accessories. Show details of weatherproofing at edges, terminations and penetrations.

SUSTAINABILITY REQUIREMENTS:
Provide manufacturer's product data listing recycled content.
Provide documentation of recycled content and value of recycled content as described in Section 018113.

REFERENCES
Architectural Sheet Metal Manual, published by the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), current edition.

DELIVERY, STORAGE, AND HANDLING
Protect against damage and discoloration.
Store off ground.

WARRANTY
Warrant work weathertight for 3 years, subject to General Condition terms.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

SHEET METAL
Pre-finished Sheet Steel:
Material: Sheet steel, 24 gauge thickness, unless otherwise shown on Drawings.
Exterior Finish: Baked on corrosion resistant primer and baked on Polyvinylidene Fluoride (PVDF) finish coat which includes 70% Kynar 500/Hylar 5000 resins.
Color: Selected by Architect.
Location: Where exposed and elsewhere shown on Drawings.
Aluminum Sheet:
Material: Alloy 5005-H32, conforming to ASTM B209/B209M, .050" minimum thickness unless otherwise shown on Drawings.
Finish: Anodized conforming to AA-M12C22A44, Class 1, Architectural, 0.7 mils thick, Dark Bronze #40 aluminum color to match storefront windows.
Location: Exposed locations adjacent to aluminum windows, doors, louvers and other openings shown on Drawings.
Galvanized Sheet Steel:
Conform to ASTM A 525, coating designation: G-90; lock forming quality conforming to ASTM A 527.
Location: At locations not specified above or where shown on Drawings.
Stainless Steel:
Material: Alloy 316/316L molybdenum-bearing austenitic stainless steel.
Standards: ASTM UNS S31600. ASME S31603.
Exterior Finish: No. 4, smooth.
Color: Natural.
Location: Exterior flashing where shown on drawings.

SCREWS
Pan head, self-tapping, sheet metal type; conforming to Fed. Spec. FF-S-107; #7 by one inch long minimum, cadmium plated, use stainless steel at stainless steel metal.

RIVETS
1/8 inch minimum diameter, length as recommended by rivet manufacturer for materials to be joined; cadmium plated.

EXPANSION ANCHORS
Type recommended by manufacturer for conditions of use.
1/4 inch diameter by 1 inch long, minimum.

SOLDER
ASTM B 32; 50% Tin and 50% Lead.

FLUX
Rosin, cut muriatic acid, or commercial preparation for material to be soldered.

SEALANT
Silicone type conforming to Fed. Spec. TT-S-001543; Dow, GE, or accepted substitute.

ASPHALT PLASTIC CEMENT
Fed. Spec. SS-C-153, Type 1.

PRIMER COATING AND UNDERCOATINGS
Galvanized iron primer as specified in Section 09 90 00.

ASPHALTIC COATING COMPOUND
Fed. Spec. TT-C-494, Type 11.

FABRICATION
General:
Form to details shown on Drawings or described herein. For work not described or detailed in the Drawings or Specifications, refer to SMACNA “Architectural Sheet Metal Manual”.
Form to shapes and dimensions shown with planes and lines in true alignment.
Unless otherwise shown on Drawings or specified fabricate with longest practicable lengths.
Hem exposed edges.
Angle bottom edge of vertical surfaces to form drip.
Cleats:
Same material and thickness as sheet metal.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive sheet metal are smooth, clean, and otherwise properly prepared.
Verify that reglets and nailers to receive sheet metal are properly placed.
Prior to starting work notify General Contractor of defects that require correction.
Do not start work until conditions are satisfactory.

PREPARATION
Before fabricating sheet metal, verify shapes and dimensions of surfaces to be covered.
If field measurements differ slightly from Drawing dimensions modify work as required for accurate fit. If measurements differ substantially notify Architect prior to fabrication.

INSTALLATION, GENERAL
Install work watertight, without waves, warps, buckles, tool marks, fastening stresses, distortion, or defects which impair strength or mar appearance.
Install planes and lines to true alignment.
Allow for sheet metal expansion and contraction.

SEAM INSTALLATION
Common Lock Seams:
3/4 inch finish width; 4-ply loose-locked.
Flat Lock Seams:
5/8 inch finish width; 4-ply flat-locked, malleted tight; sweat full with solder.
Drive Lock Seams:
Fold back abutting edges and cover joint with 1 1/8 inch wide loose drive cap.
Single Corner Seams:
3/4 inch finish width, 3-ply loose locked.
Double Corner Seams:
5/8 inch finish width; 4-ply loose locked.
Lap Seams:
3 inch finish width.
Solder-Lap Seams:
1 inch finish width; sweat full with solder.
Cover Plate Seams:
Space abutting sheets 1/2 inch; cover joint with 4 inch wide cover and back-up plates set in sealant.
Match plates to flashing profile.
Secure plates to substrate with screw installed through open space between flashing sheets.
S-Lock Seams:
Form 1 1/4 inch wide "S" shaped seam on one edge of flashing sheet for concealed fastening.

CLEAT INSTALLATION
Space 2 feet on center, unless continuous cleats or other spacings are specified hereunder.
Secure spaced cleats to substrate with 2 fasteners.
Secure continuous cleats to substrate with fasteners spaced at 12 inch maximum centers.
Cover fastener heads with cleat tabs.

REGLET INSTALLATION
Install in accurate locations, straight, in-line, and with leak-proof joints.
Secure with powder-driven drive pin and stainless steel washer with neoprene facing.
Caulk surface-mounted reglets with sealant.

SOLDERING
Clean and flux metals prior to soldering.
Sweat solder completely through seam widths.

SEALANT INSTALLATION
Apply 1/4 inch diameter bead, centered in full length of joint.

ASPHALT PLASTIC CEMENT INSTALLATION
Trowel apply 1/8 inch thick.

PAINTING
Apply primer coat to exposed sheet metal surfaces specified in Section 09 90 00 to receive finish paint; l 1/2 mil dry film thickness.
Protect galvanized steel against oxidation by back-painting with undercoating, 1 1/2 mil dry film thickness.
Protect contacting dissimilar metals against corrosion with asphaltic coating compound, 7 1/2 mil dry film thickness, applied to each contacting face.

CUSTOM FORMED METAL
At aluminum Windows, Louvers and Other Openings: Form to detail of anodized aluminum sheet. Color and finish to match adjacent frames.
At steel doors, Louvers and Other Openings: Form to detail of prefinished steel. Color and finish to match adjacent frames.
Elsewhere: Form to detail of pre-finished steel.

ROOF PENETRATIONS
General:

Form of 26 gage galvanized steel.
Base Flashing:
Extend flange onto roof 8 inches minimum in all directions away from penetration, and upward around penetration to position at least 2 inches above roof flood line.
At sheet metal roofing fold upper and side edges back flange 1/2 inch.
Solder-lap joints.
Furnish to roofer for installation.
Counter Flashing:
Overlap base flashing at least 1 inch with storm collar sloped away from penetration.
Secure to penetration with solder.

EQUIPMENT SUPPORT FLASHING
Form of 18 gage galvanized steel.
Fully cap support.
Over lap base flashing 4 inches.
Solder-lap joints.
Provide sealant around penetrations, if any.

MISCELLANEOUS FLASHING
Provide flashing around doors, windows, louvers, and other openings in exterior walls where indicated or required to maintain building watertight.

CLEANING AND REPAIRING
As work progresses, neutralize excess flux with 5% to 10% washing soda solution, and thoroughly rinse.
Including work of other sections, clean, repair and touch-up, or replace when directed products which have been soiled, discolored, or damaged by work of this section.
Leave surfaces ready for finish painting specified in Section 09 90 00.
Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Elastomeric and non-elastomeric sealants, caulking compounds, compression seals, joint fillers and related accessories.

DELIVERY, STORAGE, AND HANDLING
Protect against damage.
Store products in original, tightly sealed containers, original labels thereon.
Do not exceed sealant shelf life.

SUBMITTALS
Submit in accordance with Section 01 33 00.
Manufacturer's Data:
Provide Manufacturer's installation instructions for each product used.
Provide Manufacturer's Literature and Data for primers and each type of sealant including compatibility when different sealants in contact with each other.
Sustainability Requirements:
Submit manufacturer's product data listing volatile organic compound (VOC) content of products specified herein.
Provide manufacturer's documentation verifying that sealants contain no urea-formaldehyde.
Samples:
Provide cured samples of exposed sealants for each color where required to match adjacent material.

ENVIRONMENTAL REQUIREMENTS
Perform no work when weather exceeds manufacturer's specified limits.

EMISSIONS STANDARDS
Conform to the following minimum standards for sealant emissions:

Sealant Type	VOC Limits	Standard
Architectural Sealants:	250 g/L	SCAQMD Rule #1168
Other Sealants:	420 g/L	SCAQMD Rule #1168

QUALITY ASSURANCE
Installer Qualifications:
Experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
Source Limitations:
Obtain each type of joint sealant through one source from a single manufacturer.
Sealant Testing:
Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates in accordance with sealant manufacturer's recommendations:
- Locate test joints as directed by Architect.
- Conduct field tests for each application indicated below:
  - Each type of elastomeric sealant and joint substrate indicated.
  - Each type of non-elastomeric sealant and joint substrate indicated.
- Notify Architect seven days in advance of dates and times when test joints will be installed

Arrange for tests to take place with joint sealant manufacturer's technical representative present.
Mockups:
Provide a mock-up example of three stages of the assembly;

The joint with all existing removed and cleaned prior to backer rod.
The joint with backer rod and all prep prior to sealant.
The finished joint with sealant applied.

The mock-up examples may be presented at one location or several at contractor’s option.

Pre-Application Meeting:

Prior to sealant application, arrange meeting to clarify any questions about Specifications, details, and application requirements.

Representatives of the following shall attend:

Owner
Architect
General Contractor
Sealant Contractor with Supervisor
Sealant Manufacturer Representative

ENVIRONMENTAL REQUIREMENTS

Perform no work when weather exceeds manufacturer's specified limits.

WARRANTY

Caulking and sealing subject to 2 year weatherproof warranty called for in Supplementary Conditions, Section 00 73 00.

Prior to final project acceptance submit in accordance with Section 01 78 23, 2 copies of the Warranty for inclusion in Owner's Maintenance Manual:

COORDINATION

Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

SILICONE SEALANT

At Interior Air Seal of Doors/Windows:

One part, neutral cure silicone sealant.

Basis of Design: Dow Corning, Dow 758.

At other locations:

Dow Corning, DOWSIL 790, or accepted substitute, with mildew inhibitor, conforming to Fed. Spec. TT-S-001543.

Select proper type in accordance with manufacturer's recommendations.

URETHANE SEALANT

Vertical Joints:

ASTM C920, Type S, Grade NS, Class 50 for use NT.

Non-sag, one component type; BASF Building Systems, MasterSeal NP100.

Horizontal Joints:

ASTM C920, Type M, Grade P, Class 25 for use T and I.

Self-leveling, multicomponent type; BASF Building Systems, MasterSeal NP100.

FOAM AIR-INFILTRATION SEALANT

Grace Polycel One.

SEALANT COLORS

Urethane Sealant: Approximate color of adjacent surfaces, unless otherwise directed.

Silicone Sealant: Approximate color of adjacent surfaces, or clear if color not available.

Foam Sealant: Contractor's choice.

PRIMER AND SURFACE CONDITIONER

Made or recommended by manufacturer of compound or sealant.

BACKER ROD

Closed-cell polyethylene gasketing rod, Dow "Ethaform," or accepted substitute.

Diameter: 1/4 greater than width of joint where to be installed.

PART 3 - EXECUTION

EXAMINATION
Inspect joints to be sealed and verify that joints are clean, dry, and free from dust, oil, grease, rust, lacquer, laitance, loose mortar, or other bond-reducing matter.
Allow concrete surfaces to dry at least 4 weeks before sealing.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
General:
Remove dust, dirt and other foreign matter from joints to be sealed by brushing and air-blowing.
Priming:
Prime unpainted surfaces to receive sealant.
Apply with bristle brush. Do not flood surfaces.

BACKER INSTALLATION
Install backer rod behind sealant in accordance with manufacturer's directions.
Provide in as long continuous lengths as practicable.
Stretch taut and force into joints to uniform depth, approximately 1/2 Joint width but not to exceed 1/2 inch.
Replace any punctured backer rod.

FOAM SEALANT INSTALLATION
Follow sealant manufacturer's directions.
Inject sealant continuously until opening is filled.
If opening is not filled within sealant snap time or maximum of 3 minutes, stop application for at least 15 minutes before resuming work.
Trim cured foam flush with adjacent surface.

OTHER SEALANT INSTALLATION
Apply sealant in accordance with manufacturer's directions using gun-type dispenser.
Size gun nozzle to fit joint.
Seal joints before applying final paint coat.
Fill joints and voids solid; superficial pointing with skin bead not acceptable.
Install flush with adjacent surfaces.
Tool joints smooth within 10 minutes after installation.
Remove masking materials, if any, immediately after sealant installation.

APPLICATION
Caulk exterior and interior joints around window frames, door frames, and louver frames and other openings in exterior walls with urethane sealant.
Apply color-matched sand to joints in masonry.
Where subject to air infiltration, caulk spaces between wall framing members and windows, doors, and other openings in exterior walls with foam air-infiltration sealant.
Caulk space beneath exterior wall base plates with foam air infiltration sealant.
Caulk with silicone sealant where shown on Drawings.

CLEANING AND REPAIRING
Remove excess material as work progresses and leave surfaces neat, smooth, and clean.
Remove debris from project site upon work completion or sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Shop fabricated metal doors, insulated or non-insulated, stock or custom sizes. Shop fabricated and assembled or field assembled steel frames of standard profiles and measurements.

REFERENCES
Except as modified herein, conform to requirements of "Recommended Specifications Standard Steel Doors and Frames," S.D.I. 100 (ANSI 250.8-2003), published by Steel Door Institute, 30200 Detroit Road, Westlake, Ohio 44145; 440-899-0010.
Conform to requirements of ANSI 250.4-2001, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings; and ANSI 250.10-1998, Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames. Specifications may be obtained from Institute.

SUBMITTALS
Provide in accordance with Section 01 33 00.
Shop Drawings:
Show elevations, principal construction features, and dimensions of each door type and frame type, cut-outs, reinforcement, joints, welds, finish, anchoring and other pertinent details.
Locate and detail field splice joints for frames too large to ship in one piece.
Indicate instructions for making field splices.
Manufacturer's published details may be substituted for standard stock items, provided required information is included.
Certificates:
Furnish letter from manufacturer stating that the work delivered to project conforms to these Specifications.
Label on each unit, as defined in this section, may be substituted, at Contractor's option.

REGULATORY REQUIREMENTS
Fabricate doors and frames where scheduled to be fire-restrictive in accordance with Underwriters Laboratories requirements. Affix UL Acceptance Label on each piece.

QUALITY ASSURANCE
Manufacturer’s Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

DELIVERY, STORAGE, AND HANDLING
Protect against damage and discoloration.
Remove door wrappings upon jobsite delivery.
Store doors and frames upright in protected dry area, at least one inch above ground or floor, and with at least 1/4 inch between individual pieces.
Brace bottom ends of frame jambs against displacement.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

MATERIALS
General:
Steel, carbon, cold-rolled, commercial quality: ASTM A 366.
Steel sheet, zinc coated (galvanized) by the hot dip process, general requirements: ASTM A 525.
Steel, carbon, hot-rolled sheet and strip, commercial quality: ASTM A 569.
Sheet steel, cold-rolled, electrolytic zinc coated: ASTM A 591.
Supports and Anchors:
Fabricate of not less than 18 gage galvanized sheet steel.
Inserts, Bolts, and Fasteners:
General: Comply with ASTM A 153, class C or D as applicable.

Items built into exterior walls: Galvanized.
Elsewhere: Manufacturer's standard units.
Glass and Glazing:
Provide glass and glazing materials which comply ANSI Z97.1 and with Section 08 80 00.

STANDARD STEEL DOORS
Type: Level II, Model 1, heavy duty 1-3/4 inch. Galvanized at exterior locations.
Style: Style F unless otherwise shown on Drawings, full flush hollow steel construction.
Construction: 18 gage.
Core: Solid foam core.

STANDARD STEEL FRAMES
Gauge Construction:
Exterior Frames: 16 gage, galvanized.
Interior Frames less than 40 inches wide: 18 gage.
Frame Type:
Construction: Full welded.
Frame Face: Standard 2" width.
Frame Depth:
Interior: Finished wall thickness + 1 inch unless otherwise shown on Drawings.
Exterior: 5 3/4 inches unless otherwise shown on Drawings.

ANCHORS
General:
Follow referenced specifications.
To Stud Walls:
Full frame width and depth, welded to frame.
Minimum quantity:
Frames up to 7'-6" high: 3 per jamb.
Frames 7'-6" to 8'-0" high & Bullet Resistant Steel Frames: 4 per jamb.

FABRICATION
General:
Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle.
Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site.
Fill surface depressions with metallic paste filler and grind to smooth finish.
Touch up areas where galvanized coating has been removed.
Fabricate with 26 gage minimum dust cover boxes at hardware mortises.
Fabricate with the following clearances:
Between doors and frames: 1/8 inch.
Between door sills and thresholds: 1/4 inch.
Between door sills and floor: 5/8 inch.
Between meeting edges of pairs of doors: 1/8 inch.
Shop Finish:
Dress surface irregularities to smooth surface.
Chemically treat and clean exposed surfaces.
Manufacturer's standard, bonderized, and one coat baked-on rust inhibiting prime paint.
Doors:
Mechanically interlock longitudinal seams of honeycomb core type doors and panels. Leave seams invisible, or weld, fill and grind smooth.
Fabricate exterior doors with flush tops.
Provide astragals for double doors where removable center mullions are not provided. Provide in accordance with UL requirements for labeled doors and panels.
Frames:
Accurately form and cut mitered corners of welded type frames. Weld on inside surfaces. Grind welded joints to smooth uniform finish.
Accurately cope and securely weld butt joints of mullions and transoms of glazed lights. Grind welded

joints to smooth uniform finish.
Reinforce frames wider than four feet with 12 gage formed steel channels welded in place, flush with top of frames.
At metal stud partitions, for exterior and interior doors as noted on Drawings: backplaster frames with rich, metal adhering, fast setting gypsum plaster.
Hardware reinforcement:
Make standard provision for hardware listed in Section 08 71 00, in accordance with ANSI/SDI 250.6-2003 “Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames”.
Reinforce for hardware listed in Hardware Schedule, Section 08 71 00.
Provide standard reinforcement for door closers whether or not closers are listed in Hardware Schedule, Section 08 71 00.

PART 3 - EXECUTION

EXAMINATION
Verify that openings to receive hollow steel doors and frames are accurately sized and located, square, plumb, and otherwise properly prepared.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
Verify field dimensions prior to fabrication.
If minor differences exist between field measurements and drawing dimensions, modify work as required for accurate fit. Notify Architect about major differences prior to fabrication.

INSTALLATION
Follow referenced specifications and manufacturer's instructions.
Secure anchors to adjacent construction.
At metal stud partitions, for exterior and interior doors as noted on Drawings: backplaster frames with rich, metal adhering, fast setting gypsum plaster.
Set frames true with adjacent construction.
Accurately position work. Set doors flush with frame face.
Set doors plumb to hold any desired position.
Install glazed light frames with welded glass stops on security side.
Coordinate installation of glass and glazing in doors.

ADJUSTING
Adjust moving parts to operate satisfactorily at time of final project acceptance and during warranty period.

CLEANING AND REPAIRING
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.
Leave surfaces ready for finish painting specified in Section 09 90 00.
Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.
Protect contacting dissimilar materials against electrolytic corrosion.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Hollow and solid core wood doors, solid wood stiles and rails and/or plastic laminate face veneer.

REFERENCES
For Hardwood Veneer Faced Doors: National Woodwork Manufacturer's Association Industry Standards I.S.1-97.
Standard may be obtained from association at 400 W. Madison Street, Chicago, Ill. 60606.
For Softwood Doors: Fir and Hemlock Door Association, Industry Standard FHDA 5-75.
Standard may be obtained from Association at 1500 Yeon Building, Portland, Oregon 97204.

OPTIONS
Prefitting doors to frames and preparing for finish hardware specified in Section 08 71 00 may, at Contractor's option, be performed at mill.
Flush panel doors with openings therein, may, at Contractor's option, be fabricated with stile and rail cores.

SUBMITTALS
Submit in accordance with Section 01 33 00.
Shop Drawings:
Show elevations, principal construction features and dimensions of each door type.
Samples:
Submit two samples of door veneer, 12 x 12 inch size, illustrating wood grain, stain color, and sheen.

REGULATORY REQUIREMENTS
Fire Resistance Rating Certification Agency: Underwriter's Laboratories, Inc.

QUALITY ASSURANCE
Manufacturer’s Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

DELIVERY, STORAGE, AND HANDLING
Do not deliver to jobsite until notified by General Contractor that project is conditioned and prepared to handle and store products without damage or discoloration.
Protect against damage and discoloration.
Store flat on level, dry surface and in well ventilated space.
Cover for protection, but allow air circulation.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

CORE
Interior Flush Solid Core Doors:
Particle board type with 1 1/8 inch minimum width stiles.
All other doors:
Manufacturer's standard material.

FACE
At doors to be stained and varnished:
Plain sliced white birch.
Veneer Grade: HPVA Grade AA.
Construction Grade: AWI Premium Grade.
Book matched veneers. Carefully match veneers for color.

EDGE BAND
At wood veneer faced doors:
1/2 inch thick, minimum.
Species: Manufacturer's standard hardwood, matched for color.

ADHESIVE
Commercial Standards CS-171, Type I.

FACTORY FINISH
Finishing Standards: Conform to AWI/WDMA TR-6, Premium grade.
Type:
Base: One coat clear sealer.
Top Coat: Two coats clear catalyzed polyurethane, UV cured, complying with EPA Title 5 guidelines for Volatile Organic Compound (VOC) emissions limitations.
Color: Custom stain to be selected by Architect.
Sheen: Satin.
Edges: Finish vertical door edges same as door face. Finish top and bottom edges with clear sealer.

FABRICATION
Conform to referenced standards "Premium" grade.
Prepare doors in accordance with "Standard Procedures and Recommendations for Factory Machining," published by National Woodwork Manufacturer's Association.
At paired doors match face veneers on adjacent door sides and identify matching faces.
Install glass, if any, in other doors with manufacturer's standard wood stops to match Oregon Door WVF-8 Flush Square with Quirk profile.
Tolerances:
Thickness: 1/16 inch plus or minus.
Size: 1/8 inch plus or minus; 1/32 inch for prefit doors.
Squareness: 1/4 inch maximum difference between opposite diagonal measurements.
Warp: 1/4 inch maximum space measured from horizontal, vertical, or diagonal straight edge to point of maximum bow, cup or twist.

PART 3 - EXECUTION

EXAMINATION
Verify that door frames are correct type, accurately located and sized, square, plumb, true, and otherwise properly prepared.
Prior to starting work notify General Contractor about defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION OF DOORS FOR HANGING
Seal job-cut surfaces with 2 coats waterproof sealer compatible with door finish.
Undercut doors as required for floor covering clearance.
Fit doors for width by planing; for height by sawing.

INSTALLATION
Position doors flush with frame face.
Set plumb so door will hold any desired position.
Install with the following clearances:
Between doors and frames: 1/8 inch.
Between door sills and thresholds: 1/4 inch.
Between meeting edges of pairs of doors: 1/8 inch.

ADJUSTMENTS
Adjust moving parts to operate satisfactorily at time of final project acceptance and during warranty period.

CLEANING AND REPAIRING
Including work of other sections, clean, repair and touch-up, or replace when directed, products which

have been soiled, discolored, or damaged by work of this section.
Leave surfaces ready for finishing specified in Section 09 90 00.
Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Protect other surfaces against damage or discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Special doors operating in various methods and for various uses including hardware and controls.

SUBMITTALS
Provide in accordance with Section 01 33 00.
Shop Drawings:
Show elevations, principal construction features, and dimensions of each door type and frame type, cut-outs, reinforcement, joints, welds, finish, anchoring and other pertinent details.
Locate and detail field splice joints for frames too large to ship in one piece.
Indicate instructions for making field splices.
Manufacturer's published details may be substituted for standard stock items, provided required information is included.

REGULATORY REQUIREMENTS
Fabricate doors, where scheduled to be fire-resistive, in accordance with Underwriters Laboratories requirements. Affix U.L. Acceptance Label on each piece.

DELIVERY, STORAGE, AND HANDLING
Protect against damage and discoloration.

ENVIRONMENTAL REQUIREMENTS
Protect contacting dissimilar materials against electrolytic corrosion.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

WALL ACCESS DOORS
Type: Flush, side hinged, size as shown on Drawings.
Manufacturer: J.L. Industries, Milcor Inc., Larsen's, or accepted substitute.
Material: 14 gauge door, 16 gauge frame, prime coated steel.
Finish: Manufacturer’s standard primer. Paint panel doors and frames to match color of adjacent material.
Size: As required for installation. Minimum size for access to plumbing valves 12” X 12”.
Provide appropriate U.L. fire-resistance rating where doors are located in fire walls.
Hardware: Concealed type hinges.
Number Required: Allow in Bid for all access doors, if any, indicated on Drawings or required under Divisions 21 and 23.
Exact number will be determined by Architect as Work progresses.
Contract sum will be adjusted in accordance with General Conditions.
Locks: Cylinder lock, keyed to existing access door locks. Furnish with two keys per lock.

PART 3 - EXECUTION

EXISTING CONDITIONS
Verify that openings to receive doors are square, plumb, and accurately sized and located. Prior to starting work notify General Contractor of defects requiring corrections.
Do not start work until conditions are satisfactory.

INSTALLATION
Install access doors and hardware in accordance with manufacturer's directions and approved shop drawings.
Accurately locate and anchor members plumb, square, true, rigid, secure, and with proper clearances.

ADJUSTMENTS
Adjust moving parts to operate satisfactorily at time of project final acceptance and during warranty

period.

PRODUCT CLEANING AND REPAIRING

Including work of other sections, clean, repair and touch-up, or replace when directed products which have been soiled, discolored, or damaged by work of this section.

Leave surfaces ready for painting specified in Section 09 90 00.

Remove debris from project site upon work completion or sooner, if directed.

PROTECTION

Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Entrance, transom and sidelight systems fabricated of formed or extruded metals and all glass systems.

SUBMITTALS
Provide in accordance with Section 01 33 00.
Shop Drawings:
Show elevations, principal construction features, and dimensions of each door type and frame type, cut-outs, reinforcement, joints, welds, finish, anchoring and other pertinent details.
Samples:
Submit finish color samples.
Submit frame sections, mullion section, corner section, glass, and anchor samples upon request.
Submit two samples 24 x 24 inches in size illustrating finished aluminum surface, glazing, infill panels, glazing materials.

LABORATORY TESTING AND PERFORMANCE REQUIREMENTS
Performance Requirements:
Provision for Thermal Movements: Design storefront framing systems to provide for thermal movement of all component materials resulting from expected surface temperatures range without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or other detrimental effects. Operating windows and doors shall function normally over temperature range.
Test Procedures and Performance:
Air Infiltration Test:
Test unit in accordance with ASTM E 283 at a static air pressure difference of 6.24 psf (299 Pa).
Maximum air infiltration.06 cfm/SF (.30 l/s•m²) of unit.
Water Resistance Test:
Test unit in accordance with ASTM E 331.
No uncontrolled water leakage at a static test pressure of 10.0 psf (479 Pa).
Uniform Load Deflection Test:
Test in accordance with ASTM E 330.
Maximum deflection under design load L/175 of the clear span.
Uniform Load Structural Test:
Test in accordance with ASTM E 330 at a pressure 1.5 times the design wind pressure in 1.05.B.3.b with no glass breakage, permanent damage to fasteners, storefront parts, or any other damage that would cause the storefront to be defective.
Condensation Resistance Test (CRF):
Test unit in accordance with AAMA 1503.1.
Minimum condensation Resistance Factor (CRF) 66 (frame) and 69 (glass) when glazed with 1" (25 mm) insulated – 1/4" (6 mm) clear low emissivity, 1/2" (12 mm) air, 1/4" (6 mm) clear glass.
Thermal Transmittance Test (Conductive U-Value):
Test in accordance with AAMA 1503.1.
Maximum conductive thermal transmittance (U-Value) 0.44 BTU/hr•ft²•°F (2.49 W/m²•K) when glazed with 1" (25 mm) insulated – 1/4" (6 mm) clear low emissivity, 1/2" (12 mm) air, 1/4" (6 mm) clear glass.
Thermal Transmittance Test (Conductive U-Value):
Test in accordance with NFRC-102.
Maximum conductive thermal transmittance (U-Value) 0.41 BTU/hr•ft²•°F (2.32 W/m²•K) when glazed with 1" (25 mm) insulated – 1/4" (6 mm) clear low emissivity, 1/2" (12 mm) air, 1/4" (6 mm) clear glass.
Project Wind Loads:
Design wind pressure, both positive and negative as required by Building Code, calculated from ANSI A58.1, or as determined by boundary layer wind tunnel testing.
Use 20.0 psf (958 Pa) as minimum.
Provide test reports from AAMA accredited laboratories certifying performance.
Thermal Performance:
Comply with Energy Code.
Maximum Assembly U-value:

Entrance Doors: 0.80.
Elsewhere: 0.45.
Maximum Assembly Solar Heat Gain Coefficient: 0.40.
Air Leakage:
Entrance Doors: 1.0 cubic feet per minute per square foot of door area when tested in accordance with ASTM E 283.
Elsewhere: Maximum 0.3 cubic feet per minute per square foot of fenestration area when tested in accordance with ASTM E 283.

QUALITY ASSURANCE
Source Limitations for Aluminum-Framed Systems:
Obtain from single source from single manufacturer.
Manufacturer Qualifications:
Company specializing in manufacturing aluminum glazing systems with minimum five (5) years of documented experience.
Installer Qualifications:
Company specializing in installation of aluminum glazing systems and approved by glazing system manufacturer.
Pre-Installation Meeting:
Convene one week before starting work of this section to verify project requirements, coordinate with installers of other work.
Representatives of the following shall attend:
Owner's Project Representative
Architect
Mechanical Engineer/Systems Engineer
General Contractor
Storefront Installer
Manufacturer's Representatives
Representatives of other trades requiring coordination with Storefront installation.

DELIVERY, STORAGE, AND HANDLING
Protect against damage and discoloration.
Store doors and frames upright in protected dry area, at least one inch above ground or floor, and with at least 1/4 inch between individual pieces.
Brace bottom ends of frame jambs against displacement.
Provide removable protective coating on exposed metalwork adjacent to plaster, gypsum board, or sprayed gypsum work. Maintain until project completion.

ENVIRONMENTAL REQUIREMENTS
Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

WARRANTY
Total Storefront System:
Assume full responsibility and warrant for one year the satisfactory performance of the total storefront installation including insulated glazing units, anchorage and setting system, sealing, flashing, etc., as it relates to air, water, and structural adequacy as called for in the specifications and approved shop drawings. Correct any deficiencies due to such elements not meeting the specifications by the responsible contractor at their expense during the warranty period.
Material and Workmanship:
Per AAMA standard 601, provide written guarantee against defects in material and workmanship. Warranty period shall be for 3 years from the date of final shipment.
Glass:
Provide written warranty for insulated glass units that they will be free from obstruction of vision as a result of dust or film formation on the internal glass surfaces caused by failure of the hermetic seal due to defects in material and workmanship. Warranty period shall be for 10 (ten) years.

PART 2 - PRODUCTS

MATERIALS
Aluminum:
Structural shapes, blocking, bracing, and other concealed members: 6061-T6.
Exposed Extrusions: 6063-T6.
Casting: 214-T6.
Sheetmetal: 5005-H32.
Special Finishes: Modify alloys and tempers specified above as necessary for proper application of special finishes specified hereunder.
Finish (unless modified hereunder):
Concealed Work: Mill Finish.
All other Work: AA-M12C22A44, Class 1, Dark Bronze #40.
Glass:
Refer to Section 08 80 00.

STEEL REINFORCEMENT
Conform to ASTM A 36.

FASTENERS
Type recommended by manufacturer for conditions of use.
Galvanically compatible with materials to be fastened.

CORROSION INSULATING COMPOUND
Asphaltic Coating Compound: Fed. Spec. TT-C-494, Type II.

FRAMES
Material: Extruded aluminum.
Size and Profile: 2 inches x 4½ inches, center glazing at interior windows. 6” bottom rail at exterior windows to match existing.
Wall Thickness: .125 inch.
Manufacturer: Kawneer, EFCO, or accepted substitute.
Model:
Exterior insulated glazing: Kawneer “Trifab VG 451T - Center”

SWING DOORS
Material: Extruded aluminum.
Rail Dimensions:
Top and Side Rails: 5 inches width.
Bottom Rail: 10 inches height.
Manufacturer: Kawneer “Wide Stile 500”, or approved substitute.

GLASS STOPS
Square stops and non-stretch, high shore vinyl glazing beads reinforced with 60 pound test fiberglass cord core against both glass faces.

FINISH HARDWARE
Provide the following Hardware by door manufacturer:
Threshold: Manufacturer's standard extruded aluminum type, dark bronze anodized finish.
Weatherstripping: Manufacturer's standard flexible, non-porous polymeric strip. Provide for heads, jambs and sills of exterior doors. Sill weatherstrip adjustable for wear.
See Section 08 71 00 Finish Hardware for other hardware.

FABRICATION
General:
Provide concealed steel stiffeners where indicated or required to resist wind or other applied loads.
Fabricate connections as required for strength and rigidity using concealed mechanical fastenings wherever possible. Where not possible, welding may be used.
Cut horizontal members between verticals.

Match exposed welds with adjacent material, free of porosity, cracks and blow-holes.
Select materials carefully for matching color and texture after finishing.
Fabricate flat surfaces smooth and true, free from waves, buckles, and seams.
Fabricate edges, corners, and angles clean, sharp, and square; joints precision fitted.
Allow for expansion and contraction.
Make exterior work permanently weathertight.
Clearances:
Fabricate with the following clearances:
Between Doors and Frames: 1/8 inch.
Between Door Sills and Thresholds: 1/4 inch.
Between meeting edges of pairs of Doors: 1/8 inch.
Tolerances:
Member Alignment: True within 1/8 inch per 12 feet.
Openings: Accurately sized and located within 1/4 inch.
Squareness: 1/8 inch maximum difference between opposite diagonal measurements.

PART 3 - EXECUTION

EXAMINATION
Verify that openings to receive work of this section are plumb, rigid, accurately sized and located, and otherwise properly prepared.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
Verify prior to fabrication.
If field measurements differ slightly from drawing dimensions modify work as required for accurate fit. If measurements differ substantially notify Architect prior to fabrication.

INSTALLATION
Follow manufacturer's directions and approved shop drawings.
Install plumb, square, true, rigid, secure, weathertight, and without glass-to-metal contact between panels and frames.

PAINTING
Coat contacting dissimilar materials with corrosion insulating paint, 7 1/2 mil dry film thickness, minimum, applied to each contacting face.
Touch-up any unfinished metal exposed by cutting. Match adjacent color.

CLEANING AND REPAIRING
Remove protective coatings.
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.
Final glass cleaning specified in Supplementary Conditions.
Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Protect other work against damage or discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Operating hardware and accessories for doors and windows not specifically supplied as part of the manufactured item. Door hardware includes, but is not necessarily limited to mechanical door hardware, electromechanical door hardware, power supplies, back-ups and surge protection, automatic operators, and cylinders specified for doors in other sections.

CODES AND REFERENCES
Comply with the version year adopted by the Authority Having Jurisdiction.
ANSI A117.1 - Accessible and Usable Buildings and Facilities.
ICC/IBC - International Building Code.
NFPA 80 - Fire Doors and Windows.
NFPA 101 - Life Safety Code.
NFPA 105 - Installation of Smoke Door Assemblies.
UL/ULC and CSA C22.2 – Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
State Building Codes, Local Amendments.
Standards: All hardware specified herein shall comply with the following industry standards:
ANSI/BHMA Certified Product Standards - A156 Series
UL10C – Positive Pressure Fire Tests of Door Assemblies
Conform to Building Code requirements if more restrictive than those specified herein.
Notify Architect of difference prior to starting work.

SUBMITTALS
Provide in accordance with Section 01 33 00.
Product Data:
Submit three (3) copies of manufacturer's data for each item of finish hardware.
Submit manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
Hardware Schedule:
Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, and procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
Content: Include the following information:
Type, style, function, size, label, hand, and finish of each door hardware item.
Manufacturer of each item.
Fastenings and other pertinent information.
Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
Explanation of abbreviations, symbols, and codes contained in schedule.
Mounting locations for door hardware.
Door and frame sizes and materials.
Submittal Sequence: Submit three (3) copies of the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
Submit a keying schedule in accordance with the Owner's representative.
Shop Drawings:
Show details of electrified access control hardware indicating the following:
Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system

electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

Complete (risers, point-to-point) access control system block wiring diagrams.

Electrical Coordination: Coordinate with related Division 26 Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.

Keying Schedule:

Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

Operating and Maintenance Manuals:

Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required by Section 01 78 23. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

Warranties and Maintenance:

Special warranties and maintenance agreements specified in this Section.

QUALITY ASSURANCE

Hardware Supplier shall employ person qualified for membership in American Society of Hardware Consultants, who shall be available for consultation with Architect and Contractor during course of work.

Prior to final project acceptance supplier's representative shall make one field inspection and notify Architect if hardware installation complies with manufacturers instructions.

Prior to final project acceptance supplier's representative shall instruct Owner how to properly adjust and maintain hardware.

Manufacturers Qualifications:

Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

Installer Qualifications:

Approved by supplier.

Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

Door Hardware Supplier Qualifications:

Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity.

Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

Scheduling Responsibility: Preparation of door hardware and keying schedules.

Source Limitations:

Obtain each type and variety of Door Hardware specified in this Section from a single source, qualified supplier unless otherwise indicated.

Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

Regulatory Requirements:

Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and

labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
Door Closers: Comply with the following maximum opening-force requirements indicated:
Interior Hinged Doors: 5 lbf applied perpendicular to door.
Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
NFPA 101: Comply with the following for means of egress doors:
Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
Thresholds: Not more than 1/2 inch high
Keying Conference:
Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
Function of building, purpose of each area and degree of security required.
Plans for existing and future key system expansion.
Requirements for key control storage and software.
Installation of permanent keys, cylinder cores and software.
Address and requirements for delivery of keys.
Pre-Submittal Conference:
Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
Review sequence of operation narratives for each unique access controlled opening.
Review and finalize construction schedule and verify availability of materials.
Review the required inspecting, testing, commissioning, and demonstration procedures
At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

DELIVERY, STORAGE, AND HANDLING
Deliver to General Contractor for installation in original, unopened containers with legible labels intact.
Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".
Include complete set of specialized hardware maintenance and removal tools for Owner's use. Store where directed by Owner.
Protect against theft, damage, and discoloration

COORDINATION
Coordinate with other trades affecting or affected by work of this section.
Templates:
Furnish hardware templates for fabricators of doors, frames and other work to be factory prepared for hardware. Check shop drawings of such other work to confirm that adequate provisions will be made for installation of hardware.

Door Hardware and Electrical Connections:
Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
Door and Frame Preparation:
Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

WARRANTY
General Warranty:
Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
Warranty Period:
Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
Structural failures including excessive deflection, cracking, or breakage.
Faulty operation of the hardware.
Deterioration of metals, metal finishes, and other materials beyond normal weathering.
Electrical component defects and failures within the systems operation.
Standard Warranty Period:
One year from date of Substantial Completion, unless otherwise indicated.
Special Warranty Periods:
Ten years for mortise locks and latches.
Five years for exit hardware.
Twenty five years for manual surface door closers.
Two years for electromechanical door hardware.

MAINTENANCE SERVICE
Maintenance Tools and Instructions:
Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
Continuing Service:
Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original.

PART 2 - PRODUCTS

SCHEDULED DOOR HARDWARE
General:
Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
Designations:
Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
Substitutions:
Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

MATERIALS
Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than the following:
Mortise Locks: 57%
Exit Devices: 54%
Door Closers: 51%

BUTT HINGES
Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
Type: Mortise.
Sizes: Provide the following, unless otherwise scheduled, with hinge widths sized for door thickness and clearances required:
Widths up to 3'-0": 4-1/2" standard or heavy weight as specified.
Sizes from 3'-1" to 4'-0": 5" standard or heavy weight as specified.
Size Hinges to clear any projecting trim or other obstructions where necessary to obtain maximum possible door opening.
Quantity: Provide the following hinge quantity, unless otherwise scheduled:
Two Hinges: For doors with heights up to 60 inches.
Three Hinges: For doors with heights 61 to 90 inches.
Four Hinges: For doors with heights 91 to 120 inches.
For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
Out-swinging exterior doors.
Out-swinging access controlled doors.
Out-swinging lockable doors.
Provide non-rising loose pins at all other doors unless otherwise scheduled.
Acceptable Manufacturers:
Hager Companies (HA).
McKinney Products (MK).

POWER TRANSFER DEVICES
<u>Electrified Quick Connect Transfer Hinges:</u>
Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
Acceptable Manufacturers:
McKinney Products (MK) - QC (# wires) Option.
<u>Electric Door Hardware Cords:</u>
Provide electric transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
Acceptable Manufacturers:
McKinney Products (MK) – QC-C Series.
Provide one each of the following tools as part of the base bid contract:
McKinney Products (MK) - Electrical Connecting Kit: QC-R001.

McKinney Products (MK) - Connector Hand Tool: QC-R003.

MECHANICAL LOCKS AND LATCHING DEVICES

Cylindrical Locksets:

Grade 1 (Heavy Duty), ANSI/BHMA A156.2, Series 4000, Operational Grade 1 certified bored locksets furnished in the functions as specified in the Hardware Sets.

Locksets to be manufactured with a corrosion resistant, stamped 12 gauge minimum formed steel case and be field-reversible for handing without disassembly of the lock body.

Lockset trim (including levers, escutcheons, roses) to be the product of a single manufacturer. Furnish with standard 2 3/4" backset, 3/4" throw anti-friction stainless steel latchbolt, and a full 1" throw stainless steel bolt for deadbolt functions.

Manufacturer: Sargent Manufacturing (SA) – 10X Series, no substitutions (facility standard).

Lock Trim Design: As specified in Hardware Sets.

Mortise Locksets:

Grade 1 (Heavy Duty), ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified mortise locksets furnished in the functions as specified in the Hardware Sets.

Locksets to be manufactured with a corrosion resistant, stamped 12 gauge minimum formed steel case and be field-reversible for handing without disassembly of the lock body.

Lockset trim (including knobs, levers, escutcheons, roses) to be the product of a single manufacturer. Furnish with standard 2 3/4" backset, 3/4" throw anti-friction stainless steel latchbolt, and a full 1" throw stainless steel bolt for deadbolt functions.

Manufacturer: Sargent Manufacturing (SA) – 8200 Series, no substitutions (facility standard).

Lock Trim Design: As specified in Hardware Sets.

LOCK AND LATCH STRIKES

Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

Standards: Comply with the following:

Strikes for Mortise Locks and Latches: BHMA A156.13.

Strikes for Bored Locks and Latches: BHMA A156.2.

Strikes for Auxiliary Deadlocks: BHMA A156.5.

Dustproof Strikes: BHMA A156.16.

PUSH PLATES AND PULL BARS

ANS/BHMA A156.6 certified door pushes and pulls of type and design specified below or in the Hardware Sets.

Coordinate and provide proper width and height as required where conflicting hardware dictates.

Push/Pull Plates:

Thickness: Minimum .050 inch thick.

Size: As indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.

Door Pull and Push Bar: Design, size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.

Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.

Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

Acceptable Manufacturers:

Rockwood Manufacturing (RO).

Trimco (TC).

CYLINDERS AND KEYING

General:

Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

Source Limitations:

Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit

devices, unless otherwise indicated.

Cylinders

Original manufacturer cylinders complying with the following:

Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.

Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.

Bored-Lock Type: Cylinders with tailpieces to suit locks.

Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.

Keyway: Manufacturer's Standard.

High Security Cylinders:

High security cylinder conforming to UL437, including both pick and drill resistance.

Pick resistance incorporates two or more independent locking mechanisms including a pin tumbler device with six top pin chambers, mushroom-shaped driver pins, and coded sidebar locking mechanism operated independently from the six top pin tumbler device.

Drill resistance incorporates cylinder housing with fixed case-hardened inserts protecting the pin tumbler shear line, cylinder plugs with case-hardened inserts protecting both the pin tumbler shear line and the side bar, mushroom-shaped stainless steel driver pins, and stainless steel sidepins.

Factory key cylinders.

Acceptable Manufacturers: Medeco (MC) – M3 Series.

Keying System:

All Keying shall be part of Contractor's scope. Contractor to subcontract with Owner's locksmith, Oregon Lock. Each type of lock and cylinders to be keyed by Owner's locksmith.

Conduct specified "Keying Conference" to define and document keying system instructions and requirements.

Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.

Incorporate decisions made in keying conference, and as follows:

Master Key System: Cylinders are operated by a change key and a master key.

Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.

Great-Grand Master Key System: Cylinders are operated by a change key, a master key, a grand master key, and a great-grand master key.

Existing System: Master key or grand master key locks to Owner's existing system.

Keyed Alike: Key all cylinders to same change key.

Key Quantity:

Provide the following minimum number of keys:

Top Master Key: One (1)

Change Keys per Cylinder: Two (2)

Master Keys (per Master Key Group): Two (2)

Grand Master Keys (per Grand Master Key Group): Two (2)

Construction Keys (where required): Ten (10)

Construction Control Keys (where required): Two (2)

Permanent Control Keys (where required): Two (2)

Construction Keying:

Provide construction master keyed cylinders or temporary keyed construction cores where specified.

Provide construction master keys in quantity as required by project Contractor. Replace construction cores with permanent cores.

Furnish permanent cores for installation as directed under specified "Keying Conference".

Key Registration List:

Provide keying transcript list to Owner's representative.

Key Control Software:

Provide one network version of "Key Wizard" branded key management software package that includes one year of technical support and upgrades to software at no charge. Provide factory key system formatted for importing into "Key Wizard" software.

CONVENTIONAL EXIT DEVICES

General:

All exit devices specified herein shall meet or exceed the following criteria:

At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and

labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.

Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is not acceptable except in any case where the door light extends behind the device as in a full glass configuration.

Flush End Caps: Provide heavy weight impact resistant flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.

Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty trim with cold forged escutcheons, beveled edges, and four threaded studs for thru-bolts.

Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets. Provided free-wheeling type trim where indicated.

Where function of exit device requires a cylinder, provide an interchangeable core type keyed cylinder (Rim or Mortise) as specified in Hardware Sets.

Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.

Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

Rail Sizing: Provide exit device rails factory sized for proper door width application.

Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

Conventional Push Rail Exit Devices (Heavy Duty):

Conform to ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets.

Mounting rails to be formed from smooth stainless steel, brass or bronze architectural materials no less than 0.072" thick, with push rails a minimum of 0.062" thickness.

Painted or aluminum metal rails are not acceptable.

Exit device latch to be investment cast stainless steel, pullman type, with deadlock feature.

Acceptable Manufacturers: Sargent Manufacturing (SA) - 80 Series, no substitutions (facility standard).

Tube Steel Removable Mullions:

Conform to ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.

Provide keyed removable feature, stabilizers, and mounting brackets as specified in the Hardware Sets.

At openings designed for severe wind load conditions due to hurricanes or tornadoes, provide manufacturers approved mullion and accessories to meet applicable state and local windstorm codes.

Acceptable Manufacturers:

Sargent Manufacturing (SA).

ELECTROMECHANICAL EXIT DEVICES

Electrified Conventional Push Rail Devices (Heavy Duty):

Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified below.

Acceptable Manufacturers: Sargent Manufacturing (SA) - 80 Series, no substitutions (facility standard).

Electrified Options:

As indicated in hardware sets, provide electrified exit device options including: electric latch retraction (shall be motorized type that fully retracts the touchpad/push bar), electric dogging, outside door trim control, exit alarm, delayed egress, latchbolt monitoring, lock/unlock status monitoring, touchbar monitoring and request-to-exit signaling.

Unless otherwise indicated, provide electrified exit devices standard as fail secure.

DOOR CLOSERS

General:

Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size.

Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
Unless specified elsewhere, do not restrict door swing.
Fasteners: Concealed.
Standards:
Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
Cycle Testing:
Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
Size of Units:
Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
Closer Arms:
Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
Provide drop plates or other accessories as required for proper mounting.
Closer Accessories:
Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.
Door Closers, Surface Mounted (Heavy Duty):
Conform to ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force.
Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.
Provide non-handed units standard.
Acceptable Manufacturers: Sargent Manufacturing (SA) - 351 Series, no substitution, (facility standard).

AUTOMATIC DOOR OPERATORS
Refer to section 08 71 13.

DOOR PROTECTIVE TRIM:
Metal Protection Plates:
ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), beveled on four edges (B4E), fabricated from the following:
- Stainless Steel: 300 series, 050-inch thick, with countersunk screw holes (CSK).
- Brass or Bronze: 050-inch thick, with countersunk screw holes (CSK).
- Laminate Plastic or Acrylic: 1/8-inch thick, with countersunk screw holes (CSK).

Door protective trim units to be of type and design as specified below or in the Hardware Sets.
Size: Not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side.
Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
Fasteners:
Provide manufacturer's designated fastener type as specified in the Hardware Sets.
Acceptable Manufacturers:
Rockwood Manufacturing (RO).
Trimco (TC).

DOOR STOPS AND HOLDERS

Door Stops and Bumpers:

ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers.

Provide wall bumpers with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets.

Do not mount floor stops where they will impede traffic.

Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

Acceptable Manufacturers:

Rockwood Manufacturing (RO).

Trimco (TC).

DOOR SILENCERS

At Metal Frames: Glynn Johnson #64, or accepted substitute.

Three silencers for single doors, 4 for pairs of doors.

ARCHITECTURAL SEALS

General:

Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets.

Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated.

At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

Sound-Rated Gasketing:

Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

Replaceable Seal Strips:

Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

Acceptable Manufacturers: Pemko Manufacturing (PE).

Threshold:

Extruded aluminum, maximum 1/2 inch height, mill finish unless otherwise scheduled.

ELECTRONIC ACCESSORIES

Proximity Card Readers:

Card readers to support HID 125 kHz proximity technology or 13.56 MHz contactless smart cards as specified in the hardware sets.

Provide hard wired signal connection.

Card readers to meet the following minimum design and performance specifications:

Reader power supply: 4-16 VDC.

Reader to be suitable for outdoor use.

Contactless smart card versions to be compatible with the following technologies: iCLASS, iCLASS Seos, iCLASS SE, ISO1443B UID, Mifare, Mifare Plus, Desfire SE, Desfire EV1, NFC

Reader to come pre-paired with an Aperio hub and communicate with the hub via IEEE802.14.4 (2.4 GHz) wireless technology.

Reader to have green LED status indicator.

Reader type and model to meet the design and mounting applications needs of each entry point as indicated on the drawings.

Acceptable Manufacturers: HID (HD) – multiclass SE Series.

Access Control Panels: S2 MicroNode Plus.

Power Supplies:

Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies.

Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure.

Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

Acceptable Manufacturers: Securitron (SU) - BPS Series, Sargent, LSP-12-24.

FASTENERS
Provide required screws, bolts, and other fasteners.
Match hardware material and finish.
Use phillips head type where exposed to view.

KEYS
Material: Nickel-silver, or approved.
Keying Instructions: Masterkey and otherwise key locks as directed by Owner.
Number of keys required: Furnish 2 keys for each lock unless otherwise instructed.

FABRICATION
Make hardware for prefitted doors and frames to template. Send templates, together with hardware schedule, to door and frame manufacturer not later than two weeks after hardware schedule approval.
Lock and latch components shall be manufactured by only one manufacturer, and carry that manufacturer's warranty.
Fabricate joints with smooth, hair-line seams.
Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

FINISHES
Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
Finish unless otherwise scheduled: BHMA No. 626 (US26D) satin chrome except:
Door Closers: Spray painted to match hardware color.
Thresholds: As listed.
Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive finish hardware are properly prepared, including necessary backing.
Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
Wood Doors: Comply with ANSI/DHI A115-W series.
Provide solid blocking for all wall stops.
Fasteners: Use fastening devices as needed to securely anchor all hardware per manufacturer's templates. Self tapping sheet metal screws are not acceptable. Closers on wood doors shall be through bolted.

INSTALLATION
General:
Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
Accurately locate, fit, and install square, plumb, and secure in accordance with manufacturer's directions and templates.
Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and

seals.
After fitting mortised hardware to surfaces to be painted remove and store hardware in original package until painting completion, then permanently install.
Mounting Heights:
Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

Retrofitting:
Install door hardware to comply with manufacturer's published templates and written instructions.
Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections.
Do not install surface-mounted items until finishes have been completed on substrates involved.
Thresholds:
Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
Storage:
Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

FIELD QUALITY CONTROL
Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

ADJUSTING
Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit.
Replace units that cannot be adjusted to operate as intended.
Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
Adjust moving parts to operate satisfactorily at time of final project acceptance and during warranty period.

CLEANING AND REPAIRING
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.
Remove debris from project site upon work completion or sooner, if directed.
Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

DEMONSTRATION
Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes.

PROTECTION
Protect other surfaces against damage and discoloration caused by work of this section.

HARDWARE SCHEDULE
The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule.
Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process.

Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
Manufacturer's Abbreviations:

MK - McKinney
MR - Markar
PE - Pemko
RO - Rockwood
SA - Sargent
MC - Medeco
GR – George Risk Industries
SU – Securitron
NO – Norton
RF - Rixon
HD - HID

Hardware Sets

Set: 1.0

Doors: 1103A, 1106B, 1108A, 1109A, 1111A, 1115A, 1163B, 1164A, 1165A, 1167A, 1168A, 1169A, 1170A, 1172A, 1514A, 1520A

2 Hinge, Full Mortise	T4A3386xNRP 5" x 4-1/2"	US32D	MK
1 Hinge, Full Mortise	T4A3786 NRP QC12 4-1/2" x 4-1/2"	US32D	MK
1 Fail Secure Lock	RX-LC-10XG71-LL	US26D	SA
1 Medeco Cylinder X3	Verify with Owner	26	MC
1 Door Closer	351 P10/O	689	SA
1 Kick Plate	K1050 10X1.5LDW CSK B4E	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S773D		PE
1 Door Harness	QC-300P		MK
1 Frame Harness	QC-C1500P		MK
1 Door Position Switch	180 Series		GR
1 Card Reader	MultiCLASS SE RP40		HD
1 Power Supply	LSP-12-24		SA
2 Battery Backup	B-24-5		SU

Notes:

Fail secure electric lock. Integral RX switch in lock.
Presenting valid credentials retracts latch to allow entry, depressing opens door.
Free egress allowed at all times.
One power supply to operate all doors.

Set: 2.0

Doors: 1102A, 1120A, 1126A, 1134A, 1143C, 1144A, 1145A, 1150A, 1151A

3 Hinge, Full Mortise	T4A3386xNRP 5" x 4-1/2"	US32D	MK
1 Passage Lock	10XU15-LL	US26D	SA
1 Electric Strike	HES 1500		SU
1 Kick Plate	K1050 10X1.5LDW CSK B4E	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S773D		PE
1 Power Door Operator	See section 08 71 13		
1 Frame Harness	QC-C1500P		MK
1 Door Position Switch	180 Series		GR

Notes:
Latch retraction manually or via power door operator.
Free egress allowed at all times.

Set: 3.0

Doors: 1106A, 1117A, 1163A, 1166A, 1171A, 1501A, 1502A, 1517A, 1523A

2 Hinge, Full Mortise	T4A3386xNRP 5" x 4-1/2"	US32D	MK
1 Hinge, Full Mortise	T4A3786 NRP QC12 4-1/2" x 4-1/2"	US32D	MK
1 Fail Secure Lock	RX-LC-10XG71-LL	US26D	SA
1 Medeco Cylinder X3	Verify with Owner	26	MC
1 Door Closer	351 P10/O	689	SA
1 Kick Plate	K1050 10X1.5LDW CSK B4E	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S773D		PE
1 Door Harness	QC-300P		MK
1 Frame Harness	QC-C1500P		MK
1 Door Position Switch	180 Series		GR
1 Card Reader	MultiCLASS SE RP40		HD
1 Power Door Operator	See section 08 71 13		

Notes:
Fail secure electric lock. Integral RX switch in lock.
Presenting valid credentials retracts latch to allow entry, depressing opens door.
Free egress allowed at all times.
One power supply to operate all doors.

Set: 4.0

Doors: 1104A, 1105A

3	Hinge, Full Mortise	TA2714 (NRP)	US26D MK
1	Privacy Lock w/Occupancy Indicator	V21 8265 LNL	US26D SA
1	Electric Strike	HES 1500	SU
1	Kick Plate	K1050 10X1.5LDW CSK B4E	US32D RO
1	Wall Stop	403	US26D RO
1	Gasketing	S773D	PE
1	Frame Harness	QC-C1500P	MK
1	Door Harness	QC-300P	MK
1	Power Door Operator	See section 08 71 13	
1	Door Position Switch	180 Series	GR
1	Card Reader	MultiCLASS SE RP40	HD

Notes:
Presenting valid credentials retracts exit device latches to allow entry, depressing opens door.
Free egress allowed at all times.
Remote entry from Reception rooms. Thumb turn latched will disable card reader/remote entry.
Emergency key will override thumb turn.

Set: 5.0

Doors: 1107A, 1112A, 1113A, 1114A, 1121A, 1122A, 1123A, 1124A, 1125A, 1130A, 1131A, 1135A, 1136A, 1137A, 1143B, 1145B, 1153A, 1154A, 1155A, 1505A

3	Hinge, Full Mortise	T4A3786 (NRP)	US26D MK
1	Passage Latchset	10XU15-LL	US26D SA
1	Wall Stop	403	US26D RO
1	Kick Plate	K1050 10X1.5LDW CSK B4E	US32D RO
1	Gasketing	S773D	PE

Set: 6.1

Doors: 1110A, 1119A, 1119D, 1119E, 1141A, 1141D, 1141E

3	Hinge, Full Mortise	TA2714 (NRP)	US26D MK
1	Privacy Lock w/Occupancy Indicator	V21 8265 LNL	US26D SA
1	Electric Strike	HES 1500	SU
1	Frame Harness	QC-C1500P	MK ⚡
1	Power Door Operator	See section 08 71 13	
1	Kick Plate	K1050 10X1.5LDW CSK B4E	US32D RO
1	Wall Stop	403	US26D RO
1	Gasketing	S773D	PE

Notes:
Door opens when power door operator is depressed unless door is locked from inside.
Free egress allowed at all times.

Set: 6.2

Doors: 1138A, 1139A, 1161A

1	Privacy Lock w/Occupancy Indicator	V21 8265 LNL	US26D	SA
1	Electric Strike	HES 1500		SU
1	Frame Harness	QC-C1500P		MK ⚡
1	Power Door Operator	See section 08 71 13		
1	Kick Plate	K1050 10X1.5LDW CSK B4E	US32D	RO
1	Gasketing	S773D		PE

Reuse balance of existing hardware.

Notes:
Door opens when power door operator is depressed unless door is locked from inside.
Free egress allowed at all times.

Set: 6.3

Doors: 1119B, 1119C, 1119F, 1119G, 1119H, 1141B, 1141C, 1141F, 1141G, 1141H

2	Hinge, Full Mortise	T4A3386 (NRP)	US32D	MK
1	Spring Hinge, Full Mortise	1552	US32D	MK
1	Privacy Lock w/Occupancy Indicator	V21 8265 LNL	US26D	SA
1	Overhead Stop	698S	US32D	SA
1	Kick Plate	K1050 10X1.5LDW CSK B4E	US32D	RO
1	Gasketing	S773D		PE

Set: 6.4

Doors: 1156A, 1157A

2	Hinge, Full Mortise	T4A3386 (NRP)	US32D	MK
1	Spring Hinge, Full Mortise	1552	US32D	MK
1	Privacy Lock w/Occupancy Indicator	V21 8265 LNL	US26D	SA
1	Wall Stop	403	US26D	RO
1	Kick Plate	K1050 10X1.5LDW CSK B4E	US32D	RO
1	Gasketing	S773D		PE

Set: 7.1

Doors: 1127A

1	Passage Latchset	10XU15-LL	US26D	SA

Reuse balance of existing hardware.

Set: 7.2
Doors: 1128A, 1129A, 1142A, 1147A, 1152A, 1156B, 1157B

1 Passage Lock	10XU15-LL	US26D	SA
1 Electric Strike	HES 1500		SU
1 Kick Plate	K1050 10X1.5LDW CSK B4E	US32D	RO
1 Gasketing	S773D		PE
1 Power Door Operator	See section 08 71 13		
1 Frame Harness	QC-C1500P		MK
1 Door Position Switch	180 Series		GR

Reuse balance of existing hardware.

Set: 8.0
Doors: 1132A, 1133A, 1140A

1 Storeroom Lock	RGD-LC-10XG04-LL	US26D	SA
1 Medeco Cylinder X3	Verify with Owner	26	MC

Reuse balance of existing hardware.

Set: 9.0
Doors: 1143A

4 Hinge, Full Mortise	T4A3386xNRP 4-1/2" x 4-1/2"	US32D	MK
2 Hinge, Full Mortise	T4A3386 NRP QC12 4-1/2" x 4-1/2"	US32D	MK
1 Removable Mullion	L980S w/ 10W0200 (verify)	PC	SA
1 Exit Device, Fail Secure	55 56 8874 ETL	US32D	SA
1 Exit Device (exit only)	55 56 8810	US32D	SA
1 Medeco Cylinder X3	Verify with Owner	26	MC
1 Drop Plate	351D	US32D	SA
1 Door Closer	351 P10/O	689	SA
2 Kickplate	K1050 10X1.5LDW CSK B4E	US32D	RO
1 Power Door Operator	See section 08 71 13		
2 Frame Harness	QC-C1500 (as required)		MK
2 Door Harness	QC-C__ (as required)		MK
2 Door Position Switch	180 Series		GR
1 Card Reader	MultiCLASS SE RP40		HD

Notes:
Presenting valid credentials retracts exit device latches to allow entry, depressing opens door.
Free egress allowed at all times.
REX switch (55) included in exit device bars.
One power supply to operate all doors.
Threshold and weatherstripping by aluminum door and frame supplier.

Set: 10.0
Doors: 1145C

6 Hinge, Full Mortise	T4A3786xNRP 4-1/2" x 4-1/2"	US26D	MK
1 Removable Mullion	L980S w/ 10W0200 (verify)	PC	SA
2 Exit Device, Passage	8815 ETL	US26D	SA
2 Door Closer	351 P10/O	689	SA
2 Kickplate	K1050 10X1.5LDW CSK B4E	US32D	RO
2 Wall Stop	403	US26D	RO
1 Gasketing	S773D		PE

Set: 11.0
Doors: 1159A

3 Hinge, Full Mortise	T4A3786 (NRP)	US26D	MK
1 Exit Device, Exit Only	8810	US26D	SA
1 Door Closer	351 P10/O	689	SA
1 Kick Plate	K1050 10X1.5LDW CSK B4E	US32D	RO
1 Wall Stop	403	US26D	RO
1 Gasketing	S773D		PE

Set: 12.0
Doors: 1500A, 1500B

4 Hinge, Full Mortise	T4A3386xNRP 4-1/2" x 4-1/2"	US32D	MK
2 Hinge, Full Mortise	T4A3386 NRP QC12 4-1/2" x 4-1/2"	US32D	MK
1 Removable Mullion	L980S w/ 10W0200 (verify)	PC	SA
1 Exit Device	55 56 8804 ETL	US32D	SA
1 Exit Device (exit only)	55 56 8810	US32D	SA
1 Medeco Cylinder X3	Verify with Owner	26	MC
1 Drop Plate	351D	US32D	SA
1 Door Closer	351 P10/O	689	SA
2 Kickplate	K1050 10X1.5LDW CSK B4E	US32D	RO
1 Power Door Operator	See section 08 71 13		
2 Frame Harness	QC-C1500 (as required)		MK
2 Door Harness	QC-C__ (as required)		MK
2 Door Position Switch	180 Series		GR

Notes:
Exit devices to have manual hex dog down.
Latch retraction manually or via power door operator.
Free egress allowed at all times.

Set: 13.0

Doors: 1510A, 1540A

2 Frame Harness	QC-C1500 (as required)		MK
2 Door Position Switch	180 Series		GR
1 Card Reader	MultiCLASS SE RP40		HD
Reuse balance of existing hardware.			

Notes:
Existing double doors with existing Power Door Operators.
Presenting valid credentials retracts lever to allow entry.
Free egress allowed at all times.
See hardware set 1.0 for power supply.

Set: 14.0

Doors: 1530A

1 Exit Device	8804 ETL	US32D	SA
1 Medeco Cylinder X3	Verify with Owner	26	MC
1 Frame Harness	QC-C1500 (as required)		MK
1 Door Position Switch	180 Series		GR
1 Card Reader	MultiCLASS SE RP40		HD
1 Power Door Operator	See section 08 71 13		
1 Electric Strike	HES 1500		SU
Reuse balance of existing hardware.			

Notes:
Existing exterior single door.
Presenting valid credentials retracts exit device latch to allow entry, depressing opens door.
Free egress allowed at all times.
See hardware set 1.0 for power supply.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Automatic operating equipment, hardware, and accessories to operate entrance doors of the swing or horizontal sliding type not specifically supplied as part of a proprietary door or entrance assembly.

SUBMITTALS
Provide in accordance with Section 01 33 00.
Shop Drawings:
Submit showing layout, profiles, product components including anchorage, accessories, finish and glazing details.
Product Data:
Submit three (3) copies of manufacturer's data for each item of automatic operating equipment.
Templates:
Furnish hardware templates for fabricators of doors, frames and other work to be factory prepared for equipment hardware. Upon request, check shop drawings of other work so that adequate provisions will be made for installation of hardware.

INSTALLER'S QUALIFICATIONS
Factory trained, experienced to perform work of this section and approved by supplier.

SOURCE LIMITATIONS
Obtain automatic door operators through one source from a single manufacturer.

REGULATORY REQUIREMENTS
Conform to Building Code requirements if more restrictive than those specified herein.
Notify Architect of difference prior to starting work.
Conform to ADAAG requirements for accessibility.

DELIVERY, STORAGE, AND HANDLING
Deliver in original, unopened containers with legible labels intact.
Include complete set of specialized hardware maintenance and removal tools, if any, for Owner's use. Store tools where directed by Owner.
Protect against theft, damage, and discoloration.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

DOOR OPERATORS
Manufacturer and Model: MS Sedco "216 Series", or accepted substitute.
Regulatory Standard: Conform to ANSI A156.19.
Type: Extra heavy duty, surface mounted, box recessed in wall.
System Operation: Dual operation modes; push button automatic operation mode and manual "Push-N-Go" mode.
Electrical Requirements: 120V, 60 Hz, 1-phase, 10 amps for doors with operated pairs and 5 amps for single doors.
Adjustment: Door open time adjustable and opening angle adjustable 80° to 135°.
Fasteners: Concealed.
Warranty: Manufacturer's standard 1 year warranty.

ACTIVATING DEVICES
Type: Infrared touchless technology. Hard-wired, conforming to ANSI Safety Standard A117.1.
Push Plate: #216, 4½" square stainless steel, wall mounted. Engrave plates with international symbol of accessibility and "Wave To Open".

MATERIAL AND FINISHES
Extruded Aluminum: 1/8" thickness, ASTM B221, 6063-T5 alloy and temper, anodized.

Finish: AA-M12C22A41, Class I, clear anodized color.

ACCESSORIES
C1633-3 decals on both sides of door panel per manufacturer’s instructions.

FASTENERS
Provide required screws, bolts, and other fasteners.
Match hardware material and finish.
Use phillips head type where exposed to view.

FABRICATION
Components shall be manufactured by only one manufacturer, and carry that manufacturer's warranty.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive automatic door equipment are properly prepared, including necessary backing.
Prior to staring work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
Provide solid backing automatic door equipment mounting.
Fasteners: Use fastening devices as needed to securely anchor all equipment per manufacturer's templates.

INSTALLATION
Accurately locate, fit, and install square, plumb, and secure in accordance with manufacturer's directions and templates.
Separate aluminum materials and other corrodible surfaces from sources of corrosion or electrolytic action according to AAMA 101.
Install header and framing members in a bed of sealant or with joint filler gaskets. Coordinate installation with wall flashings and other components of construction.

ADJUSTING
Adjust moving parts to operate satisfactorily at time of final project acceptance and during warranty period.

CLEANING AND REPAIRING
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.
Remove temporary coverings and protection of adjacent work areas.
Remove debris from project site upon work completion or sooner if directed.
Clean product surfaces and lubricate operating equipment for optimum condition and safety.

DEMONSTRATION
Instruct Owner's personnel in proper adjustment and maintenance of equipment and equipment finishes.

PROTECTION
Protect other surfaces against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Shop or site installed glass or plastic, and glazing methods.

REFERENCES
Glass Association of North America (GANA) formerly Flat Glass Marketing Association (FGMA): Glazing Manual.
IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
American National Standards Institute (ANSI): ANSI Z97.1.
Safe Glass Standard: CPSC 16 CFR 1201.
Federal Specifications:
DD-G-451D: Glass, Plate, Sheet Figured (Flat, for Glazing, Mirrors, and other uses).
DD-G-1403B: Glass, Plate (Float), Sheet, Figured, and Spandrel (Heat Strengthened and Fully Tempered).
DD-M-00411b & Am-1: Mirrors, Glass.

PERFORMANCE REQUIREMENTS
Watertight and airtight installation or each piece of glass is required unless otherwise shown. Each installation must withstand normal temperature changes, wind loading, and impact loading (for operating doors) without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.
Comply with Building Code requirements for maximum allowable air infiltration.

SUBMITTALS
Submit in accordance with Section 01 33 00.
Product Data:
Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.
Provide data on glazing sealant. Identify colors available.
Samples:
Submit two samples, 12 X 12 inches in size, illustrating glass unit color and design.
Certificates:
Submit sealed glass unit manufacturer's certificate indicating units meet or exceed specified requirements.

ENVIRONMENTAL REQUIREMENTS
Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40° F (4.4° C).
Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

DELIVERY, STORAGE, AND HANDLING
Schedule glass delivery to coincide with glazing schedules.
Original labels, showing manufacturer, quality, and thickness required for each piece of glass except where label must be removed for glass-cutting.
Deliver other glazing materials in original containers, manufacturer's original legible labels thereon.
Protect against damage and discoloration.

WARRANTY
Manufacturer’s Special Warranty for Coated Glass Products:
Manufacturer’s standard form, made out to Owner and signed by coated glass manufacturer agreeing to

replace coated glass units that deteriorate within specified warranty period.
Warranty Period: Ten (10) years from date of substantial completion. Glass manufacturer shall warrant that any glass that is not edge deleted will not develop loss of adhesion with insulating glass or structural glazing sealants for a period of ten (10) years.
Manufacturer's Special Warranty on Insulating Glass:
Manufacturer's standard form, made out to Owner and signed by insulating glass manufacturer agreeing to replace insulating glass units that deteriorate within the specified warranty period.
Warranty period: Ten (10) years from date of Substantial Completion.
Manufacturer's Special Warranty on Laminated Glass:
Manufacturer's standard form, made out to Owner as signed by laminated glass manufacturer agreeing to replace laminated glass units that deteriorate within the specified warranty period.
Warranty period: Five (5) years from date of Substantial Completion.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

MANUFACTURERS
Provide coated glass units that are the products of one of the following coated glass manufacturers:
- Guardian Industries, Inc.
- Vitro Architectural Glass, Inc.
- Viracon.

FABRICATORS
Provide insulating glass units fabricated by firm certified by coated glass manufacturer.

SOURCE LIMITATIONS
Provide coated glass through a single source from a single coated glass manufacturer.
Provide insulating glass units fabricated by a single firm.

PRODUCT REQUIREMENTS
In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
- Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
- Products: Subject to compliance with requirements, provide one of the products specified.
- Product: Subject to compliance with requirements, provide product specified.
- Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
- Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
- Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

GLASS PRODUCTS
Glazing Publications:
Comply with published recommendations of glass product manufacturers and organizations listed in REFERENCES article above.
Safety Glazing Labeling:
Permanently mark glazing with certification label of the SGCC.
Insulating-Glass Certification Program:
Permanently marked with appropriate certification label of IGCC.
Thickness:
Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
Minimum Glass Thickness for Exterior Lites:

6 mm. Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed requirements.
Strength:
Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

ANNEALED FLOAT GLASS
Clear Float Glass: Manufacturing Standard: ASTM C1036 Type I, Class 1, Quality: q3 - Glazing Select.
Ultraclear Float Glass: ASTM C1036 Type I, Class 1, Quality: q3 - Glazing Select, and with visible light transmission of not less than 91 percent and solar heat gain coefficient of not less than 0.87.

FULLY TEMPERED FLOAT GLASS
Manufacturing Standard: ASTM C 1048, Type I, Class 1 (clear), Quality q3, Kind FT.
Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
Roll Wave Maximum Distortion Tolerance: .003 inch target with .005 inch maximum peak to valley measurement.
Bow and Warp Maximum Tolerance: 50 percent of the maximum allowed in ASTM C 1048.

HEAT-STRENGTHENED FLOAT GLASS
Manufacturing Standard: ASTM C 1048, Type I, Class 1 (clear), Quality q3, Kind HS.
Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
Roll Wave Maximum Distortion Tolerance: .003 inch target with .005 inch maximum peak to valley measurement.
Bow and Warp Maximum Tolerance: 50 percent of the maximum allowed in ASTM C 1048

INSULATING GLASS
Manufacturing Standard: ASTM E 2190.
Type: Hermetically sealed units with dehydrated air space, dual sealant, and argon gas fill.
Coatings: Comply with ASTM C1376.
Glass Layers: 2
Interspace Thickness: 1/2 inch.
Edge Sealant Material: Primary Seal: Polyisobutylene (PIB); Secondary Seal: Silicone.
Spacer Material: Aluminum.
Spacer Color: Clear Anodized.
Edge Deletion: Delete low E prior to fabrication of insulating units according to coated glass manufacturer’s instructions.

INSULATING GLASS UNIT TYPES
General:
Type: Low-E-coated, clear (low-iron) insulating safety glass.
Overall Unit Thickness: 1 inch.
Minimum Thickness of Each Glass Lite: 6 mm.
Low-E Coating: Sputtered on third surface.
Interspace Content: Argon.
Winter Nighttime U-Factor, Visible Light Transmittance, and Solar Heat Gain Coefficient to match glazing systems below.
Insulating Glass Units:
Outdoor Lite: ¼” thick, match existing tint.
Indoor Lite: ¼” Solarban 70XL on clear annealed float glass, tempered where noted.

LAMINATED SAFETY GLASS
Fabricated from two lites of Type I, Class I, quality q3 glass laminated together with a clear vinyl

interlayer.
Glass: 1/8 inch thick each lite, ASTM C1036, ASTM C1072.
Laminate Interlayer: Saflex interlayer by Monsanto, or approved, in accordance with CPS 16 CFR 1201, Catagory II Safety Glazing Standard and UL 972 Burglary rating.
Thickness: .060 inches.

ONE-WAY MIRROR REFLECTIVE GLASS
Type: Mirror quality float glass with pyrolytic (hard coat) type coating located on high light level surface of glass; ASTM C1376.
Applications: Locations as indicated on drawings.
Thickness: 1/4 inch (6 mm).
Glass Tint: Grey.
Glass Type: Annealed.
Lighting Ratio: Maintain at least 8:1 lighting level ratio between coated side (bright-observed side) and uncoated side (dim-observer side).
Glazing Method: Gasket glazing.
Manufacturers: Pilkington North America Inc; Pilkington Mirropane Transparent Mirror or accepted substitute.

MIRROR GLASS
Type: Type I, Class 1, Quality q2.
Thickness: 3/16 inch thick for sizes less than 10 square feet and ¼ inch thick for sizes 10 square feet and larger.
Silvering: Silver coating with electrolytic copper plating conforming to Fed Spec. DD-M-411.
Coating Protection: Two coats clear varnish applied over copper backing and edges.
Bottom Channel:
"J" channel, extruded aluminum with clear anodized finish.
Manufacturer: U.S. Aluminum, model MM250.

GLAZING SEALANTS
Type: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
Manufacturer: Dow Corning Corporation; 799, GE Advanced Materials-Silicones; UltraGlaze SSG4000 or UltraGlaze SSG4000AC, Tremco Incorporated; Proglaze SSG or Tremsil 600.
Applications: General applications in glazing installation including perimeter; use non-staining formula at absorbent perimeter applications.

GLAZING GASKETS
Type: As specified below and recommended by manufacturer for conditions of use.
For Wood and Hollow Steel Work: Butyl tape.
For Aluminum Sections: Silicone conforming to ASTMC1115 or EPDM conforming to ASTM C864, extruded bead compatible with the silicone sealant or other recommended by Section manufacturer.
For Insulating Glass: Type compatible with edge sealant and recommended by insulating glass fabricator.

SETTING BLOCKS
Material: Neoprene rubber with 70-90 Shore "A" durometer hardness, and compatible with glazing compound and sealant.
Size: Fabricate wider than glass unit thickness and long enough to support glass without excessive pressure on glass edge.

PART 3 - EXECUTION

EXAMINATION
Verify that openings to be glazed are accurately sized and located, and free of fasteners and other projections which will interfere with glazing.
Verify that glazing surfaces are free of moisture, dirt, grease, oil or other deleterious substances.
Verify that steel or wood glazing rabbets and any contacting dissimilar materials are painted.
Prior to starting work notify General Contractor of defects requiring correction.

Do not start work until conditions are satisfactory.

PREPARATION

Verify opening dimensions prior to fabrication; allow for glass-edge clearances.
If field measurements differ slightly from drawing dimensions modify work as required for accurate fit. If measurements differ substantially notify Architect prior to fabrication.
Prior to starting work, clean, dry, and remove protective coatings from glass and surfaces to be glazed.

INSTALLATION, GENERAL

Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
Allow for glass expansion and contraction.
Do not impact glass against framing.
Install setting blocks placed at sill quarter points unless identified other by submitted stamped structural calculations.
Install glass larger than 5 square feet with setting blocks placed at sill quarter points unless identified other by submitted stamped structural calculations.
Install glass surface waves running horizontal.
Shift glass with suction cups; do not use pry bar.
Clean inside faces of double glazed openings before setting glass in place.

INSULATING GLASS INSTALLATION

Remove identity labels immediately after installation; save for Architect's review.
Follow glazing specification for sealed insulating glass units, SIGMA No. 70-7-1.

MIRROR INSTALLATION

Install mirrors plumb, level, after finish painting is completed, and with open ventilation space behind.
Install with bottom "J" channel secured to wall framing with concealed fittings and tamperproof mountings and mastic adhesive elsewhere.
Provide mastic in coverage as recommended by manufacturer.

CLEANING AND REPAIRING

Remove excess glazing compound from glass and surrounding work.
Final glass cleaning specified in Section 01 74 23.
Remove debris from project site upon work completion or sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.

PROTECTION

Protect materials of other trades against damage or discoloration caused by work of this section.
Protect installed glazing against breakage and staining.
Cure glazing sealants in compliance with manufacturer's instructions and recommendations to obtain high early bond strength and surface durability.
Protect exterior glass from breakage immediately upon installation, by attachment of crossed streamers held away from glass.
Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during the construction period, including pieces damaged through natural causes, accidents, and vandalism.

GLAZING SCHEDULE

See Window Schedule on Drawings.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Light gage metal framing, acoustical treatment, gypsum board with paper or vinyl facings, and finishing of board joints.

REFERENCES
Conform to Recommended Specifications for the Application and Finishing of Gypsum Board, GA-216-1989, and "Recommended Specification: Levels of Gypsum Board Finish" as modified and supplemented herein.
Recommended material and methods are mandatory; those proposed by Contractor as equal or equivalent must be accepted by Architect.
Referenced Specifications may be obtained from Gypsum Association, 810 1st Street NE, Suite 510, Washington D.C. 20002; 310 277-8686.

PERFORMANCE REQUIREMENTS
Maximum ceiling deflection: 1/360 of span.
Maximum deviation from true plane: 1/8 inch per 10 ft. and 1/16 inch in any running foot.

REGULATORY REQUIREMENTS
Where fire-rated ceilings are noted, construct to obtain specified rating as listed and rated by Underwriter's Laboratories (UL).

DELIVERY, STORAGE, AND HANDLING
Deliver products to site with manufacturer's original labels intact and legible.
Identify fire-rated materials with testing agency label.
Protect gypsum materials against damage and discoloration and metal materials against rust.
Do not stack gypsum board with long lengths overhanging shorter lengths.
Do not overload floor system with stockpiled materials.
Indicate adhesive "open time" on adhesive container label.

ENVIRONMENTAL CONDITIONS
Maintain between 55ºF and 75ºF for 24 hours before and during work, and for at least 24 hours after materials have dried.
Maintain at least 30 ft. candles of illumination measured 3 ft. above floor in work spaces during joint treatment.
Maintain sufficient ventilation for proper joint treatment drying.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

INTERIOR NON-BEARING STEEL STUDS
Material: Steel conforming to ASTM C 645.
Metal Finish: Galvanized in accordance with ASTM A 591.
Metal thickness:
- Adjacent to door jamb: 20 gage.
- 6” and wider studs: 20 gage.
- Elsewhere: 24 gage.

Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.
Accessories: Provide as required for complete installation.

DEFLECTION TRACK
Material: Steel conforming to ASTM C 645.
Metal Finish: Galvanized in accordance with ASTM A 591.
Type: Slotted deep leg.
Metal thickness: 25 gage minimum.

FRAMING CHANNELS
Hot or cold rolled, galvanized steel conforming to MLA specification 12.
Type and size as required to support loads.

FURRING CHANNELS (Z-FURRING)
20 ga. Minimum, roll-formed, hot-dipped galvanized steel, zee-shaped, ASTM A 653/653M.

SHEET METAL BACKING
Provide 22 gauge sheet metal backing behind toilet room accessories, mirrors, marker boards, tack boards, miscellaneous specialties, building equipment, drapery track, and mechanical and electrical work. Verify exact location. Contractor's option to use fire retardant treated wood or metal backing, except at TV locations.

HANGER WIRE
9 ga. minimum galvanized steel wire; Fed. Spec. QQ-W-461.

TIE WIRE
Galvanized steel wire, Fed. Spec. QQ-W-461.

ATTACHING DEVICES
Hot-dipped galvanized steel wire or sheetmetal devices designed for attaching furring members to supports or each other.

GYPSUM BOARD
Manufacturing Standard: ASTM C 1396.
Edges: Tapered
Type and Thickness:
Interior stud walls and furred ceilings: Standard board, Type X, 5/8" thk., unless otherwise noted.
Exterior ceilings: Exterior gypsum soffit board, Type X, 5/8" thick.
Interior ceilings: Gypsum ceiling board, ½" thick.
Restrooms and "Wet" Walls: Water-resistant board, Type X, 5/8" thick.

TILE BACKER BOARD
Non-combustible, inorganic, dimensionally stable panels designed to be a water resistant backer for ceramic tile on finished walls.
<u>Applicable Standards:</u>
Humidified Deflection: ASTM C 473, dry cup method.
Thickness: 5/8 inch
Manufacturer: Georgia Pacific "Dens-Shield Fireguard", or accepted substitute.

EXTERIOR GYPSUM SHEATHING
Water-resistant, paperless gypsum board with fiberglass mat facing sheet both sides for exterior use.
Provide in maximum lengths available to minimize end joints.
Manufacturing Standard: ASTM C 1177.
Type and Thickness: Type X, 5/8 inch.
Edges: Square.
Manufacturer and Product: G-P Gypsum Corporation "Dens-Glass Gold Fireguard", or accepted substitute.
Provide in maximum lengths available to minimize end joints.

FASTENERS
<u>Screws:</u>
Self-tapping, self-drilling, bugle head, ASTM C 626, Type S.
Length: 1 5/8 inches
Do not use nails.

METAL TRIM
<u>Casing Bead:</u>
US Gypsum No. 200-A, 200-B, or as noted in drawings, or accepted substitute.

Corner Bead:
US Gypsum No. 101, or accepted substitute.
Reveal Molding:
Extruded aluminum, Gordon 300 Series, Fry “Z” molding, or accepted substitute.

JOINT TAPE
ASTM C 475, perforated.

JOINT COMPOUND
ASTM C 475.

ACOUSTIC SEALANT
Pecora BA 98, Tremco, Miracle 21, US Gypsum, or accepted substitute.
Provide at toilet room perimeter walls and at walls where acoustic insulation is noted on drawings.

ACOUSTIC INSULATION
Paperless, semi-rigid, spun mineral fiber mat, NOT fiberglass, minimum 2 inches thick, minimum 2.5 pcf density per ASTM C612, conforming to Federal Spec. Type 1 HH-I-521F, ASTM E136, ASTM E1050, and ASTM E90. Thermafiber SAFB (Sound Attenuation Fire Blankets), Roxul AFB.

WATER RESISTANT SEALANT
Silicone with mildew inhibitor conforming to Fed. Spec. TT-S-001543; GE, Dow, or accepted substitute.
Clear translucent color.

OTHER MATERIALS
Made or recommended by gypsum board manufacturer.
Provide all indicated or required for complete installation.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive gypsum board are accurately located, plumb, square, true, secure, and otherwise properly prepared.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

STEEL STUD INSTALLATION
General:
Follow manufacturer's directions.
Install sealer gaskets to isolate the underside of wall bottom track and the top of foundation wall or slab at stud locations.
Install plumb, level, true, and in accurate locations indicated.
Isolate stud partitions from structure to prevent transfer of loads or movement into partitions.
Where stud partitions stop at or slightly above ceiling, brace partition to structure as required to stabilize partition.
Form corners and intersection with three studs.
Locate studs two inches from internal corners.
Frame for openings.
Provide partition-height stud adjacent to door frame jambs and secure to jambs.
Provide additional partition-height stud approximately 2 inches from each jamb-stud.
Provide reinforcing and blocking as required behind wall-mounted door stops, and to support wall-hung loads such as cabinets, railings, toilet room accessories, building equipment, etc. Verify exact locations.
Deflection Track:
Provide at all full height stud walls attached to overhead roof or floor framing.
Attach track to overhead structure.
Cut studs 1" to 1 1/2" short.
Install studs plumb.
Install screws through slot into stud snug-tight, approximately centered in length of slot to allow upward and downward track movement.

Do not attach gypsum board to track. Cut gypsum board approximately 1 inch short of full height. Attach gypsum board to studs only.

SUSPENDED CEILING INSTALLATION

General:

Provide runner channels no more than 6 inches from walls and other ceiling interruptions.
Where mechanical and electrical equipment interfere with regular spacing of hangers provide additional hangers and channels, and make necessary adjustments in ceiling construction.
Hangers shall not be attached to or passed through ducts.
Provide framing around recessed light fixtures, expansion joints, and other ceiling openings.

Wire Tying:

Use double-strand 16 gage wire.
Splicing: Double wrap tie.
Horizontal stiffeners to channel brackets: Figure-eight tie.
Framing members perpendicular to each other: Saddle tie.

GYPSUM BOARD INSTALLATION

Install board horizontally, and extend to within 1/4 inch of floor.
Loosely butt joints.
Place tapered edges together, except at angles.
Do not place butt ends against tapered edges.
Where possible apply boards without butt joints. Where butt joints are necessary, locate as far from ceiling centers as possible and stagger.
Support board ends and edges on framing members.
Maintain 3/8 inch minimum distance between fastener and board edge.
Dimple board surface 1/32 inch with fastener; do not fracture face paper.
Secure to framing as follows:

Metal Wall Framing: Screw at 8 inches on center along board perimeter and 12 inches on center at intermediate supports.
Metal Ceiling Framing: Screw at 8 inches on center along each support.

Provide gypsum board hood over top of any recessed lighting fixtures which penetrate fire-rated gypsum drywall ceilings. Maintain ceiling fire-resistance rating.
At stud walls constructed with deflection track, do not attach gypsum board to deflection track. Attach gypsum board to studs only. Allow for structure deflection without loading gypsum board panels.

TILE BACKER BOARD INSTALLATION

Install at wall areas scheduled to receive tile.
Pre cut panels to required sizes and secure to framing in accordance with manufacturer's instructions.
Tape and seal joints as directed by manufacturer for tile system to be used.

JOINT, CORNER, AND EDGE TREATMENT

Application and finishing standard: ASTM C 840.
Fill joints and fastener holes in accordance with referenced standards.
Conform to GA 216, as follows:

Level 3, light orange peel.

Fill joints and fastener holes in accordance with referenced specifications.
Reinforce inside corners in accordance with manufacturer's directions.
Protect external corners and exposed edges with metal trim.
Provide control joints, unless otherwise shown on drawings, where and if framing changes direction, and at 30 ft. maximum spacings.

SEALANT INSTALLATION

Acoustic Sealant:

Provide sealant around electrical boxes, pipes, etc., located in or passing through sound walls.
Prior to installing gypsum board, provide acoustic sealant around sound wall perimeters in angle between wall, floor and ceiling; press board into sealant forming bond between framing member face and back side of board.
Provide in joints between sound wall perimeters and other adjacent materials.

Permit no voids for sound passage.
Water Resistant Sealant:
Provide at raw edges and around cutouts in water-resistant gypsum board.

ACOUSTIC INSULATION INSTALLATION
Install blankets in stud cavities. Friction fit securely between studs. Butt ends of blankets closely together and fill all voids. When installing in multiple layers, stagger joints. When installing in one thick layer, cut blankets vertically about 1 inch deep on a centerline between studs before gypsum board panel is installed.

REPAIRS
General:
After installation and before finishing, correct surface damage and defects.
Leave surfaces clean, smooth, and ready for finishing specified in Section 09 90 00.
Ridging:
Sand ridges smooth without cutting joint tape.
Fill concave areas on both sides of ridge with compound and finish flush and smooth.
Cracks:
Fill with compound and finish flush and smooth.

CLEANING
Including work of other sections, clean, repair and touch-up, or replace when directed products which have been soiled, discolored, or damaged by work of this section.
Leave surface ready for finishing specified in other sections.
Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Manufactured surfacing units of impervious materials; glazed, unglazed, abrasive, or textured.

REFERENCES
Conform to the following American National Standards Institute Specifications as Architect judges them applicable, and as supplemented and modified herein. Referenced Specifications may be obtained from Institute at 1430 Broadway; New York, NY 10018.
Ceramic Tile Installed with Portland Cement Mortar: ANSI A108.1
Ceramic Tile Installed with Water-Resistant Organic Adhesives: ANSI A108.4
Ceramic Tile Installed with Dry-Set Portland Cement Mortar: ANSI A108.5
Ceramic Tile Installed with Chemical Resistant, Water Cleanable Tile Setting Epoxy: ANSI A108.6
Installation of Grout in Tile Work: ANSI A108.10
Dry-Set Portland Cement Mortar: ANSI A118.1
Chemical Resistant, Water Cleanable Tile Setting Epoxy: ANSI A118.3
Latex-Portland Cement Mortar: ANSI A118.4
Ceramic Tile Grouts: ANSI A118.6
Organic Adhesives for Installation of Ceramic Tile: ANSI A136.1
Recommended Standard Specifications for Ceramic Tile: ANSI A137.1
Conform to Tile Council of North America, Inc. (TCNA) grade standards and installation recommendations as published in the 2008 TCA "Handbook for Ceramic Tile Installation" as Architect judges them applicable. Specifications may be obtained from Council at 100 Clemson Research Blvd., Anderson, SC 29625; 864-646-8453, Fax: 864-646-2821

SUBMITTALS
Provide in accordance with Section 01 33 00.
Data:
Submit product data specifications and instructions for using adhesives and grouts.
Samples:
Submit samples of each type of ceramic tile to be used at least 10 days prior to starting work.
Submit samples of each metal edge strip to be used, profile shape and finish options.
Mock-up:
Provide 60 square foot mockup, UON, in locations listed below, as directed by Architect. Mock-up shall include portion of wall and floor where applicable. Provide layout of tile and associated accessories for review by Owner and Architect prior to grouting. After layout is approved, fully grout mockup for review by Owner and Architect. Approved mock-up may remain as part of work. Include the following locations:
- Toilet 1105
- Restroom 1119
- Room 1119F
- Restroom 1156

Maintenance Data:
Submit maintenance data in accordance with Section 01 78 23.
Include cleaning methods, cleaning solutions recommended, stain removal methods, and polishes and waxes recommended.

QUALITY ASSURANCE:
Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
Manufacturer Qualifications:
Company specializing in manufacturing the types of products specified in this section, with minimum 5 (five) years of documented experience.
Installer Qualifications:
Company specializing in performing tile installation, with minimum 5 (five) years of documented experience.
Pre-Installation Meeting:
Convene one week before starting work of this section."

DELIVERY, STORAGE, AND HANDLING

Protect against damage, discoloration, and contamination.
Deliver in manufacturer's original, unopened containers with legible labels intact.
Attach grade label to each container in accordance with TCA 137.1.

ENVIRONMENTAL REQUIREMENTS
Refer to Section 01500 for temporary enclosures, heat and illumination.
Set and grout tile when ambient temperature is at least 50°F and rising.
Perform work under at least 30 ft. candles illumination measured 3 ft. above floor.
Notify General Contractor, if necessary, to provide additional light.

EXTRA STOCK
Provide one unopened case of each color and type of tile.
Store where directed.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

CERAMIC AND PORCELAIN TILE
Manufacturing Standard: ANSI 137.1.
Grade: Standard Grade; no seconds accepted.
Manufacturer, Color and Pattern: As indicated on Finish Legend on Sheet A-701.

SPECIAL TILE SHAPES
Provide as shown on Drawings or required for complete installation.
Size so that joints align with field pattern.

CERAMIC AND PORCELAIN TILE TRIM
Furnish size, of transition strips required, type noted below under Edge Strips.

TILE BACKER BOARD
Specified under Section 09 29 00.

CRACK ISOLATION MATERIAL
Chlorinated polyethylene sheet with non-woven fabric laminated to both sides; Schluter Systems "KERDI", or accepted substitute.

PROTECTIVE SEALER
Type made or recommended by tile manufacturer.
Provide at tile and other surfaces, if any, which are subject to damage by grout.

MORTAR SETTING BED
ANSI A118.1 and Tile Council of America, Commercial Dry-Set Mortar.

GROUT
ANSI A118.6 and Tile Council of America, Commercial Portland Cement Grout.
Color: See A-701 for grout color for each tile.
COLOR PIGMENT
Pure mineral oxides manufactured by J. Lee Smith, 3M Company, G.K. Williams, or accepted substitute.

SEALANT
Silicone, Dow #784, GE 1700, or accepted substitute with mildew inhibitor; conforming to Fed. Spec. TT-S-001543.
Provide around any plumbing fixture fittings and toilet accessories passing through or recessed into tile.

EDGE STRIP
Transition Edge Strip 1 (TS-1)
Stainless Steel "Coved" shaped strip; Schluter "Dilex-HKS"

Finish: To be selected by Architect.
Provide at joints between floor tile and wall base/wall tile, and where noted on drawings.
Transition Edge Strip 2 (TS-2)
Aluminum, “L” shaped strip; Schulter “Jolly”.
Finish: To be selected by Architect.
Provide at Exposed wall tile edges, and where noted on drawings.
Transition Edge Strip 3 (TS-3)
Aluminum, “L” shaped strip; Schulter “Schiene”.
Finish: To be selected by Architect.
Provide at exposed tile floor edges if any, and where noted on drawings.
Transition Edge Strip 4 (TS-4)
Aluminum, 90 degree corner shaped strip; Schulter “Quadec”.
Finish: To be selected by Architect.
Provide at outside corner wall edges if any, and where noted on drawings.

PART 3 - EXECUTION

EXAMINATION
Examine surfaces to receive tile and start no work until defects that will adversely affect tile work have been corrected.
Variations of surface to be tiled shall fall within maximum variations shown below:

	Walls	Floors
Portland Cement Mortar	1/4" in 8'	1/4" in 10"
Dry-Set Mortar	1/8" in 8'	1/8" in 10'
Epoxy	1/8" in 8'	1/8" in 10'
Organic Adhesive	1/8" in 8'	1/18" in 3'

Report all unacceptable surfaces to Architect and do not tile such surfaces until they are leveled enough to meet above requirements.
Surfaces to be tiled must be free of curing membranes, oil, grease, wax, and dust.
Do not start until work of other trades, which goes through or in the space behind tile, has been completed, and any unacceptable conditions are corrected.

EXTENT OF WORK
Where tile base or walls are scheduled, provide around entire perimeter of room or space, including free-standing columns and pilasters, if any.
Tile not required where concealed under or behind permanently built-in cabinets or equipment.

TILE LAYOUT
Determine locations of all movement joints before starting tile work.
Determine locations of all porcelain accessories before starting tile work.
See A-701 finish schedule, A-401 & A-402 for layout notes on interior elevations.
Lay out all tile work so as to minimize cuts less than one-half tile in size.
Locate tile cuts in both walls and floors so as to be least conspicuous.
Lay out tile wainscots to next full tile beyond dimensions shown.
Align all wall joints to give straight uniform grout lines, plumb and level.
Align all floor joints to give straight uniform grout lines, parallel with walls.
Center tile joints over slab control joints. Fill with sealant specified in Section 07 92 00.
If tile joints cannot be centered over slab control joints, cut units to allow tile joint to center over slab joint or saw-cut tile over slab joint.
Contractor’s option: Provide crack isolation joint material specified herein.
Make joints between tile sheets same width as joints within sheets so extent of each sheet is not apparent in finished work.
For heights dimensioned on Drawings, maintain full courses to produce height nearest to this dimension without cutting tile.

TILE SETTING METHODS
Refer to Tile Council of America (TCA) "Handbook for Ceramic Tile Installation".
Ceramic Tile on Concrete Floors: ANSI A108.5, TCA Method F113.
Ceramic Tile on Walls: ANSI A108.5, TCA Method W247.

CRACK ISOLATION MATERIAL INSTALLATION
Install according to manufacturer’s recommendations.
Install sheet in minimum 24 inch widths and extending minimum two tiles beyond substrate joint or crack.
Provide sealant joints at locations recommended by crack isolation material manufacturer.
Use sealant specified in section 07900.

EXPANSION JOINTS
Provide expansion joints at ceiling/wall intersections, internal wall corners and elsewhere shown on Drawings.
Extend vertical joints from floor to ceiling.
Form joints by raking out mortar 1/4 inch wide through setting bed.
Clean joint before installing backing rod and sealant.

GROUTING
Follow ANSI Standard A108.10 and grout manufacturer's recommendations for grouting procedures and precautions.
Remove all grout haze, observing both tile and grout manufacturers recommendations as to use of acid and chemical cleaners.
Rinse tile work thoroughly with clean water before and after chemical cleaners.
Polish surface of tile work with soft cloth.

PROTECTIVE SEALER
Follow manufacturer's directions.
Apply evenly to fully protect tile.

EDGE STRIP INSTALLATION
Where strip occurs at doors, center under door.

CLEANING AND REPAIRING
Including work of other sections, clean, repair, and touch-up, or replace when directed products which have been soiled, discolored, or damaged by work of this section.
Remove excess sealant within 20 to 30 minutes after installation using denatured alcohol on cheesecloth pad.
Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Commonly used acoustical ceiling systems, consisting of suspension system, grid, and acoustic tiles or boards.

REFERENCES
Acoustic Systems:
Type of acoustic materials, types of mounting, noise reduction coefficients, and methods of installation, hereinafter specified, refer to "Ceiling Systems Handbook," published by Ceilings and Interior Systems Construction Association (CISCA), 405 Illinois Avenue, Unit 2B, St. Charles, IL 60174; 630-584-1919.
Suspension Systems:
Suspension systems, hereinafter specified, refer to "Metal Suspension Systems for Acoustical Tile & Lay-in Panel Ceilings," ASTM C 635, and to "Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustic Tile and Lay-in Panels," ASTM C 636.

PERFORMANCE REQUIREMENTS
Suspension system components fully loaded; maximum deflection: 1/360 of span in accordance with ASTM C 635.
Finish surfaces level and true within 1/8 inch per 12 feet.
Fire Resistance Classification: ASTM E 119.
Flame Spread Classification: ASTM E 84.

SUBMITTALS
Product Data:
Submit manufacturer's specifications and installation instructions for acoustical materials, suspension system and accessory products required to provide a complete system.
Samples:
Submit samples of each acoustical material specified including representative grid and metal items. Samples shall show full range of texture and color to be expected in completed work.

DELIVERY, STORAGE, AND HANDLING
Deliver in original, unopened, protective packages with manufacturer's labels indicating brand name, pattern, size, thickness, and fire rating legible and intact.
Protect against damage and discoloration.
Store cartons open at each end to stabilize moisture content and temperature.

ENVIRONMENTAL REQUIREMENTS
Delay installation of acoustic units until work spaces are dry.
Maintain 65% - 75% humidity in work spaces 24 hours before, during, and 24 hours after installation.
Maintain uniform 55°F - 70°F temperature in work spaces 24 hours before, during, and after installation.

EXTRA MATERIALS
Submit one extra case of acoustic tile in unopened protective package. Store in Owner-approved location.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

ACOUSTIC TILE
Type: Mineral fiber tile, square edge.
Manufacturers: Certainteed.
Model: Baroque Square Lay-in, BET-197 & BET-157.
Size: 24 X 48 inch and 24 X 24 inch, 5/8 inch thick.
Texture: Fine.
Finish: Factory applied paint.

Color: White
Noise Reduction Coefficient on specified mounting: 0.55 minimum.

METAL SUSPENSION SYSTEM
Type: Steel, heavy duty rating, exposed grid T-bar system.
Manufacturers: Donn, Armstrong, Chicago Metallic, or accepted substitute.
Finish: Manufacturer's standard enamel.
Size: 15/16 inch.
Color: Match Acoustic Tile.
Follow layout shown on Drawings.

STRUTS
ICBO listed, adjustable, heavy duty galvanized tubing with spring steel clip at upper end and bulb clip at bottom end; Donn, Roblin, or accepted substitute.

FASTENERS AND ACCESSORIES
General:
Type and sizes recommended by suspension system manufacturer.
Seismic Accessories:
Beam End Retaining Clip: CertainTeed Seismic Perimeter Clips or accepted substitute.
Main Runner Seismic Joint Clip: CertainTeed Seismic Sleeves or accepted substitute.
Grid Intersection Seismic Joint Clip: CertainTeed CTSTJ Seismic transition joint clip or accepted substitute.

METAL EDGE TRIM
Corrosion-resistant steel, bonderized and enameled to match color of adjacent metal suspension system.

ACOUSTIC INSULATION
Paperless, semi-rigid, spun mineral fiber mat, 2 inches thick, standard density, conforming to Federal Spec. HH-I-521F, Type I, ASTM C 665 and ASTM E 84. USG Thermafiber Sound Attenuation Blankets, Roxul AFB, or accepted substitute.

PART 3 – EXECUTION

EXAMINATION
Verify that surfaces to receive directly-attached acoustical units are even, regular, true, level within 1/8 inch per 12 ft. dry and free from oil, or other bond-reducing substances.
Verify that surfaces provided by other trades are clean, dry, dust-free, smooth, level, within 1/8 inch in 12 ft. and otherwise properly prepared to receive acoustic treatment.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

FIELD MEASUREMENTS
Verify prior to fabrication.
If field measurements differ slightly from drawing dimensions, modify work as required for accurate fit. If measurements differ substantially notify Architect prior to fabrication.

INSTALLATION
General:
Follow standard specifications, manufacturer's directions and layout drawings, except as modified hereunder.
Metal Suspension System:
Where mechanical and electrical work interferes with regular spacing of hangers provide additional hangers and channels and make necessary adjustments in ceiling construction.
Do not attach or pass hangers through mechanical or electrical ductwork.
Provide framing around recessed light fixtures and other openings.
Maximum vertical hanger splay: 5 inches per 4 ft.
Acoustical Units:
Install units in level plane, in straight line courses, and with solid bearing on support members.

Minimum border unit width: 1/2 unit dimension, unless otherwise shown on Drawings.
Install pattern grain, if any, in one direction.
Seal joints around pipes, ducts, and other penetrations with sealant specified in Section 07900.
Where tile abuts vertical surfaces trim joints with metal edge trim. Attach trim to vertical surface with mechanical fasteners.
Acoustic Insulation:
Provide between framing members butting joints tight with no voids.
Provide above ceilings at all family conference rooms, offices, restrooms, lunchroom, lactation room, and conference rooms.

CLEANING AND REPAIRING
Including work of other sections, clean, repair and touch-up, or replace when directed products which have been soiled, discolored, or damaged by work of this section.
Remove debris from project site upon work completion, or sooner, if directed.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Sheet vinyl and resilient tile flooring. Preparation of substrate surfaces. Resilient bases and accessories.

SUBMITTALS
Provide in accordance with Section 01 33 00.
Samples:
Two full size samples of specified floor tile.
One sample of specified sheet vinyl flooring.
One 12 inch long sample of each edge strip.
One 12 inch long sample of each wall base.
Maintenance Instructions:
In accordance with Section 01 33 00, submit manufacturer's recommended maintenance products and methods to General Contractor, for inclusion on Owner's maintenance manual.
Product Data:
Submit manufacturer's product data listing volatile organic compound (VOC) content of products specified herein.
Provide manufacturer's documentation verifying that adhesives and sealants contain no urea-formaldehyde.

EMISSIONS STANDARDS
Conform to the following minimum standards for sealant emissions:

Adhesive Type	VOC Limits	Standard
Rubber Floor Adhesives:	60 g/L	SCAQMD Rule #1168
VCT Adhesive:	50 g/L	SCAQMD Rule #1168
Cove Base Adhesive:	50 g/L	SCAQMD Rule #1168
Multi-Purpose Construction Adhesive:	70 g/L	SCAQMD Rule #1168

Aerosol Adhesives: Green Seal Standard for Commercial Adhesive GS-36 requirements.
Submit manufacturer's product data listing volatile organic compound (VOC) content of products specified herein.
Provide manufacturer's documentation verifying that adhesives and sealants contain no urea-formaldehyde.

QUALITY ASSURANCE
General:
Standards: Meet requirements of Resilient Floor Covering Institute.
Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
Manufacturer Qualifications:
Company specializing in manufacturing the types of products specified in this section, with minimum 5 (five) years of documented experience.
Installer Qualifications:
Company specializing in performing tile installation, with minimum 5 (five) years of documented experience.
Pre-Installation Meeting:
Convene one week before starting work of this section.
Mock-up:
Install at project site a mock-up of resilient flooring materials as listed below, minimum floor area size 9 sq. ft., encompassing all design elements, including heat welded seams, self-coving, and a corner. Use specified products, manufacturers and installation methods. Obtain acceptance of Owner and Architect of finish, color, texture, pattern and workmanship standards prior to proceeding with final installation.
Mock-ups required:
Sheet Vinyl
Luxury Vinyl Tile

DELIVERY, STORAGE AND HANDLING
Deliver in unopened packages, manufacturer's original labels thereon.
Matching coverings shall bear manufacturer's run number.

Do not remove labels or open packages until Architect inspects.
Protect against damage and discoloration.
Store in dry place.
Maintain storage place temperature above 70°F for immediate 48 hours prior to and during storage.

ENVIRONMENTAL REQUIREMENTS
Work Space Air and Surface Temperatures:
Not less than 70°F 48 hours before, during, and 48 hours after laying.
Not lower than 55°F thereafter.
Work Space Ventilation:
When using offensive odor adhesive provide sufficient ventilation to maintain healthy and pleasant environment for all trades.
Work Space Illumination:
Do not work under less than 30 foot candles measured 3 ft. above floor.

EXTRA STOCK
Provide one unopened case of each color and type of tile.
Store where directed.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

SHEET VINYL (SV-1)
Extent of work as noted on Drawings.
Manufacturing Standard: ASTM F1 g1 3 Sheet Vinyl Floor Covering without Backing
Manufacturer and type: Mannington Commercial Assurance III
Color: Marl 16345
Thickness: .080 inches
Wear Layer: Quantum Guard Elite"
Install: 6” Self-cove

SHEET VINYL COVE BASE ACCESSORIES
Cove Stick Fillet: Flexco, no. 195
Cove Cap: Mannington Commercial, round cap 1/8” 040

LUXURY VINYL TILE (LVT-1)
Extent Of Work As Noted on Drawings.
Manufacturer: XL Flooring
Manufacturing Standard: Class III printed vinyl tile
Backing: Dryback
Pattern/Style: Easy Plank
Wear Layer: 12 Mil
Thickness: 5 mm
Size: 48” x 7”
Color: Lloydminster.

RUBBER BASE
Manufacturer: Johnsonite
Height: 4 inches
Type: Coved.
Provide with factory formed external corners, mitered internal corners and factory-formed end stops.
Color: Dark Brown.

EDGE STRIP
Manufacturer: Roppe.
Color: Black brown
One inch wide, 1/8 inch thick, rubber with beveled top.

Provide at exposed resilient flooring edges, if any.

PRIMER, SEALER, CRACK FILLER, AND ADHESIVE
Water-resistant type, made or approved by covering manufacturer.

CLEANER
Neutral type approved by covering manufacturer.

FLOOR POLISH
Non-slip, non-yellowing type approved by floor covering manufacturer.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive work specified herein are solid, dry, clean, level, and otherwise properly prepared.
Verify that walls to receive base extend to within 1/4 inch of floor.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
Fill concrete slab cracks less than 1/16 inch wide and depressions less than 1/8 inch deep with crack filler. Notify General Contractor to correct wider cracks and deeper depressions.
Provide 1 coat of primer on sanded wood and other surfaces recommended by manufacturer.

AREAS TO BE COVERED
In Spaces Scheduled to have Floor Covering:
Also cover closet and alcove floors opening off spaces, if any, with same material.
Where Base is scheduled:
Provide around perimeter of room or space, unless otherwise indicated elsewhere.
Include casework, free-standing columns, pilasters and other projections, if any.
Miscellaneous:
Covering not required under permanently built-in casework and equipment, unless otherwise indicated elsewhere.

INSTALLATION
General:
Follow manufacturer's instructions and applicable sections of referenced specifications.
Luxury Vinyl Tile:
At least 24 hours before installing, remove tile from shipping cartons and back-stack.
Install tile in "ashlar pattern" – See A-701, A-702, and A-703 for direction and pattern.
Develop layout and Install tiles so that no tile is smaller than 5 or 6 inches.
Install floor tiles in strict compliance with manufacturer’s printed instructions.
Extend tile flooring into toed space, door reveals, into closets, and similar openings.
Sheet Vinyl Flooring:
Install with adhesive over entire floor area to be covered.
Install with all seams to be heat welded. Prepare heat-welded seams with special routing tool supplied for this purpose and heat weld with vinyl welding rod in seams. Use methods and sequence of work in conformance with written instructions of the flooring manufacturer. Finish all seams flush and free from voids, recesses, and raised areas. Provide integral flash cove wall base, 6 inches high, where shown on the drawings, including cove fillet support strip and top edge cap trim. Construct flash cove base in accordance with the flooring manufacturer's instructions. Heat-weld seams as specified for those on the floor.
Edge Strip:
Provide wherever covering edges are exposed.

PATCHING
General:
Where alterations occur, and where indicated, patch existing covering to remain; match existing material,

pattern, and color.
Join new covering neatly with existing covering in as good condition as found.
At Floor Tile:
Patch with full size tile only, unless otherwise approved.
Remove existing, less than full size tile, where required to install new full size tile.
Base:
Patch existing base with 4 ft. minimum length pieces.

CLEANING, REPAIRING, AND FINISHING
After covering and base have set sufficiently, wash with cleaner.
After rinsing and drying apply one coat of floor polish to covering. Machine-buff to smooth, dull gloss; hand-buff inaccessible areas.
Leave surfaces smooth and defect-free.
Remove debris from project site upon work completion or sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed products which have been soiled, discolored, or damaged by work of this section.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.
Rope off work areas and/or provide necessary coverings to protect work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Low pile carpet materials including cushions, if any, and accessories.

INSTALLER QUALIFICATIONS
To be eligible to perform work specified herein Contractor must be acceptable to carpet Manufacturer and have successfully completed 2 similar projects.

REGULATORY REQUIREMENTS
Comply with Department of Commerce Flammability Standard DOC FF 1-70.
Corridor and exit way carpet shall comply with National Bureau of Standards Radiant Panel Test 75-950.

QUALITY ASSURANCE
Testing: Owner will employ services of an independent testing laboratory for testing moisture content in concrete slabs in accordance with the requirements of ASTM F 1869-98 Standard Test method for measuring vapor emission rate of concrete subfloor using anhydrous calcium chloride.

SUBMITTALS
Certifications:
Provide in accordance with Section 01 33 00.
Product Data:
Submit manufacturer’s product data listing volatile organic compound (VOC) content of products specified herein.
Provide manufacturer’s documentation verifying that adhesives and sealants contain no urea-formaldehyde.
Lay-out diagram:
Provide to scale layout diagram showing all seam locations and direction of materials.
Samples:
Two full size samples of specified floor tile.

MAINTENANCE INSTRUCTIONS
Submit to General Contractor in accordance with Section 01 78 23 for inclusion in Owner's maintenance manual 1 copy of Manufacturer's recommendations for care, cleaning, and maintenance of installed carpet.
After installation thoroughly instruct Owner in care, cleaning, and maintenance of installed carpet.

PRODUCT DELIVERY
Deliver in original unbroken mill-wrapping, Manufacturer's register number labels thereon.
Do not deliver until installation is ready to start.
Do not remove labels or open packages until Architect reviews and accepts.

PRODUCT STORAGE AND HANDLING
Protect against damage and discoloration.
Do not store carpet rolls on end.

WORK SPACE ILLUMINATION
Perform no work under less than 30 ft. candles measured 3 ft. above floor.

MINIMUM AIR AND SURFACE TEMPERATURE
Perform no work when conditions exceed manufacturer's specified limits; 50°F minimum.

EXTRA STOCK
Provide two unopened cases of each color and type of tile.
Leave with Owner excess pieces of usable carpet over 2 sq. ft., but not more than the equivalent of two cases.
Store where directed by Owner.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

WARRANTY
Correct defects in materials or workmanship which appear during Warranty Period by repairing and/or replacing and/or re-stretching, if necessary, at no additional cost to Owner. Warrant for 5 years that carpet will maintain specified limits of static electricity generation. 10 year wear warranty against edge ravel and de-lamination.

PART 2 - PRODUCTS

CARPET TILE (CPT-1)
Extent of work as noted on Drawings.
Manufacturer: Interface
Collection & Style: Heart Beats, Heart Strings
Color: Paramour 107381
Minimum construction requirements:
- Type: Modular carpet tile 19.69 inch x 19.69 inch
- Product Number: 1312102500
- Construction: Tufted textured loop
- Gauge: ½ inch
- Pile Height: 0.13 inches
- Fiber System: 100% recycled content nylon
- Face Weight: 20 oz./sq. yd
- Dye Method: 100% Solution Dyed
- Primary Backing: GlasBac
- Density: 9,730 oz/ sq. yd
- TARR Rating: Severe.

Electrostatic Propensity: 3.0kV (AATCC 134); Permanent Conductive Fiber.
Installation method: Monolithic.

WALK-OFF Carpet Tile (WO)
Extent of work as noted on Drawings.
Manufacturer: Milliken
Collection & Style: Obex cutx tile, Fizz.
Color: Russet
Minimum construction requirements:
- Construction: Tufted, cut pile
- Gauge: 5/32 inches
- Pile Density: 4,684 oz/sq. yd (finished)
- Pile Height: 0.186 inches
- Tufted Weight: 24 oz/sq. yd.
- Yarn System: Milliken-Certified WearOn® Nylon and Monofilament
- Backing: PVC-Free WellBAC® Comfort Plus Cushion.
- Dye Method: PrintWorksTM Precision Dye
- Tile Size: 19.7” x 19.7”

Electrostatic Propensity: (AATCC-134) 20% R.H.,70° F. ≤ 3.5 KV, Permanent Conductive Fiber

CUSHION
Not required.

EDGE STRIP
Manufacturer: Roppe.
Color: Black brown
One inch wide, thickness to match carpet height, with beveled top.
Provide at exposed carpet edges, if any. Locations Noted on Drawings.

ADHESIVE
Full coat of non-flammable type recommended by carpet Manufacturer.
Adhesive for Carpet Tiles: Non-flammable type with anti-microbial protection, VOC content meeting requirements of CRI Green Label Indoor Air Quality Program; Provide Documentation.

FLOOR FILLER
W.W. Henry 547 Unipro™, DAP “Webcrete 98”, Maipei “PlaniPatch”, Ardex “Featherfinish” or similar accepted substitute.
Provide over concrete floor slabs which are too rough or uneven to provide satisfactory base for carpeting.

CONCRETE SEALER
Type recommended by carpet Manufacturer.

SEAM CEMENT
Non-flammable type recommended by carpet Manufacturer.

PART 3 - EXECUTION

EXAMINATION
Verify that subfloor is clean, dry, level, and solid, with no projections or holes that will damage carpet system; that work spaces have specified illumination, humidity, and temperature; and that surfaces are otherwise properly prepared.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
Fill cracks less than 1/16 inch wide and depressions less than 1/8 inch deep with filler.
Notify General Contractor to correct wider cracks and deeper depressions.

EDGE STRIP INSTALLATION
Follow Manufacturer's directions.
Provide edge stripping at exposed carpet edges.
Where carpet terminates at door openings, center edge strip under door.

ADHESIVE APPLICATION
Follow Manufacturer's directions.
Apply uniformly.
Apply only to area that can be covered by carpet within adhesive working-time.
Promptly remove spillages.

CARPET TILE
Provide Interface direct glue-down carpet adhesive per manufacturers installation graphic.
Follow Manufacturers direction for installation.
Do not force the tile together. Compression must be avoided.
Roll tiles only after 24 hours to re-adhere any tiles that may be lifting.

WALK-OFF MAT INSTALLATION
Provide Milliken glue-down Installation System per manufacturer’s installation graphic.
Follow Manufacturers direction for installation.
Do not force the tile together. Compression must be avoided.
See sheet A-701, A-702, and A-703 for installation pattern and direction.
Roll tiles only after 24 hours to re-adhere any tiles that may be lifting.

CLEANING AND REPAIRING
After all trades have completed with work, vacuum clean carpet.
Remove debris from project site upon work completion or sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have

been soiled, discolored, or damaged by work of this section.

PROTECTION

Protect work specified herein, and work of other trades, against damage and discoloration caused by work of this section.

Provide necessary coverings and barricades to protect completed work.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Wallcoverings of paper, vinyl, vinyl coated fabrics, cork, and other prefinished panels over solid substrate for light, medium and heavy duty usage.

SUBMITTALS
Samples:
In accordance with Section 01 33 00 submit the following:
One full width sample, 36 inches long for each color and pattern.
Obtain Architect's approval of samples prior to ordering materials.

QUALITY ASSURANCE
Qualifications:
Workmen must have at least 2 years prior experience performing work of type specified herein, and be approved by covering manufacturer.
Before starting work submit certification of workmen's experience and manufacturer's approval.
Regulatory Requirements:
Maximum ASTM E 84 Flame Spread Rating: 25.
Maximum ASTM E 84 Smoke Developed Rating: 50.
Label each package with fire rating classification.
Mock-Ups: 2
In accordance with Section 01 33 00 prepare mock-up including the following:
- Full height panel with at least two vertical seams.
- Panel termination at top of wall.
- External corner treatment.

Conform to project appearance and workmanship requirements.

DELIVERY, STORAGE, AND HANDLING
Deliver in unbroken packages with manufacturer's labels thereon. Do not remove labels or open packages until Architect inspects and approves.
Store in clean and dry area.
Maintain storage area temperature above 55°F with normal humidity.
Do not store wall covering on end.
Protect against damage and discoloration.
24 hours prior to application, remove wall covering from its packaging and allow Covering to acclimatize to installation area temperature and humidity.

ENVIRONMENTAL REQUIREMENTS
Install wall covering only when air temperature and humidity conditions approximate those that will exist when Building is occupied.
Do not install covering on surfaces which are colder than 65°F.
Do not install covering under less than 30 ft. candles of light measured 3 ft. above floor.
Notify General Contractor, if necessary, to provide additional light.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

MAINTENANCE INSTRUCTIONS
Submit to General Contractor, in accordance with Section 01 78 23, two copies for inclusion in Owner's Maintenance Manual.
Include manufacturer's recommended cleaning materials and methods, including precautions against cleaning materials which may be detrimental to covering.

EXTRA STOCK
Provide extra rolls of full width wall covering of each color and pattern in the minimum amount of 10% of installed

wall coverage.
Wrap each color and each pattern separately, roll neatly, and secure with masking tape.
Store where directed by Owner.

PART 2 - PRODUCTS

VINYL WALLCOVERING
Meet Fed. Spec. CCC-W-408D and CFFA-W-101-A.
Sheet width: 52 inches nominal.
Total weight: 33 oz per yard
Flammability: ASTM E84 Class A / Class 1
Material: Olefin composite and recycled olefin composite
Repeat: No match Required. Install vertically to minimize seems.
Manufacturer and pattern: Carnegie Turris
Color: 11.

PRIMERS, SEALERS, AND ADHESIVES
Type: Mildew-resistant, made or recommended by wall covering manufacturer, and type which will not exceed fire-resistant limitations of specified wall covering.
Manufacturer: Gibson-Homans "Shur-Stik III," or accepted substitute.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive wall covering are true, sound, clean, dry and dust-free, free from conditions that would damage covering or impair adhesive bond, and otherwise properly prepared.
Prior to starting work notify General Contractor about defects requiring correction,
Do not start work until conditions are satisfactory.

PREPARATION
Before applying covering remove any finish hardware, electric cover plates, mechanical grilles and registers, etc. which would interfere with covering application.
Carefully store removed items and replace following covering application.

SURFACE PREPARATION
Follow manufacturer's directions.

INSTALLATION
Follow manufacturer's directions.
Take special care to insure complete adhesion at joints, edges, and corners.
Where possible apply rolls in accordance with manufacturer's numerical sequence.
Reverse adjacent strips unless otherwise directed by manufacturer.
Cement to backing with seams carefully butted and practically invisible.
Horizontal seams and seams within 8 inches of external corners not permitted, except at any color and/or pattern breaks.
Match material for any grain, color and pattern.
Make allowance for material shrinkage.
Do not extend covering more than 1/2 inch below top of wall base.
Work out wrinkles and air pockets.

CLEANING AND REPAIRING
Remove adhesive from surfaces during application.
Replace defective and improperly applied material.
Leave surfaces clean, whole, and defect-free at time of final acceptance.
Remove debris from project site upon work completion or sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been

soiled, discolored, or damaged by work of this section.

PROTECTION

Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES

Exterior and interior painting with transparent or opaque finishes. Includes stains, varnishes, lacquers, fillers, and preparation of surfaces.

SUBMITTALS

Provide in accordance with Section 01 33 00.

Product List:

Before ordering, submit complete and detailed list of materials proposed for use.
Obtain Architect's acceptance before ordering.
Provide product data for field-applied interior paints and coatings which have a potential impact on indoor air quality, including manufacturer's MSDS sheets or other Product Data listing VOC content as noted below.
Provide product data for exterior field-applied paints and coatings, which have a potential impact on ambient air quality, including manufacturer's MSDS sheets or other manufacturer's Product Data listing VOC content as noted below.

Color Samples:

One Sample of each required finish, color, and sheen. Sample size 8 1/2 X 11 inches, minimum.
Use suitable substrate for each sample, such as stiff paper for paint and specified wood for stains.
Obtain Architect's acceptance before proceeding with work.

QUALITY ASSURANCE

Each product container shall bear manufacturer's legible label indicating the following:

- Manufacturer's Name
- Type of Material
- Manufacturer's Product Number
- Manufacturer's Batch Number
- Color
- Instructions for reducing, where applicable.

DELIVERY, STORAGE, AND HANDLING

Deliver in original, unopened containers.
Do not open containers or remove labels until Architect inspects.
Store in suitable location where directed by General Contractor.
Protect against contamination by foreign matter.
Remove unacceptable materials from project site.

ENVIRONMENTAL REQUIREMENTS

Follow manufacturer's directions.
Minimum ambient air and surface temperature for 24 hours prior to and during application and until film is dry hard thereafter: 40°F.
Do not work where dust or insects are present.
Do not work where inclement weather may damage surface.
Do not work with less than 30 foot candles of available light measured 3 ft. above floor.

EMISSIONS STANDARDS

Conform to the following minimum standards for coating emissions:

Coating Type	VOC Limits	Standard
Architectural Flat Paints – Interior	50 g/L	Green Seal GS-11
Architectural Non-Flat Paints - Interior	150 g/L	Green Seal GS-11
Primer or Undercoat	150 g/L	Green Seal GS-11
Anti-Corrosive Coating	250 g/L	Green Seal GS-11
Clear Wood Finishes - General	350	SCAQMD Rule 1113
Clear Wood Finishes – Varnish	350	SCAQMD Rule 1113
Clear Wood Finishes – Sanding Sealer	275	SCAQMD Rule 1113
Clear Wood Finishes – Lacquer	550	SCAQMD Rule 1113
Clear Wood Finishes – Pigmented Lacquer	550	SCAQMD Rule 1113
Stains – Interior	250	SCAQMD Rule 1113

EXTRA STOCK
Leave, in previously unopened original containers, one gallon of each top coat.
Label for positive identification.
Store on project premises where directed.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

GENERAL
Products for each general purpose shall be of same manufacturer.
Do not use products of different manufacturers over one another, except for shop prime coats specified in other sections of these Specifications.
Basis of Design: **Sherwin Williams Paint Products, CCC standard.**

MATERIALS
Select from the following Approved Products Table unless otherwise specified herein.
All listed products will not necessarily be employed on this project. Consult painting schedule for required materials.
Product numbers are given to establish desired quality and do not indicate color.

COLORS
As selected by Architect.
Color Quantity:
Interior Walls: Maximum 12 colors, colors noted on Drawings.
Exterior Walls, Trim and Galvanized Metal: Maximum 3 colors, colors to be selected by Architect.

MIXING AND TINTING
Deliver paints and enamels ready-mixed to jobsite.
Job-mix and job-tint only when acceptable to Architect.
Mix only in clean, rust-resistant containers.
Use tinting colors recommended by manufacturer for specific type of surface.
Factory-add fungicidal agent to all exterior coatings and to interior coatings applied in any high humidity spaces.

PART 3 - EXECUTION

EXAMINATION
Examine surfaces to receive coating for conditions that will adversely affect execution, permanence, and Work quality.
Verify that General Contractor has removed door hardware.
Prior to starting work notify General Contractor about defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
Protection:
Cover or otherwise protect work of other trades, including walls and floors of paint storage and mixing rooms.
Remove finish hardware, accessories, plates, lighting fixtures, and similar items. Obtain Architect's approval for protection in lieu of removal.
Post signs and install barricades as required to protect work of this section against damage or discoloration.
Take extraordinary care to prevent fire. Open cans of paint and varnish only when needed.
Keep rubbing cloths and oily rags submersed in water.
Surface Preparation:
General: Remove any loose material, dirt, or dust.
Galvanized Metal: Thoroughly clean with surface conditioner in accordance with manufacturer's instructions.

Etch metal with metal conditioner or in accordance with Steel Structures Painting Council Specification 7.
Non-Galvanized Steel: Remove any rust and scale.
Wood Doors: Lightly hand block-sand faces and edges with 180 grit sandpaper to remove any raised grain.
Fill any Voids. At natural finish, color filler to match wood.
Other Wood: Clean soiled surfaces with alcohol or approved.
Hand block-sand with 180 grit sandpaper to remove any raised grain.
At opaque coating seal knots, pitch, and resinous sapwood before prime coat application.
Fill voids, cracks, and other defects. At natural finish, color filler to match wood.
Remove gloss by washing and sanding; touch-up bare spots with proper type primer.

COATING APPLICATION

General:

Follow manufacturer's directions.
Do not apply initial coating until moisture content of surface to be finished is within limitations recommended by paint manufacturer. Test with moisture meter.
Apply coating with suitable brushes, rollers, or spraying equipment as recommended by coating manufacturer.
Do not exceed coating manufacturer's application rate.
Follow coating manufacturer's recommended drying time between succeeding coats.
Apply finish coats smooth, free of brush marks, streaks, laps, coating pile-up, and skips.
Keep brushes, rollers, and spraying equipment clean, dry, free from contaminates, and suitable for finish required.
Leave moldings and ornaments clean and true to detail without excessive coating build-up in corners and depressions.
Where paint abuts other materials or colors, cut paint edges clean and sharp and with no overlap.
Finish door tops, bottoms and edges as specified below: Remove doors from frames, if necessary.

Painted Work:

Flat Metalwork except Doors: Apply paint with brush, roller or airless spray equipment.
Doors: Apply paint with roller or airless spray equipment only, do not apply with brush.
Face runs not permitted.

FIELD QUALITY CONTROL

For each required color scheme, request Architect to inspect first finished room, space, or item for color, texture, and workmanship.
Dry paint film thicknesses will be measured upon painting completion using Tooke Paint Inspection Gage IV, a precision instrument designed for measuring and evaluating paint coatings. Re-coat any Work measuring less than specified thickness.

FIELD SAMPLE

Before proceeding with painting, apply where directed at least 30 sq. ft. of each specified coating on actual wall and ceiling surfaces, and at least one sample door, door frame, and cabinet. Simulate building's design lighting during Architect's review.
Accepted sample represents minimum standards for subsequent work.
Accept samples in like-new condition may be used in contract work.
Touch-up test surfaces, which will measure approximately 1 sq. inch per Test.

CLEANING

Remove spills, splatters, and stains from all surfaces including other work and those in paint storage and mixing rooms.
Unless otherwise approved, refinish entire wall or surface where portion of finish has been damaged or is otherwise unacceptable.
Remove debris from project site upon work completion or sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.

PAINTING SCHEDULE

General:

Prime coats specified below may be omitted where factory-applied shop coats are specified in other

Sections.
Prime coats specified may be omitted from existing finished surfaces, provided existing coating is sound.
Number of coats hereunder specified is minimum. Finished work shall be even, uniform color, and free from cloudy and mottled surfaces. Apply additional coats where necessary for any deep tone colors.
Minimum coating thicknesses specified below include prime coat and finishing coats combined.
Surfaces not coated, unless otherwise shown on Drawings:
Items having complete factory finish.
Rubber.
Non-ferrous metal.
Elastomeric sealants.
Tempered hardboard.
Acoustic tile.
Glass.
Flooring.
Fire-resistance rating labels and instructional labels.
Portions of buildings where no alterations occur, except as noted on Finish Schedule on Drawings.
Exterior Galvanized Steel, Ferrous and Non-Ferrous Metal:
Paint System – 2: Latex Enamel
One coat metal primer, 2.5 mils, S-W Pro Industrial Pro-Cryl Primer.
Two coats semi-gloss latex enamel, 2.6 mils, S-W Pro Industrial DTM Acrylic.
Total minimum dry thickness: 5.1 mils.
Exterior Synthetic Stucco:
Paint System - 16: Acrylic Enamel.
Two coats flat acrylic enamel, 2.8 mils, S-W Exterior Acrylic Stucco Finish.
Total minimum dry thickness: 2.8 mils.
Interior Gypsum Board Ceilings:
Paint System - 14: Latex Enamel
One coat wallboard primer, 1.6 mils, S-W ProMar 200 Zero VOC Primer.
Two coats flat latex enamel, 2.6 mils, S-W ProMar 200 Zero VOC Interior Latex.
Total minimum dry thickness: 4.2 mils.
Interior Gypsum Board:
Paint System - 15: Latex Enamel
One coat wallboard primer, 1.6 mils, 1.6 mils, S-W ProMar 200 Zero VOC Primer.
Two coats eggshell gloss latex enamel, 2.6 mils, S-W ProMar 200 Zero VOC Interior Latex.
Total minimum dry thickness: 4.2 mils.
Interior Gypsum Board in Wet Areas:
Paint System - 16: Epoxy Enamel
One coat water base primer, 1.6 mils, 1.6 mils, S-W ProMar 200 Zero VOC Primer.
Two coats eggshell gloss water-based catalyzed epoxy enamel, 6.0 mils, S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy.
Total minimum dry thickness: 7.6 mils.
Interior Ferrous and Non-ferrous Metal:
Paint System – 18: Latex Enamel
One coat metal primer, 2.5 mils, S-W Pro Industrial Pro-Cryl Primer.
Two coats semi-gloss latex enamel, 2.6 mils, S-W Pro Industrial DTM Acrylic.
Total minimum dry thickness: 5.1 mils.
Exposed Mechanical and Electrical Work except in Mechanical or Electrical Equipment Rooms:
Paint System -25: Exterior metal work including that on roof:
Prepare and paint as specified for other exterior metal of same kind.
Paint System - 26: Interior metal work:
Prepare and paint as specified for other interior metal of same kind.
Paint System - 27: Electrical conduit, panel boards, and service boxes:
Prepare and paint as specified for other interior metal of same kind.
Traffic Control Markings:
Paint System - 28: Traffic paint:
One coat white traffic paint.
Paint parking stall lines 4 inches wide, and any other pavement markings shown on Drawings. Apply straight, true, and with sharp edges.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Writing and marker board surfaces manufactured of various materials; mounting surfaces including framing systems and accessories.

SUBMITTALS
Provide in accordance with Section 01 33 00.
Shop Drawings:
Show dimensions, full size sections, metal thickness, construction details, required clearance, anchor location, and installation details.
Manufacturer's Instructions:
One copy of manufacturer's cleaning and maintenance instruction for inclusion in O & M Manual.
Install one permanent Chalkboard Maintenance Instructions Plate where directed in each room where boards are installed. Plate shall include instructions for proper board care.

QUALITY ASSURANCE
Manufacturer’s Qualifications: Company specializing in manufacturing the products specified in this section with a minimum of five years of documented experience.

DELIVERY, STORAGE, AND HANDLING
Deliver in protective containers with manufacturer's original, legible label intact.
Store in clean, dry area.
Protect against damage and discoloration.
Store rolled material on end, and sheet material flat.
Provide support necessary to retain original shape.
Maintain storage area temperature above 55°F.

ENVIRONMENTAL REQUIREMENTS
Maintain installation area temperature greater than 55°F for 24 hours prior to, during, and continuously after installation.
When using offensive smelling adhesives provide adequate ventilation to maintain healthy and pleasant working environment for workmen of all trades.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

DRY MARKER BOARDS
Manufacturer and Model:
Platinum Visual Systems, DTS, or accepted substitute.
Board:
Type: Porcelain enamel on steel. Base sheets coated on both sides.
Thickness: 23 gage minimum base metal, .0025 inch minimum porcelain writing surface.
Sizes: As noted on Drawings.
Color: Bright White.
Metal Trim:
Frame: Extruded aluminum, 1/16 inch minimum thickness, 4 ft. minimum length, satin mechanical finish with Class III clear architectural anodic coating AA-M31A31.
Chalk Trough: Manufacturer’s standard type with end closures. Provide full length across bottom of marker boards.
Map Rail: Manufacturer’s standard 1 inch type with cork inserts. Provide full length across top of each marker board unit.
Mounting:
Steel mounting clips at top, angle clips at bottom mounted 24” on center.

Backing For Boards:
7/16 inch particle board, 42 pcf maximum density, “Duraflake”, “Timblend”, “Versabord” or accepted substitute.

BACKING FOR BOARDS
Provide all necessary.
Sheet metal backing as described in section 09 29 00.
Accessories are located on Drawings for Contractor's convenience.
Verify location, type, and quantity with Owner prior to proceeding with work.

FABRICATION
Fabricate panels to sizes and configurations shown on Drawings.
Fabricate panels to exact sizes required to fit wall surfaces based on field measurements of completed substrates.

PART 3 - EXECUTION

EXAMINATION
Do not proceed with work until surfaces to receive boards are smooth, true, clean, sound, dry, backing is in place, and otherwise properly prepared.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.
Verify prior to fabrication.
If field measurements differ slightly from drawing dimensions modify work as required for accurate fit. If measurements differ substantially notify Architect prior to fabrication.

PREPARATION
Remove substrate surface imperfections that will interfere with board installation or mar board appearance.
Roughen smooth surfaces before applying adhesive.
Prime substrate surfaces prior to applying adhesive when recommended by manufacturer.

INSTALLATION
General:
Follow manufacturer's directions.
Keep perimeter lines straight, plumb, level, and true to wall plane.
Install boards without horizontal joints, unless otherwise shown on Drawings.
Install boards without vertical joints if possible; where joints are mandatory space no closer than 8 feet on center unless otherwise approved or shown on Drawings.
Fabricate board joints straight and balance symmetrically, unless otherwise shown on Drawings.
Fit butt joints tight and in same plane on both side of joints.
Metal Trim:
Provide metal trim around board perimeter.
Secure as recommended by manufacturer, unless otherwise approved.
Fit with precise hairline joints with no rough edges.
Locate joints no closer than 4 ft. on center unless otherwise approved.

CLEANING AND REPAIRING
Remove debris from project site upon work completion or sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.
Provide temporary protective cover. Remove at substantial completion.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Directories, directional items, letters, signs, and plaques of various materials used in establishing identity or communication.

SUBMITTALS
Provide in accordance with Section 01 33 00.
Shop Drawings:
Prior to starting work submit the following for review and acceptance:
- Layout templates
- Color samples
- One completed sign
- Jobsite layout and mounting of each sign type.

DELIVERY, STORAGE, AND HANDLING
Protect against damage and discoloration.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

PLASTIC SIGNS
General:
Type: Injection-molded plastic, exposed edges beveled, single faced.
Thickness: 1/8 inch minimum.
Colors: To be selected by Architect.
Size: See sizes on Drawings.
Accessories: At signs located on glazing, provide blank back plates to match size and shape of sign.
Manufacturer: Innerface Sign Systems, ASI Sign Systems, Architectural Metalcrafters, Meyer Architectural Signs & Graphics, Best Sign Systems, Gemini Incorporated, Martin Bros, Mohawk Sign Systems.
Extent of Work: Provide signs next to each new interior door in Door Schedule.
Provide room names and numbers as directed by owner.
Provide the sign types per the Room Signage Schedule on the Drawings.

PART 3 - EXECUTION

EXAMINATION
Verify that backing and surfaces to receive signs are complete, clean, dry, secure, and otherwise properly prepared.
Prior to starting work notify General Contractor about defects requiring corrections.
Do not start work until conditions are satisfactory.

FIELD MEASUREMENTS
Verify prior to fabrication.
If field measurements differ slightly from Drawing dimensions modify work as required for accurate fit. If measurements differ substantially notify Architect prior to fabrication.

INSTALLATION
Install plumb, level, square, true, and secure.
Attach to wall at latch side of doors unless otherwise noted on Drawings.
Install with double-stick adhesive tape.
Mount signs at maximum 60 inches above floor to centerline of sign. All signs mounted at uniform height.

CLEANING AND REPAIRING
Remove debris from project site upon work completion of sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed products which

have been soiled, discolored, or damaged by work of this section.

PROTECTION

Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Shop fabricated enclosures, dividers and screens for toilets including accessories.

SUBMITTALS
Shop Drawings:
Show layouts, dimensions, colors, methods of anchoring and reinforcing, core construction, other pertinent details; submit in accordance with Section 01 33 00.
Furnish bolt hole locations templates.

DELIVERY, STORAGE, AND HANDLING
Protect against damage and discoloration.
Deliver in manufacturer's original unopened and undamaged packages.
Clearly label packages with manufacturer, brand name, contents, color, stock number, and order number.

EXTRA STOCK
Provide Owner with extra stock of screws and bolts, and tamperproof tools used to change fasteners.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

SOLID COLOR REINFORCED COMPOSITE TOILET PARTITIONS AND SCREENS
Material and Finishes:
Partitions, Stiles and Doors: 1” thick solid HDPE resin with integral color.
Color: Scranton “Shale”, Orange Peel Texture.
Fittings: Manufacturer's standard, non-corrosive type.
Edges: Shiplap.
Compartments:
Type: Floor supported, overhead braced type with anti-grip rails, flush partitions, doors and pilasters.
Manufacturer and Model: Scranton “Eclipse”, or accepted substitute.
Door and Dividing Panel Height Hight Privacy 62 inches, 10 inches AFF.
Dimensions:
Refer to Drawings.
Maintain 32 inch minimum clear dimension at outswinging doors serving compartments for handicapped users.

HARDWARE
For Each Door:
Continuous stainless steel hinge that will hold door partially open when compartment is unoccupied. Out-swing doors shall close tight.
One coat hook with rubber tipped bumper.
One slide bar latch with combination stop and latch keeper.
One pull on outswinging doors complying with ADAAG requirements.
Fasteners:
Corrosion-resistant finished to match fittings.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive compartments are straight, plumb, square, secure, accurately sized and located, and otherwise properly prepared.
Prior to starting work notify general contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

Verification of Conditions:
Verify prior to fabrication.
If field measurements differ slightly from Drawing dimensions, modify work as required for accurate fit. If measurements differ substantially notify Architect prior to fabrication.

COMPARTMENT AND SCREEN INSTALLATION
Install rigid, straight, parallel, plumb, and level in accordance with Manufacturer's directions and approved Shop Drawings.
Install with the following maximum uniform clearances:

Pilaster and Wall: 3/8 to 1/2 inch.
Panel and Wall: 3/8 to 1/2 inch.
Pilaster and Panel: 1/2 inch.
Pilaster and Door: 3/16 inch.

Align closed doors with adjacent panel tops and bottoms.

HARDWARE INSTALLATION
Follow manufacturer's directions.
Provide no less than 2 wall brackets; locate near panel top and bottom.
Conceal evidence of field drilling, cutting, and fitting.

ADJUSTMENTS
Adjust moving parts to operate satisfactorily at time of final project acceptance and during warrant period.

PRODUCT CLEANING AND REPAIRING
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.
Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Folding, stacking type manually or electrically operated partitions with ceiling track and hardware.

WORKMEN'S QUALIFICATIONS
Factory-trained and approved Manufacturer.

SUBMITTALS
Submit in accordance with Section 01 33 00.
Shop Drawings:
Show locations, openings sizes, stacking space, construction details, anchorage, clearance, head and jamb details, hardware, facing pattern and color, and installation methods.
Certificates:
Submit for each partition type one copy of the following independent laboratory test results signed by laboratory official:
Sound Transmission Class: ASTM E-90 using 14 X 9 ft. minimum test opening.
Operate partitions 10 times minimum prior to test.
Operation and Maintenance Instructions:
In accordance with Section 01 78 23, submit one copy of adjusting and maintenance instructions to Contractor for inclusion in Owner's maintenance manual.

ALLOWABLE TOLERANCE
Install tracks level within 1/4 inch per 10 ft. non-accumulating.

PRODUCT DELIVERY, STORAGE, AND HANDLING
Protect against damage and discoloration.
Deliver in Manufacturer's original, unopened, undamaged packages with labels legible and intact.
Identify Manufacturer, brand name, model size, finish, and location.

SYSTEM MODIFICATIONS
Verify installation conditions, and include in Bid Proposal sufficient funds to modify building, if necessary, to accommodate partition system design.
No additional payment to Contractor for work of this type will be made.

WARRANTY
Provide manufacturer’s written warranty agreeing to repair or replace any components with manufacturing defects within a warranty period of two years.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

PAIRED PANEL OPERABLE PARTITIONS
General:
Type: Paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals.
Manufacturer and Model: Modernfold “Acoustiseal” Premier, or approved substitute.
Acoustic Performance: STC 50 per ASTM E 90-75, field test, 40 NIC per ASTM E 336-76.
Jamb Closure: Expandable panel with flexible seal.
Panels:
Facing Material: Full height magnetic markerboard work surface, white color, enamel on steel, bonded panel face.
Horizontal Trim: Without exposed fasteners.
Vertical Trim: None required.

Construction: Manufacturer's standard 18 gauge steel frame and panels, 3 inches thickness.
Hinges for Closure Panels, Pass Doors, and Pocket Doors: Full leaf butt hinges, attached directly to panel frame with welded hinge anchor plates. Lifetime warranty on hinges.
Sound Seals:
Vertical: Interlocking tongue and groove sound seals between panels, continuous contact vinyl bulb top seal, manually operated bottom seals with self contained handle.
Horizontal Bottom Seal: Modernfold IA2 bottom seal. Automatic operable seals providing nominal 2-inch operating clearance with operating range of +1/2-inch to –1-1/2-inch. Automatic drop as panels are positioned, without tools or cranks.
Suspension System:
Suspension Track: Minimum 11-gage, 0.12-inch roll-formed steel track, with adjustable steel hanger brackets.
Hanger Rods: Pair 3/8-inch diameter threaded rods.
Exposed Track Soffit: Steel, integral to track, and pre-painted off-white.
Carriers: Manufacturer’s standard type all-steel trolley with steel-tired ball bearing wheels per panel sized for loads, and designed for ease of operation, maintenance, and adjustments.
Hardware:
Manufacturer's recommended pulls and latches.
Provide lever handles both sides of door.
Hardware Colors:
Hinge: To be selected by Architect from Manufacturer’s standard selection.
Trim: To be selected by Architect from Manufacturer’s standard selection.
Other: Manufacturer’s standard.

PART 3 - EXECUTION

EXISTING CONDITIONS
Verify that openings to receive partitions are square, plumb, accurately sized and located, and with level floor.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

FIELD MEASUREMENTS
Confirm field dimensions prior to fabricating partitions.
If field measurements differ slightly from Drawing dimensions modify work as required for accurate fit. If measurements differ substantially notify Architect prior to fabrication.

INSTALLATION
Follow Manufacturer's directions,
Level tracks and secure to support headers.
Maintain 3/4 inch clearance between partition bottom and floor.

ADJUSTMENTS
Adjust moving parts to operate satisfactory at time of final project acceptance, and during Warranty Period.

CLEANING AND REPAIRING
Remove debris from project site upon work completion or sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Prefabricated items for use in conjunction with toilets and baths.

DELIVERY, STORAGE, AND HANDLING
Protect against damage and discoloration.
Do not remove protective covers until final project clean-up.
Deliver keys to Architect.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

GRAB BARS
Material: Satin finish stainless steel.
Mounting: 1 1/2 inch clearance between bar and wall; mount as shown on Drawings.
Manufacturer: Bobrick B-5806 series, or accepted substitute.
Provide in toilet compartments intended for handicapped users as shown on the Drawings.

SANITARY NAPKIN RECEPTACLE
Type: Surface mounted with hinged top cover and bottom trap door.
Material: Stainless steel.
Manufacturer: Bobrick B-270, or accepted substitute.
Provide one in each women's toilet compartment and each individual toilet room.

TOILET SEAT COVER DISPENSER
Type: Surface-mounted.
Material: Stainless steel with satin finish.
Manufacturer: Bobrick B-221.
Provide one in each toilet compartment and each toilet room where shown on Drawings.

ELECTRIC HAND DRYER
Type: Surface-mounted, hard-wired type.
Material: Polycarbonate with Sprayed Nickel finish.
Manufacturer: Dyson Airblade.
Provide where shown on Drawings.

COAT HOOKS
Type: Single robe hook, concealed mounting.
Material: Satin finish stainless steel.
Mounting: Unless otherwise shown on Drawings, mount 4 ft. above floor.
Manufacturer: Bobrick B-6707, or accepted substitute.
Location: Provide one in each toilet room, new and existing.

BABY CHANGING STATION
Type: Wall mounted, horizontal, fold-down, ADA compliant.
Construction: Blow-molded high density polyethylene with Microban antimicrobial additive, continuous steel hinge, 11 gage steel mounting plates and mounting hardware, pneumatic cylinder controlled opening and closing, with built-in dispenser for sanitary liners.
Accessories: Nylon safety straps and bag hooks, safety messages in six languages and Braille.
Manufacturing and Safety Standards: Conform to ASTM F 2285-04, ANSI S117.1 and ANSI Z535.4.
Manufacturer and Model: Koala Kare Products KB200-01SS, Grey color.

CUP DISPENSER
Type: Wall mount, ADA compliant. 4 oz cup dispenser, 16 inches tall, stainless steel finish.
Accessories: Wall mount bracket.
Manufacturer and Model: ULINE, H-1352 or accepted substitute.

OWNER-PROVIDED PRODUCTS
The owner will provide the following Toilet Accessories to the Contractor for installation:
- Soap dispensers: Surface mount.
- Paper towel dispensers: Surface mount hands-free type.
- Toilet paper dispensers: Surface mount double roll type.
- Trash receptacles: Surface mount.

BLOCKING AND BACKING
Provide all necessary.
Accessories are located on Drawings for Contractor's convenience.
Verify location, type, and quantity with Owner prior to proceeding with work.

FABRICATION
Fabricate units with welded corners, one piece seamless exposed flanges, and without open miters.
Except at coin boxes, key locked units alike.

PART 3 - EXECUTION

EXAMINATION
General:
Do not proceed until surfaces to receive accessories are smooth, clean, dry, square, sound, accurately sized and located, and otherwise properly prepared.
Prior to starting work notify General Contractor of defects requiring correction.
Verification of Conditions:
Verify type of wall construction prior to ordering. Provide all required fasteners, clamps, adapters, etc., necessary for conditions encountered.

INSTALLATION
Install accessories in accordance with manufacturer's directions where indicated, or directed.
Mount plumb, level, true, and secure with non-corrosive Fasteners.

ADJUSTMENTS
Adjust moving parts to operate satisfactorily at time of final project acceptance and during warranty period.

CLEANING AND REPAIRING
Remove debris from project site upon work completion or sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Collection of small specialty items not found in independent sections.

SUBMITTALS
Submit in accordance with Section 01 33 00.
Shop Drawings:
Show layout, dimensions, details of construction, methods of joining to other work, required clearances, finishes, accessories, and other pertinent items.
Manufacturer's printed data or samples may be substituted, provided required information is included.
Approved samples in like-new condition may be used on contract work.
Product Data:
Provide manufacturer’s data for products specified herein. Include information on mounting, operation, finishes, and sizes.
Samples:
Provide two (2) 12 inch long samples of chair rail, showing size and color.

DELIVERY, STORAGE, AND HANDLING
Protect against damage and discoloration.
Deliver in manufacturer's original, unopened, protective wrapping with original, legible label intact.

COORDINATION
Coordinate with other trades affecting or affected by work of this section.

PART 2 - PRODUCTS

CHAIR RAIL (CR-1)
Material: Vinyl, PVC
Style: 2500 Series
Mounting: 0.65” thick aluminum retainer.
Size: 2” x 1” x 12’
Manufacturer: Inpro.
Color: TAUPE 0113.

SPEAK-THRU DEVICE
Type: Two-way corded audio speaker intercom system. Mount circular end at height shown on drawings and secure cord to finish faces of glass and counter.
Size: Approximately 3 inches.
Finish: Black
Manufacturer and Model: CallToU Window Intercom. See Appliance Package cut sheets.

FIRE EXTINGUISHER CABINETS (FEC)
Type: Recessed, aluminum, trimmed.
Door: Clear acrylic plastic slim window.
Cylinder Lock: Not required.
Brackets: Provide with manufacturer's standard brackets to support extinguisher.
Painting: Paint cabinet interior with black enamel.
Manufacturer and Type: J. L. Industries Academy Series or accepted substitute.
Provide where “FEC” is noted on Drawings.

FIRE EXTINGUISHERS (FE)
Type: OSHA Approved, red, multi-purpose dry chemical.
Rating: UL rated 2A-10B:C, 5 lb capacity.
Fill and service extinguishers prior to substantial completion of project.
Install in fire extinguisher cabinets where “FEC” is noted on Drawings.
Install on manufacturer’s standard wall bracket where “FE” is noted on Drawings.

FIRE EXTINGUISHER SIGNS
Type: 3D Tent Style, 5” x 6”.
Manufacturer and Type: J. L. Industries 24S or accepted substitute.
Provide at each fire extinguisher, new and existing, noted on Drawings, mount bottom of sign at 84” above finish floor.

CORNER GUARDS
Size: 1½” X 1½” wings or 2” x wall width, 48 inches length.
Material: 16 gage, type 304 stainless steel, No. 4 finish.
Mounting: Cement-on type.
Manufacturer: IPC Door and Wall “181124C-304” Protection, Babcock-Davis “CG-SS304”, Korogard Wall Protection Systems “GS20”, or accepted substitute.
Location: Provide at all 90-degree interior corners at new and existing work.

JANITOR'S MOP HANDLE HOLDERS
Material: Type 30 Stainless steel.
Size: 24 inches long with 3 holders.
Manufacturer: Bobrick B-223 X 24, or accepted substitute.
Quantity Required: 1

SHOP PAINTING
Factory-apply one coat rust-preventative metal primer to ferrous metal surfaces after fabrication, but before installation, unless hereunder specified otherwise.
Substitute complete factory-finish where so specified herein.

BLOCKING AND BACKING
Provide where necessary.
Specialties are shown on Drawings for Contractor's convenience; verify location, type and extent of Work before installing blocking and backing.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces to receive specialties are properly prepared, sized, and located.
Prior to starting work notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
Chair Rail:
Surface Prep: Prior to installation, clean the substrate to remove dust, debris and loose particles.
Ensure the substrate is sound and per project plans Acclimate product in temperatures between 65°F and 80°F and a humidity level less than 80% 24 hours in advance of installation.
The area of installation must temperature and humidity controlled for at least 48 hours after installation.

INSTALLATION
General:
Follow manufacturer's instructions and approved shop drawings.
Secure plumb, level, square, straight, and true as applicable.
Fire Extinguishers:
Mount in cabinet where “FEC” is noted on Drawings. Mount on bracket on wall where “FE” is shown on Drawings unless otherwise directed by building official.
Chair Rail:
Refer to manufacturer’s installation instructions.
Locate the chair rail as indicated on the approved detail drawing for the appropriate substrate and in compliance with the IPC installation instructions.
Install chair rail level and plumb at the height indicated on the drawings.
Cut the aluminum retainer to the desired length, allowing 1-5/16" (33mm) for each end cap and inside corner, 5/16" (8mm) for each outside corner and 2-5/16" (59mm) for each picture frame corner.
Position and level the aluminum retainer on the wall, allowing for end caps, inside corners, and outside

corners, and transfer mounting holes to the wall with a marker.
Pre-drill holes and mount the retainer to the wall.
Slide the end caps, inside corners, outside corners or picture frame corners onto the aluminum, leaving a gap for adjustments, and secure them by using self-tapping screws.
Cut the vinyl cover to the distance between the end caps/corners.
Trim all factory edges square before installation. Position the vinyl cover on the aluminum retainer starting at one end and working to the other end by pushing the cover over the aluminum until it snaps into place.

ADJUSTMENTS
Adjust moving parts to operate satisfactorily at time of final project acceptance and during warranty period.

CLEANING AND REPAIRING
Remove debris from project site upon work completion or sooner, if directed.
Including work of other sections, clean, repair and touch-up, or replace when directed products which have been soiled, discolored, or damaged by work of this section.
Leave installation clean and defect-free.

PROTECTION
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Furnishing and installing roll-up fabric interior window shades including mounting and operating hardware.

PERFORMANCE REQUIREMENTS
As a shade cloth, the fabric shall hang flat, without buckling or distortion. The edge, when trimmed, shall hang straight without raveling. An unguided shade fabric shall roll true and straight without shifting sideways more than 1/8 inch in either direction due to warp distortion or weave design.
Performance Classification: Premium, heavy-duty, clutch operated design for use in demanding applications.

REFERENCES
NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

SUBMITTALS
Submit in accordance with Section 01 33 00.
Product Data:
Manufacturer's catalog pages and data sheets for products specified including materials, finishes, dimensions, profiles, mountings, and accessories.
Preparation instructions and recommendations.
Styles, material descriptions, dimensions of individual components, profiles, features, finishes , accessories, and operating instructions.
Storage and handling requirements and recommendations.
Mounting details and installation methods.
Manufacturer's Instructions: Include storage, handling, protection, examination, preparation, and installation.
Shop Drawings:
Plans, elevations, sections, product details, installation details, operational clearances, and relationship to adjacent work.
Provide location plan showing all manual shade control locations. Cross-reference furniture plans for optimal positioning of chains.
Provide elevation drawings showing shade band layout. Indicate any necessary seam or batten locations, and align with horizontal mullions where possible.
Indicate mounting location on details.
Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
Samples:
Submit two copies of manufacturer’s fabric samples.

QUALITY ASSURANCE
Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of 20 years experience in manufacturing products comparable to those specified in this section.
NFPA Flame-Test: Passes NFPA 701. Materials tested shall be identical to products proposed for use.

PRODUCT DELIVERY, STORAGE, AND HANDLING
Deliver in Manufacturer’s protective container with legible identifying labels intact.
Store flat and above ground.
Protect against moisture, damage, and discoloration.

WARRANTY
Manufacturer’s warranty from date of substantial completion that covers the following:
Shade Hardware: 25 years.
Electric Motors: 5 years.
Electronic Control Equipment: 5 years.
Fabric: 10 years.
Aluminum and Steel Coatings: 5 years.
Installation: One year commencing on date of final acceptance.

COORDINATION
Coordinate with other Trades affecting or affected by Work of this Section.

PART 2 - PRODUCTS

ROLLER SHADES
Manufacturers: Mechoshade, Mecho/5x, or accepted substitute.
Mounting: Wall/Door mount as shown on drawings.
Operation:
Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.
Bead chain loop: No. 10 stainless steel bead chain rated to 90 lb. minimum breaking strength.
Bead Chain Hold Down: Spring-loaded tensioner.
Clutch mechanism:
Fabricated from high carbon steel and molded fiberglass reinforced polyester or injected molded nylon. Minimum 20 lb. lifting capacity. White color.
Idler Assembly:
Provide roller idler assembly of molded nylon with adjustable or spring-loaded length idler pin to facilitate easy installation, and removal of shade for service.
Single Roller Configuration:
Mounting: Universal mounting brackets, endcaps and fascia. Provide size compatible with roller size. Mounted to walls and doors as noted on drawings.
Endcap covers: To match fascia or headbox color.
Fascia: L shaped aluminum extrusion to conceal shade roller and hardware.
Attachment: Snaps onto endcaps without requiring exposed fasteners of any kind. Fascia can be mounted continuously across two or more shade bands. No notching is required.
Shape: Square Fascia Panel.
Locations:
At Reception Windows: provide bead chain operation.
At Exterior Windows in Lobby 101: provide cordless operation.
At Exterior Windows, all other locations: provide bead chain operation.

FABRIC
Light-Filtering Fabrics:
ThermoVeil: 1500 series. 3 percent open 2 by 2 dense basket-weave pattern, also 126 inches (3200 mm) wide.
NRC Rating: 0.25.
SAA Rating: 0.28.
Low-Emitting Material Certification: Greenguard Gold certified and listed in UL (GGG).
Health Product Declaration (HPD): Published declaration with full disclosure of known hazards.
Extent of Work: At all exterior windows as noted on drawings.

ACCESSORIES
Dynamic Hembar: Extruded aluminum profile, single lengths for each shade panel; insert in fabric pockets and sew both ends.

PART 3 - EXECUTION

EXISTING CONDITIONS
Verify that surfaces to receive work of this section are solid, true, square, plumb, accurately sized and located, and otherwise properly prepared.
Prior to starting work notify General Contractor of defects requiring corrections.
Do not start work until conditions are satisfactory.

INSTALLATION
Fabricate shades completely in the factory.

Coordinate requirements for blocking and structural supports to ensure adequate means for installation of window shades.
Install level and plumb with anchorage and support as shown on drawings.

ADJUSTMENTS
Adjust moving parts to operate smoothly and free from binding or malfunction throughout entire range at time of final project acceptance and during warranty period.

PRODUCT CLEANING AND REPAIRING
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section.
Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Protect other Work against damage and discoloration caused by work of this section.

END OF SECTION

PART 1 - GENERAL

SUMMARY
The intent of Division 21, Fire Suppression Specifications, and the accompanying Drawings is to be a reference for preliminary locations and routing of fire protection system components.
Provide a complete and workable facility with complete systems that comply with the requirements of the state codes, local codes, fire marshal, owner's insurance underwriter, and any other authority having jurisdiction.
Division 21, Fire Suppression Specifications and the accompanying Drawings are complimentary and what is called for by one as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa.
Imperative language is frequently used in Division 21, Fire Suppression Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.
Routing of piping mains, or other pipe routing and sprinkler head locations must be approved by the architect prior to installation. If additional space is required for fire protection system components, Architect to make a formal request.
Request approval from the electrical engineer to use spaces in electrical panels provided at no additional cost.
Furnish piping, pipe fittings, valves, gauges, and incidental related items as required for complete systems. Identify valves, piping and equipment components to indicate their function and system served.
The General and Supplemental Conditions apply to this Division, including but not limited to:
Drawings and specifications.
Public ordinances, permits.
Include payments and fees required by governing authorities for work of this Division.
Division 01, General Requirements, applies to this Division.

RELATED SECTIONS
Division 01, General Requirements
Division 21, Fire Suppression
Section 21 10 00, Water Based Fire Suppression Systems

QUALITY ASSURANCE
Regulatory Requirements:
Products and equipment prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment's within this specification contain these banned substances, provide complying products and equipment's from approved manufacturers with equal performance characteristics.
General:
Conform Work and materials to requirements of the local and State codes, fire marshal, the owner's insurance underwriter, and any other authority having jurisdiction; and Federal, State and other applicable laws and regulations.
Contractor responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.
Fire protection system designs must bear the stamp and seal of the registered Professional Engineer who prepared the documents. The Engineer's stamp certifies that the work was done under the Engineer's supervision and control. Certification from NICET technicians, or other contractors, cannot replace the certification by the Engineer. Verify/coordinate with local building department for their specific requirements. New materials and Equipment
Good work quality, free of faults and defects and in conformance with the Contract Documents.
Apparatus: Build and install to deliver full rated capacity at the efficiency for which it was designed.
The entire system and apparatus operate at full capacity without objectionable noise or vibration.
Install equipment level and true equipment. Housekeeping pads and curbs account for floor or roof slope.
Materials and Equipment:

Each piece of equipment furnished meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
Furnish materials and equipment of size, make, type, and quality herein specified.
Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.
Workmanship:
General: Install materials in a neat and professional manner.
Manufacturer’s Instructions:
Follow manufacturer’s directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 21, Fire Suppression Specifications, obtain clarification before starting work.
Cutting and Patching:
Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
Make additional openings required in building construction by drilling or cutting. Use of jackhammer is specifically prohibited.
Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
Do not pierce beams or columns without permission of Architect and then only as directed.
New or existing work cut or damaged restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces repaired, refinished, and left in condition existing prior to commencement of work.

SUBMITTALS
Certified Shop Drawings:
Drawings indicate the general layout of the piping and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare fire protection system layout Drawings showing locations and types of head or outlets, alarm valves and devices, pipe sizes and cutting lengths, test tees and valves, drain valves, and other related items. New drawings prepared by Contractor and not reproductions or tracings of Architect’s Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. Drawings the same size as Architect’s Drawings with title block similar to the Drawings and identifying Architect’s Drawing number or any reference drawings. Drawings fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
Shop Drawings:
Prepare in two-dimensional format.
Include but are not limited to:
Sprinkler head layout drawings overlaid with ceiling and floor plans.
Sprinkler floor plans, including piping, equipment, and heads to a minimum of 1/4-inch equals 1-foot scale or same as plans, whichever is greater.
Superplot plans of above ground work with a colored overlay of all trades including, but not limited to, HVAC piping, HVAC equipment, plumbing piping and equipment, sprinklers, lighting, lighting controls, cable tray, fire alarm devices, electrical power conduit, and ceiling system to a minimum of 1/2-inch equals 1-foot scale.
Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
Fabrication drawings of radiant ceiling panels, architectural metal ceiling, including panel penetrations for lighting, sprinkler heads, fire alarm devices, and any other penetrations.

Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.
Product Data:
Submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications, and data sheets. Data sheets include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable
Provide sample of each type of sprinkler head.
Indicate equipment operating weights including bases and weight distribution at support points.
In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.
Hydraulic Calculations:
Submit hydraulic calculations specific to the installation.
Test Reports:
Submit certificates of completion of tests and inspections.
Submission Requirements:
Refer to Division 01, General Requirements for additional requirements related to submittals.
Shop Drawings:
Provide electronic copies of the Drawings showing sprinkler head locations and layout coordinated with architectural ceiling details to the Architect for review prior to submitting Drawings to insurance underwriter and Fire Marshal.
Provide Drawings and calculations to the Architect to be sent to the Owner's insurance underwriter for approval.
Submit set of approved Drawings to Architect for final review.
Product Data:
Submit electronic copies of shop drawings and product data for Work of Division 21 in PDF format with each item filed under a folder and labeled with its respective specification section number, article, paragraph, and mark, if applicable.
Submit shop product data in a single submittal. Partial submittals will not be accepted. Re-submittals submitted after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned re-submittals, insert them in the previously submitted binder.
Contractor Responsibilities:
See that submittals are submitted at one time and are in proper order.
Obtain approvals and permits from the AHJ.
Ensure that equipment will fit in the space provided.
Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNERS INSTRUCTIONS
Refer to Division 01, General Requirements for additional requirements.
Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature on 8-1/2-inch by 11-inch sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified.
Provide wiring diagrams for electrically powered equipment.
Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover phases of control.
Furnish competent engineer knowledgeable in this building system for minimum of one 4-hour day to instruct Owner in operation and maintenance of systems and equipment. Keep a log of this instruction including dates, times, subjects, and those present and present such log when requested by Architect.

RECORD DRAWINGS

Provide record drawings in PDF format.
Drawings include the following:
Project specific title block.
Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

PROJECT CONDITIONS
Existing Conditions: Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work. Include related costs in the initial bid proposal.
Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.
Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

WARRANTY
Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.
Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.
Correct warranty items promptly upon notification.

TEST REPORTS AND CERTIFICATES
Submit one copy of test reports and certificates specified herein to the Architect.

SUBSTITUTIONS
Submit any requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 - PRODUCTS

ACCESS PANELS
Furnish under this Division as specified in another Division of work.

PIPE SLEEVES
Interior Wall and Floor Sleeves:
18-gauge galvanized steel or another pre-approved watertight system.
Interior Wall and Floor Sleeves (fire rated):
Fire rated and watertight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
Exterior Wall Sleeves:
Cast Iron
On Grade Floor Sleeves:
Same as exterior wall sleeves.

FLOOR, WALL AND CEILING PLATES
Furnish stamped split type plates as follows:
Floor Plates:
Cast brass, chromium plated.
Wall and Ceiling Plates:
Spun aluminum.

PART 3 - EXECUTION

COORDINATION
Coordinate fire protection piping and appurtenances with ducts, other piping, electrical conduit, and other equipment.
Conceal fire protection piping and equipment be concealed except in area without ceilings and as noted on the Drawings.
Locate piping, heads, and equipment where shown on Drawings.

GENERAL
Install fire protection systems to serve the entire project area and incorporate into the existing building's system.
Locate sprinklers in the center of ceiling panels and symmetrically within rooms and down corridors, coordinated with and in pattern with lights and grilles. Deviations must be approved.
Locations of sprinkler heads, outlets, piping, and appurtenances are not shown in areas and therefore are to be installed in accord with code requirements.

SLEEVES
Interior Floor and Wall Sleeves:
Provide sleeves large enough to provide clearances around pipe outside diameter as required by NFPA.
Penetrations through mechanical room and fan room floors made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved watertight system.
Layout work prior to concrete forming. Do cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.
Wall sleeves flush with face of wall unless otherwise indicated.

WALL AND CEILING PLATES
Install on piping passing through finished walls, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe and duct.
Secure wall and ceiling plates to pipe or structure.
Plates not required in mechanical rooms or unfinished spaces.

CLEANING
General:
Clean equipment and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.
Painted Surfaces:
Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.
Additional requirements are specified under specific Sections of this Division.

PROTECTION
Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated equipment, or apparatus to original conditions or replace at no cost to the Owner.
Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.
Cover or otherwise suitably protect equipment and materials stored on the job site.

ACCESSIBILITY
General:
Locate valves, indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.
Gauges:

Install gauges so as to be easily read from the floors, platforms, and walkways.

PAINTING
General:
Coordinate painting of fire suppression equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.
Equipment Rooms and Finished Areas:
Hangers
Miscellaneous Iron Work
Structural Steel Stands
Steel Valve Bodies and Bonnets:
One coat of black enamel.
Sprinkler Heads:
Not painted.
Concealed Spaces (above ceilings, not visible):
Hangers, Miscellaneous Iron Work, Valve Bodies, and Bonnets: Not painted.
Sprinkler Piping:
Concealed from View: Not painted.
Exposed to View: Paint pipe and hangers exposed to view, including in equipment spaces, with one coat approved rust inhibiting primer. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
Exterior: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
Alarm Bell: Factory paint with two coats of red enamel.

ADJUSTING AND CLEANING
General:
Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced.
Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.
Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals.
Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.
Piping:
Clean interior of piping before installation.
Flush sediment out of piping systems.

ELECTRICAL EQUIPMENT
Do not install fire suppression systems in switchgear rooms, transformer vaults, telephone rooms, or electric closets except as indicated.
Fire Suppression systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

END OF SECTION

PART 1 - GENERAL

SUMMARY
This Section includes Design-Build work and the following:
Preaction System
Sprinkler Heads
Flow Switch
Valves
Air Vent
Black Steel Pipe
Flanged Joints
Mechanical Pipe Couplings and Fittings
Threaded Fittings
Pressure Gauges
Valve Identification
Piping Markers

RELATED SECTIONS
Division 01, General Requirements
Division 21, Fire Suppression
Division 21 05 00, Water Based Fire Suppression Systems

QUALITY ASSURANCE
Regulatory Requirements:
Sprinkler system to comply with NFPA 13 and local Fire Marshal requirements.
Refer to Section 21 05 00, Common Work Results for Fire Suppression for additional requirements.
Hydraulically Calculated Sprinkler System: Sprinkler system to be hydraulically calculated grid system designed to provide:
Light Hazard Occupancies: 0.10 GPM/Ft2 density at most remote 1500 SF for public areas, living spaces, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements or additional excess pressure as required by fire marshal.
Ordinary Hazard Occupancies Group 1: 0.15 GPM/Ft2 density at most remote 1500 SF for mechanical rooms, kitchen, and parking areas, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements or additional excess pressure as required by fire marshal.
Ordinary Hazard Occupancies Group 2: 0.20 GPM/Ft2 density at most remote 1500 SF for mechanical rooms, kitchen, and parking areas, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements or additional excess pressure as required by fire marshal.
NFPA 13 (without the use of exceptions found in NFPA 13 systems minimum guideline) used for the location, sizing, and installation of piping and sprinkler systems unless local fire marshal or owner's insurance underwriter requirements are more stringent. Exceptions must be approved by the Engineer prior to usage.

SUBMITTALS
Provide submittal in accordance with Section 21 05 00, Common Work Results for Fire Suppression.
Sprinklers referred to on shop drawings and identified by the listed manufacturer's style or series designation. Trade names and abbreviations are not permitted.

PART 2 - PRODUCTS

SUMMARY
This part provides accepted manufactures and a description of relevant equipment used for a water based fire suppression system.

MANUFACTURERS
Preaction System:
Single Interlocked Electric Release
Manufacturer: Preaction system to be pre-trimmed.
Reliable
Tyco Fire Protection Products
Victaulic
Viking
Sprinkler Heads:
Globe
Reliable Automatic Sprinkler
Tyco Fire Protection Products
Victaulic
Viking
Flow Switch:
Potter Electric
Tamper Switch:
Potter Electric Signal Company
Valves:
Where only one manufacturer's model is listed, equivalent products by those specified below, or equal, are acceptable upon approval.
Use only one manufacturer.
Gate:
Kennedy
Tyco Fire Products; TJP series, TJR series Models
Victaulic; 771, 772, 773 Model Series
Wilkins
Zurn
Swing Check:
Kennedy; 1126, 1126A, 726 Models
NIBCO; G-997, W-403-W
Tyco Fire Products; CV-1F Model
Victaulic; 717 or 717H Model
Zurn/Wilkins; F210 Model
Butterfly:
FPPI
Kennedy
Tyco Fire Protection Products
Victaulic
Zurn
Specialty:
Conbraco
Kennedy
NIBCO
Victaulic
Air Vents
ECS
Potter
Reliable Automatic Sprinkler
Tyco Fire Protection Products
Black Steel Pipe:
Bull Moose
Wheatland
Youngstown
Flanged Joints:
Anvil
McWane

US Pipe
Mechanical Pipe Couplings and Fittings:
Tyco Fire Protection Products/Grinnell
Victaulic
Threaded Fittings
American
Anvil
Tyco Fire Protection Products
Viking
Pressure Gauges:
Ametek
Ashcroft
FPPI
Potter Roemer
Reliable
Victaulic
Viking
Winters Instruments
Piping Markers:
Marking Systems, Inc. (MSI).
Seton
W.H. Brady

PREACTION SYSTEM
Single Interlocked:
General:
Factory assembled trim package for a single interlocked preaction system with electric release module in a metal enclosure.
Standard trim normally required on a deluge valve has been moved to a single cabinet. The cabinet provides access doors for emergency release and alarm test valve for manual operation of these trim valves.
Cabinet is equipped with priming water pressure and water supply gauge viewports for easy monitoring of water pressures.
Cabinet eliminates the installation of alarm trim piping at the deluge valve.
Enclosure protects trim valves from inadvertent operation. Included stainless steel hoses from the valve body to the enclosure assembly allows the assembly to be installed remote of the sprinkler riser.
UL listed, FM approved trim assembly manufactured by the same manufacturer as the deluge valve.
Operation:
System incorporates an electric release module that controls the pressurization of the priming chamber of the deluge valve.
Water is supplied to the deluge valve’s priming chamber from an outlet upstream of the water supply control valve.
Water flow passes through the normally opened priming valve, Y-strainer, 1/16-inch restricted orifice and spring loaded check valve. Supply water to the inlet side of the normally closed solenoid valve and to the priming side of the PORV.
Priming water exits the trim package cabinet passing to the chamber of the deluge valve, pressurizing the deluge valve closed. Once pressure is present in the priming chamber of the deluge valve, the water supply control valve can be opened. Water supply control valve is opened, water will pressurize the inlet chamber of the deluge valve, and water will exit the inlet chamber of the deluge valve and enter the trim package cabinet.
After water enters the trim package cabinet it will pressurize the water supply pressure gauge. Water pressure will now be available on the inlet of the normally closed alarm test valve. Valve and trim assembly is now in a normal operation mode.
In Fire Conditions:
Single Interlocked Preaction Systems with an electric release require a compatible electric release device (or combination of compatible electric release devices) to activate in the hazard area which initiates a power sequence from the listed release control panel to open the normally closed solenoid valve.

Factory assembled trim package in wall mounted cabinet. Solenoid valve opens releasing the water pressure in the deluge valve's priming chamber.
Priming water is discharged from the outlet of the solenoid valve to the drain cup. Once priming water pressure is relieved in the priming chamber of the deluge valve, water supply pressure will pass from the inlet of the deluge valve to the outlet of the deluge valve to the sprinkler piping.
Include but not be limited to, the following components:
Water Control Valve:
Deluge of preaction systems utilizes a 90-degree pattern type of deluge valve. Employ a positive vent on the priming line to ensure that the deluge valve will not prematurely reset.
Inlet and outlet connections of deluge valve can be flanged by flanged or flanged by grooved, respectively.
UL listed and FM approved
Working pressure of 300 psi.
Externally resettable, and internal components replaceable with valve in the installed position.
Valve trim compatible and utilizes a 90-degree pattern type or a straight pattern deluge valve.
Detection:
Activation of the system incorporates as part of the operation, a compatible electric detection system.
Detection devices installed compatible with the deluge valve control panel.
Control Panel:
Capable of single hazard cross-zone release.
Equipped with a local tone alarm to annunciate loss of A/C power, system trouble, circuit trouble, and low auxiliary D/C power supply.
Capable of supervising trouble and audible alarms.
Silence trouble and alarms at release panel.
House in a vented enclosure with ambient temperature compatibility of 32 degrees F to 120 degrees F.
Adequate size to house auxiliary D/C power supply.
Auxiliary D/C power supply consists of two 12-volt lead acid batteries of the same ampere hour rating.
Actual ampere hour rating will be established by auxiliary D/C power requirement.
Solenoid Valve:
Electrically operated solenoid deluge valve priming water release device. Constructed of a 1/2-inch brass body with a stainless steel core tube, core, plug nut, and springs.
Maximum working pressure of 175 psi.
Solenoid valve UL listed for its intended use and listed for use with the deluge valve and flow control valve.
Compressed Air Supply:
Provide an air supply capable of restoring system pressure within 30 minutes. Acceptable air supply arrangements are:
A tank-mounted air compressor with an air maintenance device between the air compressor and the air supply inlet on the system riser.
A riser-mounted air compressor feeding an air reservoir. An air maintenance device placed between the air reservoir and the system riser.
A riser-mounted compressor listed as an air maintenance compressor.
System Check Valve:
UL listed and FM approved for use on fire protection systems. Sprinkler riser check valves manufactured with supply side and system side gauge connections and a main drain outlet in accordance with NFPA 13.
Check valves constructed of a ductile iron body with a brass seat and a rubber faced clapper assembly hinged to a removable access cover. Equip with a removable access cover for periodic inspection as required in NFPA 25. Working water pressure of 250 psi.
High-Low Air Pressure Switch:
Maintain supervisory air pressure on preaction systems with 20 sprinklers or more on the system piping.
Low Air Pressure Alarm:
Activate by way of a pressure supervisory alarm pressure switch.
Switch compatible with system devices.
Enclosure UL listed and FM approved for the application in which it is used.

Ability to be wired for Class A or Class B service.
Water Flow Pressure Switch:
Activate an alarm by way of an alarm pressure switch.
Compatible with system devices.
Enclosure UL listed and FM approved.
Wired for Class A or Class B service.

SPRINKLER HEADS
General:
One manufacturer throughout building. Mixing of sprinkler brands is not permitted.
Brass frame construction with a coated metal sealing button coated with Teflon film. Sprinklers utilizing non-metal parts in the sealing portion of the sprinkler are strictly prohibited.
Quick response frangible bulb type fusible element with a temperature rating of 155 degrees or 200 degrees F or a fast response metal type fusible element with a temperature rating of 165 degrees or 212 degrees F
Standard spray and extended coverage to not be mixed within a space or compartment.
UL listed or FM approved for working water pressures up to 175 psi. Sprinkler heads in dry and preaction type systems installed per NFPA 13.
Heads, UL or FM approved for application and installation.
Provide intermediate or high temperature heads for mechanical rooms, areas below skylights, dishwashing and other areas which have high heat producing equipment to prevent accidental trippage per NFPA requirements.
Sprinklers Installed in Finished Ceilings:
Quick response, recessed, bulb type, chrome finish, 165 degrees F unless required otherwise.
Sprinklers Installed in Unfinished Ceiling Areas (or Above Finished Ceilings Where Required):
Pendent or up-right, rough bronze finish, and adequate temperature for the hazard.
Sprinklers Installed in Exterior Perimeter Areas:
Quick response, horizontal dry sidewall sprinkler, polished chrome finish.
Sprinklers Installed in Exterior Covered Areas:
Quick response, dry pendent, chrome finish, 165 degrees F unless required otherwise.
Sprinkler Heads, Corrosion Resistant:
Pendent type, rough bronze finish, 165 degrees F, with factory applied corrosion resistant coating.
Flexible Stainless Steel Hose:
UL listed, or FM approved stainless steel hose assembly for individual sprinkler connections.
Drop includes a UL approved braided hose with a bend radius to 2-inch to allow for proper installation in confined spaces.
Provide union joints for ease of installation.
Attach flexible drop to the ceiling grid using a one-piece open gate bracket. The bracket allows installation before the ceiling tile is in place.
The braided drop system is UL listed and FM approved for sprinkler services to 175 psi.

VALVES
Gate, butterfly, and check valves must be UL listed or FM approved.
Bronze check valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
Full lug and grooved butterfly valves suitable for bi-directional dead end service at full rated pressure without use or need of a downstream flange.
Gate Valves: Rising stem or Non-rising stem with Post Indicator type.
Butterfly Valves: Extended necks.
Valve ends may be threaded, flanged, or grooved as applicable to piping system.
Provide ball drip drains, test orifices, and other related items as required to provide a complete fire protection system.
Gate Valves:
Bronze Gate: Bronze body, bronze screwed bonnet, bronze solid wedge, OS&Y pattern, rising stem, pre-grooved stem for supervisory switch mounting, 175 psi, UL listed or FM approved.
Iron Gate: Iron body, OS&Y pattern, solid wedge, pre-grooved stem for supervisory switch mounting, 175 psi, UL listed or FM approved.

Iron Gate, High Pressure: Iron body, OS&Y pattern, solid wedge, FM approved for 300 psi, UL listed 350 psi.
Check Valves:
Horizontal Bronze Swing Check:
Bronze body, bronze-mounted, 175 psi.
Y-pattern, regrindable seat
Similar to Nibco KT-403-W
UL listed or FM approved.
Horizontal Bronze Swing Check, High Pressure:
Bronze body, bronze-mounted, regrinding bronze disc, 365 psi.
UL listed or FM approved.
Swing Check:
Iron body, 175 psi
Can be installed vertically upward flow or horizontally
Flanged valves may be horizontal only.
Non-slamming operation
Similar to Victaulic 717
UL listed or FM approved
Swing Check, High Pressure:
Iron body, 300 psi
Can be installed vertically for upward flow or horizontally
Non-slamming operation
Similar to Victaulic 717H
UL listed or FM approved
Butterfly Valves:
Iron Butterfly:
Ductile iron body, aluminum-bronze disc and one-piece stainless-steel shaft, copper bushing, fasteners and pins not used to attach stem to disc, gear operator, stem neck length to accommodate insulation where applicable, EPDM liner or disc, 200 psi;).
Butterfly valves in main riser path, FM approved.
Iron Butterfly, High Pressure: Ductile iron body, ductile iron disc and one-piece stainless steel shaft, copper bushings, fasteners and pins not used to attach stem to disc, with lever handle and locking feature on valves 6-inches and smaller, gear operator, EPDM liner or disc, 300 psi, integral supervisory switch, UL listed or FM approved.
Specialty Valves:
Drain Valves: Bronze ball valve, garden hose end, cap and chain 3/4-inch size, bronze cast body, chrome-plated full port ball, with handle, Teflon seat, threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing, 600 psi CWP; NIBCO T-585-70-HC.
Gauge Cocks: Brass, tee handle, male to female, 200 psi working pressure, 1/4-inch; Conbraco 41 series, or equal.

AUTOMATIC AIR VENT (MECHANICAL)
The fire sprinkler contractor shall furnish and install an approved automatic air vent; 175 psi rated working pressure. Install per manufacturer’s instructions.
Provide at least one automatic air vent per automatic fire sprinkler system.
Install automatic air vent at or near the remote high point of the fire protection system piping. Device location shall be at the location(s) provided on the drawings.
The piping between fire protection system and automatic air vent must not create a water trap; the connecting piping must drain when fire protection system is drained or automatic air vent cannot perform venting functions.
The fire sprinkler contractor shall leave the isolation ball valve in the open position after installation of the automatic air vent and the final testing of the system has been completed.
The automatic air vent shall have redundant float valves to prevent leakage from the device in the event that the primary float valve fails; the automatic air vent shall not require plumbing to drain.
The automatic air vent shall not require a drip pan or water collection device to prevent water discharge in the event that the primary float valve fails.

The automatic air vent shall have a pressure indicating element indicating functionality of the primary float valve that is visible from the floor or below the device. The contractor shall install the automatic air vent in a location that provides a clear view of the pressure indicating element.
Provide a supervised automatic air vent when automatic monitoring is specified.

BLACK STEEL PIPE
General:
UL listed and FM approved for fire protection use.
Fittings and joints must be UL listed with pipe chosen for use.
Listing restrictions and installation procedures per NFPA 13 and state and local authorities for fire protection use.
Pipe/fittings must be hot-dipped galvanized in accordance with ASTM A795 for dry pipe sprinkler systems if air filled.
Pipe: ANSI/ASTM A53.
Fire Protection:
Schedule 10 or Schedule 40 in sizes up to 5 inches.
0.134-inch wall thickness for 6-inch.
0.188-inch wall thickness for 8-inch and 10-inch.
0.330-inch wall thickness for 12-inch.
Grooved Fittings: Roll grooved ends with mechanical couplings as specified.
Threaded Fittings: Threaded ends with fittings as specified.
Mechanical tees using rubber gasketed fittings are permitted only when connecting to fire protection piping for additions or modifications to an existing system. Mechanical tees must use a connection method that completely wraps around the pipe.
Service Above Grade: Fire protection system only for sizes listed, as approved by NFPA 13.

FLANGED JOINTS
Flanged Joints:
Cast iron or steel for screwed piping and forged steel welding neck for welded line sizes.
Pressure rating and drilling matches the apparatus, valve, or fitting to which they are attached.
Flanges in accordance with ANSI B16.1; 150 lb. for system pressures to 150 psi; 300 pounds for system pressures 150 psi to 400 psi.
Gaskets 1/16-inch thick, Cranite, or equal, ring type, coated with graphite and oil to facilitate making a tight joint.
Make joint using American Standard hexagon head bolts, lock washers, and nuts (per ASTM A307 GR.B) for service pressures to 150 psi; alloy steel stud bolts, lock washer, and American Standard hexagon head nuts (per ASTM A307 GR.B) for service pressures 150 psi to 400 psi. Use length of bolt required for full nut engagement.
Provide electro-cad plated bolts and nuts.

MECHANICAL PIPE COUPLINGS AND FITTINGS
Couplings and Fittings:
Coupling housing to be zero flex rigid type coupling with angled bolt pad design. Couplings fully installed at visual pad-to-pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted. Installation-Ready, for direct stab installation without field disassembly. Similar to Victaulic Type 009N.
Flexible couplings to be used only when expansion contraction, deflection or noise and vibration is to be dampened. Flexible Coupling to be similar to Victaulic Installation-Ready Type 005.Coupling gasket similar to Victaulic's Grade E molded synthetic rubber per ASTM D-2000.
Coupling bolts oval neck track head type with hexagonal heavy nuts per ASTM A-449 and A-183. series.

THREADED FITTINGS
Ductile iron conforming to ASME B16.3. Threads to be NPT per ANSI/ASME B1.20.1. Similar to Tyco Fire Protection Products Series 800.
UL listed and FM approved.

PRESSURE GAUGES
Description: 3-1/2-inch dial, turret case.
Range:

SYSTEM	PRESSURE	GRADUATIONS
Wet	0-300 psi	5 psi
Dry	0-80 psi	2 psi
*Provide compound gauge where shown on inlet side of fire pump on open piping systems (30-inch 15 psi). Other ranges may be listed on Drawings in which case they take precedence.		

VALVE IDENTIFICATION
Valve Tags:
General:
Identify valves with metal tags or plastic signs, legends to be stamped or embossed.
Indicate the function of the valve and its normal operating position, and area served; i.e.

3RD FL	(Area Served)
ISOLATION	(Valve Function)
NO	(Normal Operation Position)

Size: Valve tags 2-inch diameter with 1/4-inch high letters.
Material: Use 0.050 or 0.064-inch brass tags.
Control Valves:
Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicoid, or equal.
Form letters by exposing center ply.
Valve Tag Directory: Include the following:
Tag Number
Location
Exposed or Concealed
Area Served
Valve Size
Valve Manufacturer
Valve Model Number
Normal Operating Position of Valve

PIPING MARKERS
Label pipes with all-vinyl, self-sticking labels or letters.
Pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters; above 2-inches outside diameter, 2-inch letters.
Identify and color code as follows with white directional arrows.

SERVICE	PIPE MARKER	BACKGROUND COLOR
SPRINKLER WATER	FIRE PROTECTION WATER	RED
AIR, COMPRESSED	*COMPRESSED AIR*	GREEN

PART 3 - EXECUTION

SUMMARY
This part provides directions on installation of water based fire suppression systems.

INSTALLATION
General:
Provide seismic hangers as required by code.
Provide tamper switches on sprinkler system isolation valves. Provide flow switches for sprinkler zones.
A corrosion-resistant metal placard provided on riser indicating location number of sprinklers, design criteria, water demand, and date of installation.
Install fire sprinklers in exhaust ductwork from grease hood per NFPA 13. Provide access doors for sprinkler access per NFPA 96 and IBC. Provide access doors at a maximum of 10-feet on center in horizontal run. Provide a dry pendent sprinkler head at top of ductwork to prevent freezing.

Provide fire sprinkler guards on exposed sprinklers in areas subject to damage.
Quick response sprinklers listed for installation in an Ordinary Hazard occupancy when installed in an Ordinary Hazard occupancy.
All fire sprinkler system components shall be installed free of rust/corrosion or visible damage. All items not complying with this requirement shall be replaced without cost to the Owner.
Provide an air vent at the high point of all of the fire protection systems as required by code and per the manufacture.
Flexible Sprinkler Wet Head Drop:
Install per manufacturer's installation requirements.
Coordinate head location with other trades to assure space is available to maintain proper radius requirements.
Provide flexible sprinkler drops of appropriate length as conditions require.
Provide flexible sprinkler drops at sprinkler heads located in suspended, dropped, or acoustical ceilings.
In hard lid ceiling areas, provide flexible heads at Contractor's option.
Sprinklers above finished ceilings: Include heads above finished ceilings if structure is combustible, or if steel beams are not provided with spray-on fire proofing.
Electrical: Electrical work to comply with Division 26, Electrical.
Hangers and Supports:
Install sprinkler system hangers, and supports in accordance with NFPA 13.
Install standpipe piping, hangers, and supports in accordance with NFPA 14.
Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
Pressure Gauges:
Provide gauges where specified, shown on Drawings, or required by code.
Install additional gauges as required and as recommended by equipment manufacturer or their representative.
Locate gauges so that they may be conveniently read at eye level or easily viewed and read from the floor or from the most likely viewing area.
Install instruments over 6-1/2-feet above floor, to be viewed from the floor, with face at 30 degrees to horizontal.
Provide instrument gauge cock at inlets.
Valves:
Provide valves at connections to equipment where shown or required for equipment isolation.
Install valves accessible and same size as connected piping.
Provide separate support for valves where necessary.
Provide drain valves in low points in the piping system, and at equipment, as required by code, and as indicated.
Fire Suppression Service:
In piping 2-inches and smaller; bronze gate valve, bronze swing check valve, vertical check valve.
In piping 2-1/2-inches and larger; iron gate valve, iron swing check valve, vertical check valve.
UL listed and FM approved butterfly valves.
Non-slamming check valves on pump discharge.
Provide gauge cocks for pressure gauges.
Piping Preparation:
Measurements, Lines and Levels:
Check dimension at the building site and establish lines and levels for work specified in this Section.
Establish inverts, slopes, and elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
Use established grid and area lines for locating trenches in relation to building and boundaries.
Piping:
Hold piping as tight to structure as possible. In general, run piping in areas without ceilings parallel to building elements in a neat, professional manner.
Pipe inspector test connections to exterior and discharge as approved by local applicable governing authorities.
Provide test tees as required.

Install unions in non-flanged piping connections to apparatus and adjacent to screwed control valves, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.
No fittings that bite into the pipe may be used.
Mechanical Couplings:
On systems using galvanized pipe and fittings, galvanize fittings at factory.
Before assembly of couplings, lightly coat pipe ends and outside of gaskets with approved lubricant.
Pipe grooving in accordance with manufacturer's specifications contained in latest published literature.
Install piping as to drain per NFPA 13.
Support piping independently at apparatus so that its weight not carried by the equipment.
Utility Marking:
Installed over the entire length of the underground piping utilities. Install plastic tape along both sides and the center line of the trenches at the elevation of approximately 12-inches above the top of utility.
Underground Water System:
Prior to testing pipe provide concrete thrust blocks at changes in direction.
Block size as required for types of fittings involved.
Drain Piping:
Pitch drain piping 1/2-inch per 10-feet minimum; no traps allowed.
Discharge drain piping to outside with suitable splash plate to a location as approved by the architect.
Piping Joints:
Join pipe and fittings using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.
Grooved Joints:
Install in accordance with the manufacturer's latest published installation instructions.
Clean pipe ends free from indentations, projections and roll marks in the area from pipe end to (and including) groove.
Gasket manufactured by the coupling manufacturer and verified as suitable for the intended service.
Factory trained representative (direct employee) of the coupling manufacturer to provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and product installation.
Periodically visit the job site and review installation to ensure best practices in grooved joint installation are being followed.
Remove and replace any improperly installed products.
No couplings installed in floor or wall sleeves.
Steel Piping:
Screwed Joints:
Pipes cut evenly with pipe cutter reamed to full inside diameter with burrs and cuttings removed.
Joints made up with suitable lubricant or Teflon tape applied to male threads only, leaving two threads bare.
Joints tightened so that not more than two threads are left showing.
Junctions between galvanized steel waste pipe and bell of cast iron pipe made with tapped spigot or half coupling on steel pipe to form spigot end and caulked.
Flanged Joints:
Pressure rating of flanges match valve or fitting joined.
Coat joint gaskets with graphite and oil.
Welded Joints:
Preparation for Welding: Bevel piping on both ends before welding:
Use following weld spacing on buttwelds:

NOMINAL PIPE WALL THICKNESS	SPACING	BEVEL
1/4-inch or less	1/8-inch	37-1/2
Over 1/4-inch, less than 3/4-inch	3/16-inch	27-1/2

Before welding, remove corrosion products and foreign material from surfaces.
Welded Joints:
Use arc-welding process using certified welders. Port openings of fittings must match the inside diameter of the pipe to which they are welded. Use full radius welding elbows for turns, use welding tees for tees.

Use reducing fittings for size reduction. Weldolets may be used for branches up through one-half the pipe size of the main to which they are attached. Nipples are not allowed.
Welding Operation:
After deposition, clean each layer of weld metal to remove slag and scale by wire brushing or grinding. Chip where necessary to prepare for proper deposition of next layer.
Weld reinforcement no less than 1/16-inch not more than 1/8-inch above normal surface of jointed sections. Reinforcement crowned at center and taper on each side to surfaces being joined. Exposed surface of weld present professional appearance and be free of depressions below surface of jointed members.
Do not weld when temperature of base metal is lower than 0 degrees F. Material to be welded during freezing temperatures made warm and dry before welding is started. Metal warm to the hand or approximately 60 degrees F.
Ductile Iron Pipe: Install joints per manufacturer’s written instructions.
Seismic Expansion Loops / Seismic Expansion Joints:
Install at building seismic expansion joints.
Install in other locations indicated on the drawings.
Install per manufacturer’s installation instructions.
Pipe Wrap:
Apply per manufacturer’s written instructions.
Apply wrapping to fittings in field after installation.

IDENTIFICATION
Valve Identification:
Valve Tags:
Attach to valve with a brass chain.
Valve tag numbers continuous throughout the building for each system. Obtain a list for each system involved from the Owner
Valve Tag Directory:
Post final copy in Operation and Maintenance Manual.
Piping Markers:
Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, painting, or other similar work, as follows:
Every 20-feet along continuous exposed lines.
Every 10-feet along continuous concealed lines.
Adjacent to each valve and stub out for future.
Where pipe passes through a wall, into and out of concealed spaces.
On each riser.
On each leg of a T.
Locate conspicuously where visible.
Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.
Equipment Identification:
Nameplates:
Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.
Nameplate Directory:
Post final copy in Operation and Maintenance Manual.

EXTRA STOCK
Provide additional number of heads of each type and temperature rating installed as required to meet NFPA 13 requirements.
Provide storage cabinet or cabinets as required to receive reserve sprinkler heads and special installation tools required.
Provide index label for each head indicating manufacturer, model, orifice size of K-factor, and temperature rating.
Provide, inside cabinet a list of heads stored within and brief description of where installed.

Locate cabinet near sprinkler control station as approved.

FIELD QUALITY CONTROL
Tests and Inspections:
Perform tests and arrange for required inspections of installed system as required.
Notify the Architect 48 hours prior to any test or inspection.
Provide final test and certification in the presence of an Owner representative. Coordinate hereunder.
Inspection Service:
At start of warranty year, execute inspection agreement.
Without additional charge to Owner, make quarterly inspection of system during year.
Check and operate control valves.
Lubricate valve parts.
Report each inspection to Owner.

END OF SECTION

PART 1 - GENERAL

SUMMARY
The intent of Division 22, Plumbing and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include all work specified in Division 22, Plumbing and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.
Division 22, Plumbing and the accompanying Drawings are complementary and as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa. Specifications supersede drawings in case of conflict.
The Drawings that accompany the Division 22, Plumbing, are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in fixture location prior to roughing-in, without cost impact.
The General and Supplemental Conditions apply to this Division, including but not limited to:
Drawings and specifications.
Public ordinances, permits.
Include payments and fees required by governing authorities for work of this Division.

RELATED SECTION
Division 01, General Requirements
Division 22, Plumbing

QUALITY ASSURANCE
Regulatory Requirements:
Products and equipment prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
General:
Conform work and materials to local and State codes, and Federal, State and other applicable laws and regulations.
Responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.
New materials and equipment. Work of good quality, free of faults and defects and in conformance with the Contract Documents.
Build and install apparatus to deliver its full rated capacity at the efficiency for which it was designed.
Operate the entire plumbing system and apparatus at full capacity without objectionable noise or vibration.
Install equipment level and true. Use housekeeping pads and curbs to account for floor or roof slope.
Materials and Equipment:
Meet detailed requirements of the Drawings and Specifications and suitable for the installation shown.
Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
Furnish materials and equipment of size, make, type, and quality herein specified.
Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements or any other differences which impact the project.
Workmanship:
General:

Install materials in a neat and professional manner.
Manufacturer's Instructions:
Follow manufacturer's directions where they cover points not specifically indicated.
If in conflict with the Drawings and Division 22, Plumbing, obtain clarification before starting work.
Cutting and Patching:
Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
Additional openings required in building construction made by drilling or cutting. Use of jackhammer is specifically prohibited.
Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
Do not pierce beams or columns without permission of Architect and then only as directed.
Restore new or existing work cut or damaged to its original condition. Where there are alterations disturb lawns, paving, walks, etc., repair, refinish, and leave in condition existing prior to commencement of work.

SUBMITTALS
Shop Drawings:
Contract Drawings indicate the general layout of the piping, and various items of equipment.
Coordinate with other trades and field conditions.
Prepare Shop Drawings of piping, and equipment installations.
Prepare new Shop Drawings by Contractor and not reproductions or tracings of Architect's Drawings or Plumbing Drawings.
Overlay drawings with shop drawings of other trades and check for conflicts.
Drawings same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's Drawing number or any reference drawings.
Fully dimensioned including both plan and elevation dimensions.
Shop drawings cannot be used to make scope changes.
Prepare in three-dimensional format.
Shop drawings include but are not limited to:
Complete floor plans with plumbing to a minimum of 1/8-inch equals 1-foot scale.
Plumbing in mechanical rooms to a minimum of 1/4-inch equals 1-foot scale.
Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.
Superplot plans of above ground work with a colored overlay of all trades including, but not limited to, HVAC piping, HVAC equipment, plumbing piping and equipment, sprinklers, lighting, lighting controls, cable tray, fire alarm devices, electrical power conduit, and ceiling system to a minimum of 1/2-inch equals 1-foot scale.
Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.
Product Data:
Submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications and data sheets. Data includes the following:
Capacities
RPM
BHP
Pressure Drop
Design and Operating Pressures
Temperatures
Manufacturer's abbreviations or codes are not acceptable.
List the name of the motor manufacturer and service factor for each piece of equipment.
Indicate equipment operating weights including bases and weight distribution at support points.
In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.
Submission Requirements:
Shop Drawings and Product Data:

Refer to Division 01, General Requirements for additional requirements related to submittals.
Submit electronic copies of shop drawings and product data for Work of Division 22, Plumbing in PDF format with each item filed under a folder and labeled with its respective specification section number, article, and paragraph and mark, if applicable.
Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
The bulk of the shop drawings and product data, excepting Controls and Instrumentation, included with the original submittal. Controls and Instrumentation submittals may lag but still complete when submitted.
Partial submittals will not be accepted. Other stragglers submitted after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.
Contractor Responsibilities:
Submit submittals at one time and are in proper order.
Ensure equipment will fit in the space provided.
Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

AS-BUILT DRAWINGS
Provide 3D model and record drawings at the end of the project.
3D model in the following format:
Revit
Navisworks
Provide record drawings in hard copy and pdf format. Drawings include the following:
Project specific titleblock.
Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNER'S INSTRUCTIONS
Refer to Division 01, General Requirements for additional requirements.
Submit data when the work is substantially complete, packaged separately, and clearly identified. Include name and contact information for location of source parts and service for each piece of equipment.
Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.
Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover all phases of control.

PROJECT CONDITIONS
Existing Conditions:
Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work.
Include related costs in the initial bid proposal.
Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.
Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

WARRANTY
Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.
Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.
Correct warranty items promptly upon notification.

PROVISIONS FOR LARGE EQUIPMENT
Make provisions for the necessary openings in building to allow for admittance of equipment.

TEST REPORTS AND CERTIFICATES

Submit one copy of test reports and certificates specified herein to the Architect.

SUBSTITUTIONS
Submit requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 - PRODUCTS

ACCESS PANELS
Furnish under this Division as specified in another Division of work.

PIPE SLEEVES
Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.
Interior Wall and Floor Sleeves, Fire Rated: Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
Water Tight Sleeves: Combination steel pipe sleeves with water stop and anchor plate; Link Seal Model WS, mated with synthetic rubber links interlocked with bolts and nuts; Link Seal Model LS.

FLOOR, WALL AND CEILING PLATES
Furnish stamped split type plates as follows:
Floor Plates: Cast brass, chromium plated
Wall and Ceiling Plates: Spun aluminum

PART 3 - EXECUTION

ACCESS PANELS
Install in accord with manufacturer's recommendations, coordinated with architectural features.
Provide 2-hour fire rated doors where required bearing the UL label.
Furnish 18-inch by 18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12-inch by 12-inch for walls unless indicated otherwise.
Furnish where indicated and where required to access valves, trap primers, shock arresters, and other appurtenances requiring operation, service, or maintenance. Submit proposed locations for review prior to installation.

SLEEVES
Interior Floor and Wall Sleeves:
Provide sleeves large enough to provide 3/4-inch clearances around pipe.
Where pipe is insulated, provide sleeves large enough to provide 3/4-inch clearance around insulation.
Maintain continuous insulation as it passes through sleeve.
Penetrations through mechanical room and fan room floors made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.
Sleeves Through Rated Floors and Walls:
Similar to interior sleeves except install fire rated system approved by Authority Having Jurisdiction and Owners insurance underwriter
Rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
Layout work prior to concrete forming. Do cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.
Floor sleeves maintain a water barrier by providing a water tight seal or they extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated. Waste stacks using carriers have sleeves flush with floor and sealed.
Sleeves through planters extend 8-inches above planter base.
Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor supported.
Special sleeves detailed on drawings take precedence over this Section.

CLEANING

General: Clean plumbing equipment, fixtures and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.
Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.
Additional requirements are specified under specific Sections of this Division.

EQUIPMENT PROTECTION
Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, fixtures, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.
Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.
Cover or otherwise suitably protect equipment and materials stored on the job site.

ACCESSIBILITY
General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.
Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms, and walkways.

FLOOR, WALL AND CEILING PLATES
Install on piping passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe.
Secure wall and ceiling plates to pipe, insulation, or structure.
Plates not to penetrate insulation vapor barriers.
Plates not required in mechanical rooms or unfinished spaces.

PAINTING
General:
Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.
Exposed work under this division receives either a factory painted finish or a field prime coat finish, except:
Exposed copper piping.
Aluminum jacketed outdoor insulated piping.
Equipment Rooms and Finished Areas:
Insulation: Not painted.
Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
Steel Valve Bodies and Bonnets: One coat of black enamel.
Brass Valve Bodies: Not painted.
Equipment:
One coat of grey machinery enamel.
Do not paint nameplates.
Concealed Spaces (above ceilings, not visible):
Insulation: Not painted.
Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.
Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.
Exterior Black Steel Pipe: Wire brush and apply two coats of rust-inhibiting primer and one coat of exterior enamel. Painting schemes comply with ANSI A13.1.

ADJUSTING AND CLEANING
Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced.
Check factory instructions to see that installations made accordingly and that recommended lubricants have been used.

Use particular care in lubricating bearings to avoid damage by overlubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

ELECTRICAL EQUIPMENT

Do not install piping for plumbing systems not serving electrical space in switchgear room, transformer vault, telephone room, or electric closet except as indicated.

Piping for plumbing systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

EQUIPMENT CONNECTIONS

Make final connections to equipment specified in sections other than Division 22, Plumbing of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.

END OF SECTION

PART 1 - GENERAL

SUMMARY
This Section includes:
Expansion Joints and Compensation
DWV Expansion Joints
Expansion Loops/Seismic Expansion Joints

RELATED SECTIONS
Division 01, General Requirements
Division 22, Plumbing
Section 22 05 29, Hangers, Supports and Anchors for Plumbing
Section 22 21 13, Pipe and Pipe Fittings Plumbing

QUALITY ASSURANCE
The expansion joints, pipe guides, and related supports, braces, and anchorages to building structure designed to absorb thermal expansion and contraction of piping and terminal movement, resist static and dynamic loads due to fluid flow at design conditions, hydraulic testing pressures, and seismic forces.
The system of expansion joints, guides, and related supports, braces, and anchorage to building structure designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.
Use expansion joints in straight lengths of rigid pipe; preferably welded steel, anchored and guided in accordance with best practices recommendations of Crocker and King, Piping Handbook, latest edition.
Avoid use of expansion joints in conjunction with U-bends or other piping systems with inherent flexibility, such as Victaulic piping with flexible couplings. If expansion joints are used in piping with bends, thorough analysis of pipe stresses and deflections conducted and extra care and attention paid to radial thrust capacity of pipe guides, braces, and anchors.
Design includes:
Pipe stress analysis indicating loads, deflections, and pipe stress at critical points throughout the piping systems under the following conditions:
Hydraulic design test pressure and ambient water temperature.
Design operating temperature, pressure, and flow.
Model number, size, location, and details of expansion joints, compensator guides, supports, braces, and anchorage to building structure, with substantiating calculations that the components and building can accept the calculated loads and deflections.
Detailed shop drawings stamped and signed by a registered professional engineer.
Structural details and calculations stamped and signed by a registered professional structural engineer.
Expansion Joints to be designed and manufactured to the current Expansion Joint Manufacturers Association (EJMA) standards. Manufacturer of expansion joints to be certified by EJMA.

SUBMITTALS
Submit the following:
Product Data
Shop Drawings showing details of construction, dimensions, arrangement of components, and isolation.
Structural Details and Calculations: Submit structural details and calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads.
Specified testing requirements.
Operating and Maintenance Data

PART 2 - PRODUCTS

MANUFACTURERS
Expansion Joints and Compensation:
Flexonics
Keflex
Hyspan
Metraflex
Other Manufacturers: Submit substitution request.
DWV Expansion Joints:

Canplas
Fernco
Other Manufacturers: Submit substitution request.
Expansion Loops/Seismic Expansion Joints:
Metraflex Metraloop
Other Manufacturers: Submit substitution request.

EXPANSION JOINTS AND COMPENSATORS
Description:
Expansion compensators to be of the packless, externally pressurized type to allow for axial movement constructed of stainless steel bellows, stainless steel shroud, integral guide rings, internal liner, limit stops, with drain port and plug.
Materials of construction and pressure ratings appropriate for the application as specified for each piping material and service.

DWV EXPANSION JOINTS
Expansion Joint:
DWV piston or sphere expansion/compression joint suitable for use with non-pressurized DWV piping.
Materials of construction and pressure ratings appropriate for the application as specified for each piping material and service.

EXPANSION LOOPS / SEISMIC EXPANSION JOINTS
Description:
Flexible stainless steel hose and braid connector.
Connector accepts differential support displacement without damaging pipe, equipment connections, or support connections.
Materials of construction and pressure ratings be appropriate for the application as specified for each piping material and service.

PART 3 - EXECUTION

EXPANSION JOINTS AND COMPENSATORS
Install in piping to compensate for thermal expansion and contraction. Determine quantities and locations required.
Install in other locations indicated on the drawings.
Provide and install pipe alignment guides as recommended by the expansion joint manufacturer with the first guide no more than 4 pipe diameters away from the expansion joint or compensator and second guide no more than 14 pipe diameters from first guide.
Install per manufacturer’s installation instructions.

EXPANSION LOOPS/SEISMIC EXPANSION JOINTS
Install at building seismic expansion joints.
Install in piping to compensate for thermal expansion and contraction. Determine quantities and locations required.
Install in other locations as required for buildings need.
Install per manufacturer’s installation instructions.

END OF SECTION

PART 1 - GENERAL

SUMMARY
This Section includes:
Thermometers, Water

RELATED SECTIONS
Division 01, General Requirements

SUBMITTALS
Submit the following:
Products listed in this Section.
Water flow meters, include graph of output signal vs. gpm for each device.
Operating and Maintenance Data.

PART 2 - PRODUCTS

MANUFACTURERS
Thermometers, Water
Ashcroft
Weiss
Trerice
Marsh
Weksler
Tel-Tru
Other Manufacturers: Submit substitution request.

THERMOMETERS, WATER
Description: Direct drive 5-inch dial type, stainless steel case, separable sockets, stem length to penetrate minimum of 1/2 pipe diameter, adjustable face, extension necks where required to clear insulation.
Range:

Plumbing Systems	Temperature	Graduations
Domestic Cold Water	25-125 degrees F	1 degrees F
Domestic Hot Water	30-180 degrees F	2 degrees F

PART 3 - EXECUTION

INSTALLATION - GENERAL
Provide meters and gauges where shown on Drawings.
Install gauges and meters as required and as recommended by equipment manufacturer or their representative.
Extend connections, wells, cocks, or gauges to a minimum of 1-inch beyond insulation thickness of the various systems.
Locate gauges so that they may be conveniently read at eye level or easily viewed and read from the floor or from the most likely viewing area.
Install instruments over 6-feet 6-inches above floor, to be viewed from the floor, with face at 30 degrees to horizontal.

END OF SECTION

PART 1 - GENERAL

SUMMARY
This Section includes:
Ball Valves
Balancing Valves
System Specialties

RELATED SECTIONS
Division 01, General Requirements
Division 22, Plumbing

SUBMITTALS
Submit product data.

DEFINITIONS

CWP	Cold working pressure
EPDM	Ethylene propylene copolymer rubber
NBR	Acrylonitrile-butadiene, Buna-N, or nitrile rubber
NRS	Nonrising stem
OS&Y	Outside screw and yoke
RS	Rising stem
PTFE	Polytetrafluoroethylene plastic
SWP	Steam working pressure

Lead Free Section 1417 of the Safe Drinking Water Act (SDWA) establishes the definition for lead free as a weighted average of 0.25 percent lead calculated across the wetted surfaces of a pipe, pipe fitting, plumbing fitting, and fixture and 0.2 percent lead for solder and flux. The Act provides a methodology for calculating the weighted average of wetted surfaces.

QUALITY ASSURANCE
ASME Compliance:
ASME B16.10 for ferrous valve dimensions.
ASME B31.9 for building services piping valves.
NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 372 for valve materials for potable-water service.
ANSI/NSF-359

PART 2 - PRODUCTS

MANUFACTURERS
General: Where only NIBCO figure numbers are listed, equivalent products by those specified below are acceptable.
Valves:
Balancing:
Bell and Gossett
Armstrong
Tour and Anderson
NIBCO
Ball:
Apollo
Hammond
Milwaukee
Other Manufacturers: Submit substitution request.
Use only one manufacturer.
Valve ends may be threaded, flanged, soldered, or grooved, as applicable to piping system. Refer to Section 22 21 13, Pipe and Pipe Fittings Plumbing for allowable fittings.

BALL VALVES
Bronze Ball: Bronze cast body, chrome-plated full port ball, with handle, Teflon seat, 600 psi WOG, 150 psi steam; NIBCO 585-70.
Lead Free Bronze Ball: Two piece, full port, lead free silicon bronze body, Stainless steel or silicon bronze trim, Reinforced PTFE or TFE seats, 600 psi CWP NIBCO T/S-585-80-LF or T/S-585-66-LF, T/S-585HP-LF, or T/S-585HP-66LF.

BALANCING VALVE
Lead-Free Manual Calibrated:
Bronze, Ametal (copper-alloy), or ductile iron body, brass globe or ball, differential pressure readout valves with integral checks, calibrated plate, and integral pointer.
Suitable for tight shutoff, memory stops, threaded, grooved or soldered ends, 250 psi water, NSF/ANSI 61 compliant.
Bell and Gossett Lead-Free Circuit Setter Plus.
Drain Valves: Bronze globe valve or full port ball valve, garden hose end, cap, and chain 3/4-inch size.

SYSTEM SPECIALTIES
Manual Air Vents: Coin type; Dole 9 or approved equal.
Pressure/Temperature Test Plug:
Manufacturers:
Peterson Engineering, Inc.
Universal Lancaster
Sisco
Trerice
Other Manufacturers: Submit substitution request.
General: 1/2-inch NPT fitting to receive either a temperature or pressure probe 1/8-inch O.D., fitted with a color coded and marked cap with gasket.
Material: Solid brass with valve core of NORDEL.
Rating: Minimum 300 psig at 275 degrees F.
Gauges and Thermometers: Supply Owner with two pressure gauge adapters with 1/8-inch OD probe and two five-inch stem pocket test thermometers 25 degrees F to125 degrees F for chilled water, 40 degrees F to 240 degrees F for heating water.

PART 3 - EXECUTION

INSTALLATION
Provide valves at connections to equipment where shown or required for equipment isolation.
Provide separate support for valves where necessary.
Provide drain valves in low points in the piping system, at coils and equipment, and as indicated.
Coordinate gas pressure regulator selection with inlet pressure available at the regulator and the capacity and outlet pressure required by the equipment served.
Install in accordance with manufacturer’s recommendations.
Locate gas cocks and gas regulator readily accessible for servicing.
Provide approved gas cock immediately upstream of each gas pressure regulator.
Provide separate vent to the outside for each regulator.

APPLIED LOCATIONS PLUMBING VALVES
In piping 2-inches and smaller:

System	Valve Types				
	Gate	Globe	Swing Check	Ball	Butterfly
Domestic Hot	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Not Allowed
Domestic Cold	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Not Allowed

In piping 2-1/2-inches and larger:

System	Valve Types				
	Gate	Globe	Swing Check	Ball	Butterfly
Domestic Hot	Lead Free Iron	Lead Free Iron	Lead Free Iron	Not Allowed	Lead Free Ductile Iron
Domestic Cold	Lead Free Iron	Lead Free Iron	Lead Free Iron	Not Allowed	Lead Free Ductile Iron

Calibrated balancing valves on domestic hot water. Size balancing valves based on the published performance curve characteristics for the scheduled flow rate for each location to ensure proper operation at design conditions.

VALVE IDENTIFICATION

General: Identify valves to indicate their function and system served.

Refer to Section 22 05 53, Identification for Plumbing Piping and Equipment.

INSTALLATION

Manual Air Vents:

Install at high points where automatic air vents are not used, where noted, and where required for proper venting of system.

Install in accordance with manufacturer's recommendations.

Install grooved joints in accordance with the manufacturer's published installation instructions.

Mold and produce gaskets by the coupling manufacturer, and suitable for the intended service. Coupling manufacturer's factory trained representative to provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint products. Representative to periodically visit the project site to ensure best practices in grooved installation are being followed. Distributor's representative is not considered qualified to conduct the training of field visits.

Test Plugs: Install where indicated and in accordance with the manufacturer's recommendations.

END OF SECTION

PART 1 - GENERAL

SUMMARY
This Section includes:
Supports, Anchorage and Restraint
Pipe Attachments
Building Attachments

RELATED SECTIONS
Division 01, General Requirements
Division 22, Plumbing
Section 22 07 00, Insulation for Plumbing
Section 22 21 13, Pipe and Pipe Fittings Plumbing

SUBMITTALS
Submit the following:
Shop Drawings of contractor fabricated piping support structures.
No other submittals required under this section.

PART 2 - PRODUCTS

MANUFACTURERS
Supports, Anchorage and Restraint:
Unistrut
Superstrut
Powerstrut and Kinline
B-Line Systems
AnvilStrut
Pipe Attachments:
Anvil
Superstrut
B-Line Systems
Tolco
ERICO
Building Attachments:
Anvil as listed or equivalent products
Elcen
Superstrut
B-Line Systems
Tolco
ERICO

SUPPORTS, ANCHORAGE AND RESTRAINT
General:
Provide pipe and equipment hangers and supports in accordance with the following:
Equipment, supports, and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor responsible for their design.
Resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
Seismic restraint not to introduce excessive stresses in the piping caused by thermal expansion or contraction.
Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
In accordance with the latest edition of the SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems for the Seismic Hazard Level corresponding to the seismic zone in which the project is constructed.
In accordance with the applicable code.

Follow provisions described in Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment.
Engineered Support Systems: Design, detail, and bear the seal of a professional engineer registered in the State having jurisdiction.
Supports and seismic restraints for suspended piping and equipment.
Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.
Equipment and piping support frame anchorage to supporting slab or structure.
Fabricate support members from welded standard structural shapes, pipe, and plate to carry the necessary rollers, hangers, and accessories as required.
Support piping less than 4-inch pipe size from or by prefabricated roll-formed channels with necessary accessories to adequately support piping system.
Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.
Dissimilar Metal Protection: Hydra-Zorb cushions or Cush-a-strip.
Clamps: Super Strut Series 700 through 702 or AnvilStrut Series 1000 through 1200.

PIPE ATTACHMENTS
Insulated Horizontal Copper Pipe with Hangers Inside & Outside of Insulation:
2-inch and Smaller: Anvil 65, 70, 104 or 260.
Larger than 2-inch: Anvil 260.
Other Uninsulated Horizontal Pipe:
2-inch and Smaller: Anvil 65, 70, 104 or 260.
Larger than 2-inch: Anvil 260.
Other Insulated Horizontal Pipe With Hangers Inside of Insulation:
2-inch and Smaller: Anvil 65, 70, 104, 260 or 300.
Larger than 2-inch: Anvil 260.
Other Insulated Horizontal Pipe with Hangers Outside of Insulation:
2-inch and Smaller: Anvil 65, 70, 104 or 260.
Larger than 2-inch: Anvil 260.
Riser Clamps Copper Pipe:
4-inch and Smaller: Anvil CT-121, CT-121C or 261C.
Riser Clamps Other Piping: Anvil 261.

BUILDING ATTACHMENTS
Inserts:
Anvil 152 malleable iron or 281 steel inserts.
Inserts sized for required rod to support load being carried.
Expansion Plugs: Similar and equal to Phillips red-head self-drilling flush shell selected for safety factor of 4.

PART 3 - EXECUTION

HANGERS AND SUPPORTS
General:
Install support systems as detailed and in accordance with manufacturer's recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required, and as detailed on the Drawings.
Provide adjustable hangers for pipes complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., except where specified otherwise.
Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping and do not support piping from other piping.
Except as otherwise indicated for exposed continuous pipe runs, install hangers, and supports of same type and style as installed for adjacent similar piping.
Install cast iron piping in accordance with Cast Iron Soil Pipe Industry (CISPI) Standards.
Support piping within 2-feet of each change of direction on both sides of fitting.
Insulated Piping Systems:
Refer to Section 22 07 00, Insulation for Plumbing for insulation requirements.

Insulated Piping Systems with Vapor Barrier Insulation:
Install hangers outside of insulation.
On piping 1-1/2-inch and larger, provide insulation protection shields at each support location.
Insulated Piping Systems with Non-Vapor Barrier Insulation:
At the contractor's option, hangers may be installed inside or outside of insulation for piping 2-inch and smaller.
If hangers are installed outside of insulation, provide insulation protection shields at support locations on piping 1-1/2-inch and larger.
On piping larger than 2-inch, provide insulation saddles at each support location.
Insulation Protection:
Band insulation protection shields firmly to insulation to prevent slippage.
Tack weld insulation protection saddles to steel pipe. Braze saddles to copper pipe.
Vertical Piping:
Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
Riser clamps on steel pipe to be directly welded to pipe. Riser clamps on copper pipe to be installed directly under fitting.
Risers that are not subject to thermal change to be supported at each floor of penetration.
Risers that are subject to thermal change require engineered supports. Size supports to carry forces exerted by piping system when in operation. Riser supports follow provisions described in Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment.
Horizontal Piping:
Trapeze Hangers:
Multiple pipe runs where indicated supported on channels with rust resistant finish.
Provide necessary rods and supporting steel.
Support Spacing:
Provide support at minimum spacing per MSS SP-69-1996 Pipe Hangers and Supports - Selection and Application:
Support piping within 2-feet of each change in direction.
Steel Pipe, Copper Tubing:

Minimum Pipe Size	Maximum Span Steel	Maximum Span Copper	Maximum Span Pex A pipe with Pex a Pipe Channel	Rod Size
1-inch and smaller	7-feet	5-feet	6-feet	1/4-inch
1-1/4-inch to 2-inch	8-feet	8-feet	8-feet	3/8-inch
2-1/2-inch to 3-inch	11-feet	9-feet	8-feet	1/2-inch

Plumbing Piping: Support in accordance with local plumbing code.
Piping provided with acoustical lagging wrap supported a maximum of 5-feet on center. Install hangers outside of acoustical lagging.
Building Attachments:
Fastening or attaching to steel deck (without concrete fill) is prohibited. It will be necessary to support piping from structural members, beams, joists, or provide intermediate angle iron supporting members between joists. Supports may be attached to concrete filled steel deck with load limitations shown on the structural drawings or otherwise obtained from the structural engineer.
Provide horizontal bracing on horizontal runs 1-1/2 inch and larger and exceeding 50-feet in length at 75-foot intervals and as required to provide stabilized piping systems.
Provide additional structural steel angles, channels, or other members required to support piping where structures do not occur as required for proper support.
Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.

END OF SECTION

PART 1 - GENERAL

SUMMARY
This Section includes:
Valve Identification
Piping Markers
Equipment Identification

RELATED SECTIONS
Division 01, General Requirements
Division 22, Plumbing

SUBMITTALS
Submit the following:
Valve Tag Directory: Submit for approval prior to fabrication of valve tags.
Equipment Nameplate Directory: Submit for approval prior to fabrication.
Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

PART 2 - PRODUCTS

MANUFACTURERS
Piping Markers:
W.H. Brady
Seton
Marking Systems, Inc. (MSI)
Other Manufacturers: Submit substitution request.

VALVE IDENTIFICATION
Valve Tags:
General: Identify valves with metal tags, legends to be stamped or embossed. Indicate function of the valve and its normal operating position.

56 HW	(NUMBER AND CONTENT OF PIPE)
ISOLATION	(VALVE FUNCTION)
NO	(NORMAL OPERATION POSITION)

Size: Valve tags 2-inch diameter with 1/4-inch high letters.
Material: Use 0.04-inch brass tags.
Automatic Valves and Regulating Valves: Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicoid, or equal. Form letters by exposing center ply.
Buildings Systems: Contact the Owner/Facility group for coordination with existing building tagging system and supplementary information required for specific systems before valve tagging begins.
Valve Tag Directory: Include tag number, location, exposed or concealed, service, valve size, valve manufacturer, valve model number, and normal operating position of valve.

PIPING MARKERS
Label pipes with all-vinyl, semi-rigid plastic or strap-on labels.
For pipes O.D. smaller than 3/4-inch and for valve and fitting identification, use valve tag.
For sizes from 3/4 to 1-1/4-inch outside diameter, 1/2-inch letters, 8-inch marker width.
For sizes from 1-1/2 to 2-inch outside diameter, 3/4-inch letters, 8-inch marker width.
Identify and color-code pipe markers as follows with directional arrows.

PLUMBING SERVICE	PIPE MARKER*	BACKGROUND/TEXT COLOR
COLD WATER	DOMESTIC COLD WATER	GREEN/WHITE
HOT WATER	DOMESTIC HOT WATER SUPPLY	YELLOW/WHITE
	DOM. HOT WATER RECIRC	YELLOW/WHITE
SANITARY WASTE	SANITARY WASTE	GREEN/WHITE

PLUMBING SERVICE	PIPE MARKER*	BACKGROUND/TEXT COLOR
VENT	VENT	GREEN/WHITE
* Directional arrow applied adjacent to pipe marker indicating direction of flow.		
** Provide custom marker labels for piping for which no standard manufactured marker is available. Submit sample for approval.		

PART 3 - EXECUTION

VALVE IDENTIFICATION
Valve Tags:
Attach to valve with a brass chain.
Continuous valve tag numbers throughout the building for each system. Obtain a list for each system involved from the Facility group to establish numbers following the listed sequences.
Valve Tag Directory: Post final copy in Operation and Maintenance Manual.

PIPING MARKERS
Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:
Every 25-feet along continuous exposed lines.
Every 10-feet along continuous concealed lines.
On pipe into and out of concealed spaces.
Adjacent to changes in pipe direction.
On each riser.
Adjacent to each leg of a T.
Locate conspicuously where visible. Position pipe labels on pipe to achieve the best visibility.
Provide pipe identification (over insulation) for reclaimed water systems in accordance with current local codes and rulings.
Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above.
Apply arrow labels indicating direction of flow.

END OF SECTION

PART 1 - GENERAL

SUMMARY
This Section includes:
Pressure Testing of Piping System

RELATED SECTIONS
Division 01, General Requirements
Division 22, Plumbing

QUALITY ASSURANCE
Code Compliance: Perform required tests in the presence of the authority having jurisdiction.
Owner Witness: Perform all tests in the presence of the Owner's representative.
Engineer Witness: The Engineer or Engineer's representative reserves the right to observe all tests or selected tests to assure compliance with the specifications.
Simultaneous Testing: Test observations by the authority having jurisdiction, the Owner's Representative, and the Engineer's representative need not occur simultaneously.

SUBMITTALS
Submit the following test reports:
Certificate of completion, inspection, and test by authority having jurisdiction on required piping systems.
Certificate of test approval by Owner's representative on all systems.
Engineer's representative will record witnessed tests.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

GENERAL
Piping:
Test prior to concealment, insulation being applied, and connection to equipment, fixtures, or specialties.
Conduct tests with all valves but those used to isolate the test section 10 percent closed.
Leaks: Repair leaks and retest until stipulated results are achieved.
Notification:
Advise the Architect and Construction Manager 48 hours in advance of each test.
Failure to so notify will require test to be rescheduled.
Testing Equipment: Provide all necessary pumps, gauges, connections, and similar items required to perform the tests.

TESTING REQUIREMENTS
Sanitary Drainage Systems:
Test entire system or sections of system by closing all openings in piping except highest opening and filling system with water to point of overflow. If system is tested in sections, plug each opening except highest opening of section under test and fill each section with water, but none with less than 10 feet head of water.
Keep water in system or in portions under test for at least 45 minutes before inspection starts. Test for 2 hours with no drop allowed. Locate and repair leaks.
Domestic Water Systems:
Test entire system by closing all openings in piping except highest opening and filling system with water to point of overflow.
Keep water in system under test for a minimum of 45 minutes before inspection starts.
Test at full working pressure for 2 hours with no drop allowed. Locate and repair leaks.

END OF SECTION

PART 1 - GENERAL

SUMMARY
This Section includes:
Domestic Hot Water Recirculation Systems

RELATED SECTIONS
Division 01, General Requirements
Division 22, Plumbing
Section 22 08 00, Commissioning for Plumbing
Section 23 09 00, Instrumentation and Controls for HVAC

QUALITY ASSURANCE
Acceptable Testing and Balancing Firms:
A.I.R., Inc.
Air Balance Specialty, Inc.
Neudorfer Engineers, Inc.
Northwest Engineering Services
American Commissioning Consultants
Accurate Balancing Agency, Inc.
Other Firms: Submit substitution requests prior to bid date.
Testing and Balancing Firm Qualifications:
Procure the services of an independent balance and testing agency, approved by the Architect, which specializes in the balancing and testing of plumbing, heating, ventilating, and air conditioning systems, to balance, adjust and test water circulating and air moving equipment and air distribution or exhaust systems as herein specified.
Testing agency to provide proof of having successfully completed at least five projects of similar size and scope.
Testing and balancing work done under direct supervision of registered professional engineer who has been employed by the Agency a minimum of one year prior to start of project.
Industrial Standards:
NEBB, American Society of Heating, Refrigerating
Air Conditioning Engineers (ASHRAE)
American National Standards Institute (ANSI) as follows:
NEBB: Comply with Procedural Standards for Testing, Adjusting Balancing of Environmental Systems.
ASHRAE: Comply with recommendations pertaining to measurements, instruments, and testing, adjusting and balancing.
ANSI:
S1.4 Specifications for sound level meters.
S1.11 Specifications for Octave-Band and Fractional-Octave-Band analog and digital filters.
Instrument Certification: Instruments used accurately calibrated and certified within six months of balancing and maintained in good working order.
Test Observation: If requested, conduct test in the presence of the Architect or the Architect's representative.
Pre-Balancing Conference:
Review with the Engineer prior to starting balancing, general techniques.
Conference must occur prior to measuring existing conditions.
Measuring of existing conditions must occur prior to any demolition or new work.
Review existing conditions and systems to be affected by the project

SUBMITTALS
Submit the following:
Balancing Log:
Include water outlets, actual field measured water volume, and percentage of design volumes.
Provide drawings identifying location of outlets.
Equipment Data Sheets:
Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.

Additional Data: Submit additional data as provided by Associated Air Balance Council (AABC) Standard forms.
Number of Copies: One copy of the above completed information to the Engineer for review and insertion into the Operating and Maintenance Data.
Instrument Certification: When requested, submit certificate of calibration for equipment to be used.
Record data on NEBB forms or forms approved by the Architect.

PROJECT CONDITIONS
Where existing systems are to be adjusted, establish flow rates in all branches prior to making any modifications to system. Submit preliminary report indicating existing conditions prior to making any modifications to existing systems. Adjust central equipment as required and restore unmodified branches and outlets to original condition. Obtain existing system drawings from Owner and become familiar with extent and nature of existing systems.
Do not perform final testing, adjusting, and balancing work until systems have been completely installed and operating continuously as required.
Conduct testing and balancing with clean strainers and filters in place. Clean strainers, etc., prior to performing hydronic testing and balancing.

WARRANTIES
In addition to the Requirements of the Contract, include an extended warranty of six months after completion of test and balance work during which time the Architect at his discretion may request a recheck or resetting of any equipment or device listed in the test reports.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

DOMESTIC HOT WATER RECIRCULATION SYSTEMS
General: Make measurements in accordance with Industrial Standards specified above. Record on appropriate forms.
Distribution:
Read and adjust water flow for design conditions.
Set memory stops and mark position of adjuster on balancing valves.

DOMESTIC HOT WATER POINT OF USE MIXING VALVES
General: Make measurements in accordance with Industrial Standards specified above. Record on appropriate forms.
Preliminary:
List complete data of tested equipment and verify against Contract Documents.
Open line valves to full open position.
Distribution:
Adjust water flow for design conditions.
Set mixing valve to achieve desired leaving water temperature.
Set memory stops and mark position of adjuster on balancing valves.

COORDINATION
Coordinate work with other trades to ensure rapid completion of the project.
Deficiencies noted during the course of balancing in the mechanical installation promptly reported to the Architect to allow corrective action to proceed.
Provide periodic review of progress as requested.

END OF SECTION

PART 1 - GENERAL

SUMMARY
This Section includes:
Pipe Insulation
Block Insulation
Accessories Piping

RELATED SECTIONS
Division 01, General Requirements
Division 22, Plumbing
Section 22 05 29, Hangers, Supports and Anchors for Plumbing

QUALITY ASSURANCE
Regulatory Requirements:
Insulating products prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products within this specification contain these banned substances, provide complying products from approved manufacturers with equal performance characteristics.
Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723 or ASTM E84.
Energy Codes: Local Building and Energy Codes govern where insulation performance requirements for thickness exceeds thickness specified.
Protection: Protect against dirt, water, chemical, or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost.
Source Quality Control:
Service: Use insulation specifically manufactured for service specified.
Labeling: Insulation labeled or stamped with brand name and number.
Insulation and accessories not to provide nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin. Asbestos free and no interaction with corrosively with equipment, piping, or ductwork.

SUBMITTALS
Submit the following.
Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

PART 2 - PRODUCTS

MANUFACTURERS
General:
Johns Manville
Owens Corning
CertainTeed
Such insulation by one manufacturer.
Other Manufacturers: Submit substitution request.
Pipe Insulation:
Fiberglass:
Johns Manville Microlok HP
Calcium Silicate:
Johns Manville Thermo-12 Gold
Elastomeric:
Armacell AP Armaflex
Rubatex
K-Flex
Block Insulation:
Johns Manville 1000 Series
Accessories Piping:
Adhesives:
Calcium Silicate: Benjamin Foster 30-36.

Elastomeric: Armacell 520 BLV.
Pipe Fitting Covers:
Zeston, Ceel-Co.
Grooved Coupling Insulation:
Zeston, Ceel-Co.
Tapes:
Zeston Z-tape.

PIPE INSULATION
Fiberglass: Split sectional or Snap-On type with 0.23 per inch maximum thermal conductivity (K-factor) at 75 degrees F mean temperature, 850 degrees F maximum service rating and white, vapor barrier jacket with pressure sensitive closure system.
Calcium Silicate: Sectional with 14 pcf nominal density, 0.40 maximum K-factor at 300 degrees F mean temperature and 1200 degrees F maximum service rating.
Elastomeric:
Expanded closed cell, 0.27 per inch maximum K-factor at 75 degrees F mean temperature, 220 degrees F maximum service rating with fitting covers and paintable surface.
Color:
Concealed Locations: Black
Exposed Locations: White.

BLOCK INSULATION
Fiberglass: 1-1/2-inch thick unless specified or shown otherwise with 3 pcf nominal density, 0.23 per inch maximum K-factor at 75°F mean temperature and 450°F maximum operating temperature limit.

ACCESSORIES PIPING
Adhesives:
General: Maximum Flame Spread/Smoke Developed Rating of 25/50, SCAQMD Rule 1168 compliant.
Fiberglass: Integral closure system.
Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.
Pipe Fitting Covers: One piece PVC insulated pipe fitting covers.
Grooved Coupling Insulation: One piece PVC insulated fitting cover.
Metal Pipe Jacket: 0.016-inch thick aluminum jacket with formed fitting covers, aluminum snap straps and sealant.
Cloth Facing: Presized fiberglass cloth.
Tapes: Pressure sensitive, weather resistant, and for temperatures up to 150 degrees F.
Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes, and adhesives.

PART 3 - EXECUTION

GENERAL
Workmanship:
Installation: Insulation installed in first class, neat professional manner.
Applicators: Employed by firm that specializes in insulation work.
Preparation: Surfaces of piping and equipment clean, free of oil or dirt, and dry before insulation is applied.
Stamps: ASME stamps, UL labels, and similar stamps and labels are not covered.

PLUMBING PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS
Insulation Applied Locations – Plumbing Piping:

System	Pipe Size	Insulation Type	Insulation Thickness	Notes
Domestic Cold Water, Above Grade	1-1/4-inch and smaller	Fiberglass, all-purpose jacket or Elastomeric	1-inch	Note 1 Note 2
Domestic Cold Water, Above Grade	Above 1-1/4-inch	Fiberglass, all-purpose jacket	1 1/2-inch	Note 1

System	Pipe Size	Insulation Type	Insulation Thickness	Notes
Domestic Hot Water Supply/Return, Above Grade	1-1/2-inch and smaller	Fiberglass, all-purpose jacket or Elastomeric	1-inch	Note 1 Note 2
Domestic Hot Water Supply/Return, Above Grade	1-1/2-inch and larger	Fiberglass, all-purpose jacket	1 1/2-inch	Note 1
Traps and trap priming lines (In unheated Spaces)	All	Fiberglass, all-purpose jacket	1-inch	Insulate over heat tape
Condensate or other cold water drains	All	Elastomeric	1/2-inch	Note 2
Note 1: Cover with metal pipe jacket where exposed to weather, and over heat trace cable. Note 2: Elastomeric insulation not allowed over heat trace cable.				

The following piping is not insulated:
Waste and vent, except where heat traced.
Natural Gas
Fuel Oil
Domestic cold water runouts to single fixture less than 12-inch long and exposed supplies.
Priming lines except where heat traced.
Insulation include the following:
Fittings
Unions
Flanges
Mechanical Couplings
Valve Bodies
Valve Bonnets
Piping through Sleeves except Valve Bonnets
Unions and Flanges need not be insulated on the following systems:
Domestic Hot Water
Solar Hot Water
Inside Building
Insulate valves and irregular fittings with section of pipe insulation and insulating cement, securely fastened, and finished with 6 oz. canvas and Foster 30-36 lagging adhesive.
Flanges, valves, strainers, not requiring a vapor barrier to insulate with removable replaceable pads fabricated of 1-inch layer of Pittsburgh Corning Temp Mat sandwiched between inner and outer layer of 8 oz. glass cloth held together with stainless staples with sufficient stainless lacing hooks to hold pad firmly to flange or valve with minimum 3-inch overlap onto adjacent pipe insulation using 18 gauge SS lacing wire.
Expansion Joints and Flexible Connectors: Pipe insulation or block of same material and thickness as adjacent piping.

PIPING INSTALLATION
General:
Joints: Coat both sides of complete joining area with applicable adhesive.
Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except foam plastic, seal with closure system or 3-inch wide tape.
Butt Joints: Butt lightly together and, except for foam plastic, seal with 3-inch wide tape or butt straps.
Multiple Layered Insulation: Joints staggered.
Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.
Voids:
Fill voids, chipped corners and other openings with insulating cement or material compatible with insulating material.
In insulation with heat tracing where piping is shown or specified to be heat traced, bed heat tape into heat transfer cement with insulation over heat tape and cement.
Seal joints, seams, and fittings of metal watertight jackets at exterior locations.

Fiberglass Insulation: Exterior insulation encased in metal jacket.
Calcium Silicate Insulation:
Secure with 18-gauge wire embedded into insulation.
Cover with continuous vapor barrier jacket.
Elastomeric Insulation:
Slit full length and snap around pipe.
Make cuts perpendicular to insulating surface leaving no cut section exposed.
Do not stretch insulation to cover joints or fittings.
Seal joints in elastomeric insulation with adhesive.
Exterior insulation painted with two coats of specified paint in accordance with the manufacturer's instructions and encase in metal jacket.
Sealing joints with tape will not be allowed.
Fittings: Insulation specified with continuous vapor barrier, the vapor barrier must not be violated.
On Elastomeric Insulation: Fittings covered with covers made up of mitered sections of insulation or with formed pipe fitting covers.
In Other Insulation: Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.
Unions, Mechanical Joints, Valves, Etc.:
General:
As specified for fittings.
Minimum thickness same as specified for piping.
Unions: Build up insulation at least 1/2-inch beyond adjoining insulation.
Flanges: With square corners. Where flanges are not insulated, terminate adjacent insulation so flange bolts can be removed.
Flanged Valves: Insulation with square corners.
Vapor Barrier Insulation:
Refer to Section 22 05 29, Hangers, Supports, and Anchors for Plumbing for support requirements.
Piping which requires vapor barrier protection of continuous vapor barrier, which may not be pierced or broken. The following piping systems require vapor barrier protection:
Domestic cold water.
Other piping systems with a nominal operating temperature below 65 degrees F.
Vapor Barrier Insulation:
Insulation for pipe requiring vapor barrier protection 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation with continuous vapor barrier jacket at each hanger or roller. Provide pipe shield specified in Section 22 05 29, Hangers, Supports, and Anchors for Plumbing.
Non-Vapor Barrier Insulation:
Refer to Section 22 05 29, Hangers, Supports, and Anchors for Plumbing for support requirements.
At contractor's option, insulation may be interrupted at supports. Butt insulation tight to support.
If contractor elects to continue insulation at supports, installation as specified for piping systems with vapor barrier installation.
Void between saddle and pipe filled with insulation.

EQUIPMENT INSTALLATION
General: Install true and smooth. Insulation over curved surfaces conform to curves of surface.
Access:
Insulated removable heads, water boxes, pump casings, access, etc., that require service, inspection or maintenance provided with covers or section that are easily removable and replaceable.
Reinforce openings in adjacent insulation with metal beading. In vapor barriered insulation, coat joints with vapor barrier mastic.
Voids, Depressions and Cavities: Fill voids, chipped corners, and other openings with insulating cement or material compatible with insulating material.
Vapor Barrier Insulation: Barrier not to be pierced or broken.
Coat defects with vapor barrier mastic and patched with insulation facing or tape.
Staples brush coated with vapor barrier coating.
Cover raw edges coated with vapor barrier mastic sealed to equipment surface.
Non-Vapor Barriered Insulation:
Patch tears with insulation facing or tape.

Cover and neatly bevel raw edges to equipment surface.
Multilayered Insulation: With staggered joints.
Fiberglass Block:
Anchors: Lug nuts 10 gauge black annealed iron wire welded to metal surfaces.
Banding: Block secured to surface with 1/2-inch wide stainless steel bands maximum 18-inches on center and secured to anchors.
Insulating Cement: Block covered with insulating cement minimum thickness of 1/2-inch with smooth finish.
Vapor Barrier System: Apply continuous coat of vapor barrier mastic.
Finish: Finish with cloth facing secured with adhesive and lapped a minimum of 2 inches. Defects touched up with finishing cement.
Elastomeric Blanket:
Cut insulation to size, make corners with mitering cuts to preclude raw edges, continuously cement insulation to equipment with adhesive.
Cement both surfaces of joints and butt tightly together and cover raw edges with two coats of adhesive.
Expansion Joints: Covered with larger size pipe insulation to allow full movement and be removable, ends turned back to pipe, coat with vapor barrier mastic on joints in vapor barriered system, and finished with cloth facing cemented to insulation with adhesive.

FIELD QUALITY CONTROL
Field Test: Test and approve systems prior to installation of insulation.
Existing Insulation:
Repair existing insulation damaged during construction.
Make neat connections where new and existing insulation meet.
Where existing piping, or equipment is removed, cover existing surfaces neatly to match existing.

END OF SECTION

GENERAL

SECTION INCLUDES

General requirements that apply to implementation of commissioning of Plumbing systems and components. It will assist operating staff training and familiarization with new systems. It will serve as a tool to reduce post-occupancy critical systems operational difficulty or failure. It will, also, be used to develop test protocol and record the associated test data in an effort to advance the building systems from a state of substantial completion to operation.

All plumbing systems in the project shall perform in accordance with the design intent and the Owner's operational needs.

Commissioning Process Overview, applying to the plumbing systems and plumbing commissioning team members, can be found in specifications section 01 9113, General Commissioning Requirements.

Systems to be commissioned

Plumbing system and all integral equipment controls. All plumbing systems shall be commissioned, including, but not limited to:

Domestic hot water system

RELATED SECTIONS

Commissioning requirements and related issues are given in the following Sections of the Specifications.

Division 01 Section "General Requirements", Closeout Procedures: Lists some tasks required for substantial completion and final acceptance.

Division 01 Section "General Requirements", Execution and Closeout Requirements: Lists some tasks required for substantial completion, final acceptance, and training.

Division 01 Section "General Requirements", Closeout Submittals: Lists some tasks required for O&M requirements.

Division 01 Section "General Requirements", General Commissioning Requirements: Alerts Trade Subcontractor to commissioning in other sections.

RESPONSIBILITIES

Overview

The responsibilities of the plumbing commissioning team members in the commissioning process are summarized in specifications section 019113, General Commissioning Requirements.

SUBMITTALS

Other Equipment and System Information

When not included with the standard submittals, the Trade Subcontractors shall provide to the Commissioning Provider requested shop drawings, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures and control drawings. In addition, the manufacturer installation and checkout materials that are shipped inside the equipment and the field checkout forms to be used by the factory or field technicians shall be submitted to the Commissioning Provider. This documentation may be required prior to the normal O&M manual submittals.

All equipment and system documentation requested by the Commissioning Provider shall be included by the Trade Subcontractors later in the O&M manuals.

The Trade Subcontractors shall submit startup forms and procedures. If manufacturer startup forms are unavailable, Trade Subcontractors are responsible to document baseline operation of their equipment including but not limited to:

Operational electrical data
Seasonal operational mechanical performance data
Photos of installation conditions
Deficiencies found and resolved during startup

QUALITY ASSURANCE

Test Equipment
All standard testing equipment required for the Trade Subcontractors to perform installation, start-up and initial checkout and required functional testing shall be provided by the Trade Subcontractors.

Special tools and instruments, only available from vendor, specific to a piece of equipment, required for testing equipment according to these Contract Documents shall be provided.

Instrumentation will be provided by the Subcontractor. Instruments used for measurements shall be accurate. Calibration histories for each instrument shall be available for examination. Calibration and maintenance of instruments shall be in accordance with the requirements of NEBB or AABC Standards.

Application of instruments and accuracy of measurements shall be in accordance with NEBB or AABC Standards.

COORDINATION

Commissioning Team
The members of the commissioning team consist of the Commissioning Provider, the Owner/Owner Representative, the GC, the Architect and Design Engineers, the mechanical contractor, the electrical contractor, the plumbing contractor, the testing adjusting and balancing contractor, the controls contractor, any other installing subcontractors or suppliers of commissioned equipment or systems and the facility or plant operator/engineer.

PRODUCTS NOT USED

EXECUTION

MEETINGS

Kick-off Meeting
The Commissioning Provider will schedule, plan and conduct a commissioning kick-off meeting with the entire commissioning team in attendance, including the controls, electrical, plumbing, mechanical, adjusting and balancing and other appropriate Trade Subcontractors and the facility operator or Owner Representative in attendance. Prior to this meeting, the commissioning plan will be distributed to all members. The commissioning plan, the overall commissioning process and general responsibilities of each team member, reporting and communication protocols and next steps will be discussed. Meeting minutes will be distributed to all parties by the Commissioning Provider.

Miscellaneous Meetings
Deficiencies identified through the commissioning process shall be discussed, as needed, in portions of regular construction meetings. Meetings dedicated to deficiencies or commissioning: status, coordination and planning shall also be conducted, if needed. The Commissioning Provider will plan, conduct and take minutes at commissioning meetings. When practical, commissioning meetings will be an appendage to regular construction meetings. All commissioning meetings shall be attended by the GC, the mechanical and the controls subcontractor. Selected meetings shall require the attendance of the electrical, plumbing, fire alarm, TAB or other trades of commissioned systems.

Controls Integration Meeting
The Commissioning Provider coordinates the meeting to go over the control drawings, sequences of operation included in the controls submittal. This meeting is held prior to the approval of the controls submittal. The intent is to clarify control related issues for the controls contractor, mechanical, fire alarm, plumbing and

electrical contractor, facility staff and Commissioning Provider prior to startup, testing and balancing and functional testing.
The controls contractor shall attend the meeting. The mechanical, electrical and general contractor shall attend when issues regarding equipment they are responsible for are discussed. The control technicians attending the meetings must be the same technicians that are/will install and program the DDC system.

Primary issues discussed and clarified are:

- Control drawing content
- Point database (points (monitored points, software points, naming conventions, alarms, report format)
- Sequences of operation and setpoints
- Interlocks to packaged controls and other systems
- Operator workstation graphics
- Field sensor and panel locations
- The Commissioning Provider takes minutes at these meetings.

COMMISSIONING CHECKLISTS, START-UP, AND INITIAL CHECKOUT

Commissioning Checklists

The Commissioning Provider develops and completes the commissioning checklists and procedures for commissioned equipment and systems.

Execute pre-functional system checks using the Commissioning Provider's created forms on the web based commissioning software PlanRadar (or project Cx app).

Calibrations

The construction checklists will contain requirements for calibrations when applicable. The Trade Subcontractors is responsible to calibrate all field-installed sensors and actuators using checkout documentation methods approved by the Commissioning Provider.

Manufacturer Installation and Startup Procedures:

A start-up plan shall be developed and submitted by the installing Subcontractor. Start-up plan to include the following:

- Flushing and cleaning of pipe.
- Chemical treatment.
- Cleaning of strainers, and screens.
- Balancing of system, setting valve positions.
- Manufacturer’s tests.
- Equipment electrical tests.
- Piping pressure tests.

The Trade Subcontractors shall complete the pre-start procedures in the manufacturer startup forms prior to starting equipment, including but not limited to verification of completion of wiring, safeties, lubrication, drive rotation and proper electrical test readings. Startup shall be conducted under supervision of responsible manufacturer representatives for major pieces of equipment. The GC shall notify the Commissioning Provider at least 5 days in advance of any equipment start-up, providing the Commissioning Provider a copy of the start-up plan at that time.

The Commissioning Provider shall observe startup and checkout of selected systems.

The Trade Subcontractors and manufacturer representatives shall execute start-up and provide the Commissioning Provider with a signed and dated copy of the completed start-up documentation. The Trade Subcontractors shall clearly note any items that have not been completed and the plan for their completion.

The Trade Subcontractors shall operate each commissioned device or system to the full extent of its capability, from minimum to maximum, under automatic and manual control and verify that the equipment, system and assembly is functioning according to the specifications, manufacturer recommendations and good operating practice.

The manufacturer startup reports and procedures for a given system shall be successfully completed and submitted prior to testing, adjusting and balancing of the equipment.

The Commissioning Provider will review startup documentation and identify incomplete areas.

The Trade Subcontractors shall correct all areas that are deficient or incomplete in the startup documentation in a timely manner.

Designated systems requiring test and balance work shall have this activity commence after systems have successfully completed start-up. System and equipment deficiencies observed during this activity is to be noted and corrected.

FUNCTIONAL TESTING

Functional Performance Testing begins after operational testing, adjusting, and balancing of the systems have been completed by the Subcontractors. Functional tests for a given system shall not be conducted until they are fully operational under normal and reliable control with control calibrations, programming and control system graphics complete and checked out and the Trade Subcontractors have submitted completed, applicable startup reports, satisfactory to the Commissioning Provider.

The objective of the Functional Performance Testing is to advance the building systems from a state of substantial completion to full dynamic operation in accordance with the specified design requirements and design intent.

Any test ports, gauges, test equipment, etc., needed to accomplish the functional performance tests shall be provided by Subcontractors.

Subcontractors shall provide to the Commissioning Team documentation of calibration of controls. Documentation shall include dates, setpoints, calibration coefficients, control loop verification, and other data required to verify system check-out. Documentation shall be dated and initialed by field engineer or technician performing the work.

<u>Development of Functional and Performance Test Procedures</u>
Test procedures and documentation forms are not finalized until after equipment and control system submittals and shop drawings are approved.

DEFICIENCIES AND NON-CONFORMANCE

<u>Deficiency Management</u>
The Commissioning Provider will record the results of document reviews, field observations, tests conducted or reviewed and trend logs or monitoring. All deficiencies will be recorded on a Deficiency Log kept by the Commissioning Provider. The Deficiency Log will be kept updated by the Commissioning Provider.

Participate and respond to commissioning related issues by using the Commissioning Provider's web based commissioning software PlanRadar (or project Cx app).

A current copy of the Deficiency Log will be provided to the GC and Owner/Owner Representative on a regular basis, as requested. New deficiencies will be identified.

Items that are incomplete or are requiring Designer input will be sent to the Designer and Owner/Owner Representative by the Commissioning Provider via appropriate channels.

When completion of a deficiency has been identified by the Commissioning Provider as holding up or is likely to delay any commissioning process, particularly functional testing, the GC, shall be required to notify the Commissioning Provider providing the planned actions and an expected date of completion. The GC shall notify the Commissioning Provider listing the actions taken to resolve the issue. It is not the responsibility of the Commissioning Provider to obtain this status information through meeting attendance, asking questions or field observation.

The Commissioning Provider documents resolutions in the Deficiency Log and schedules retesting and back-checking as needed.

Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Provider will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so.

The time for the Commissioning Provider to direct, document and evaluate any retesting required because a specific construction checklist or start-up test item, reported to have been successfully completed, but determined during testing to be faulty, will be charged to the GC.

The GC shall reimburse the Commissioning Provider for costs when a scheduled test cannot be completed due to:

- Failure of the GC to schedule the test with all parties required to perform the test or with regulatory authorities required to witness the test.
- Failure of the GC to provide required notice for tests that have been cancelled or rescheduled.
- Failure of the GC or Trade Subcontractors to have in place test equipment, support equipment, instrumentation, permits, or other ancillary equipment or systems required for successful execution of the test.
- Failure of the Trade Subcontractors to complete pre-start or start-up procedures or other work required as a prerequisite for execution of the test.

The GC shall respond in writing to the Commissioning Provider at least as often as commissioning meetings are being scheduled concerning the status of each outstanding deficiency identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

Approval and Acceptance

The Commissioning Provider will note each satisfactorily demonstrated function on the test form. Functional testing or acceptance of a system is indicated after all testing and monitoring is complete and there are no outstanding deficiencies for that equipment or system in the Commissioning Provider's Deficiency Log.

DEFERRED TESTING

Unforeseen Deferred Tests

If any functional test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of functional testing may be delayed.

ADDITIONAL DOCUMENTATION

Documentation required of the Trade Subcontractors shall consist of the following:

- Submitted completed documented, equipment startup reports, satisfactory to the Commissioning Provider
- Submitted completed documented, applicable TAB reports, satisfactory to the Commissioning Provider
- Submitted completed documented, integrated controls point to point device checkout noting that all controlled points and devices are functional, calibrated
- Record of deficiencies and incomplete items for tests they are responsible to document.
- Training record (see Division 01 section for contractual training requirements).

TRAINING FACILITY PERSONNEL

The Trade Subcontractors are responsible to provide training for facility personnel per the Contract Documents.

END OF SECTION

PART 1 - GENERAL

SUMMARY
This Section includes:
Cast Iron Soil Pipe, Service Weight (No-Hub)
Copper Pipe
PEX Potable Water Tubing
Unions
Solder
Flexible Connector

RELATED SECTIONS
Division 01, General Requirements
Division 22, Plumbing
Section 22 05 29, Hangers, Supports, and Anchors for Plumbing
Section 22 05 23, General Duty Valves for Plumbing

QUALITY ASSURANCE
Regulatory Requirements:
Piping material and installation to meet requirements of the local plumbing, fire, and building codes and serving utility requirements.
Provide chlorination of domestic cold and hot water piping in accordance with County and State health requirements.
Grooved Joint Couplings and Fittings:
Products of a single manufacturer.
Grooving tools of the same manufacturer as the grooved components.
Castings used for coupling housings, fittings, valve bodies, etc., date stamped for quality assurance and traceability.
Pipe Cleaning: If pipe gets plugged or should foaming of water systems occur, disconnect piping, reclean, and reconnect without additional expense to the Owner.
Correct damages to the building or systems resulting from failure to properly clean the system without additional expense to the Owner.
Products with a wetted surface installed in potable water systems UL classified in accordance with ANSI / NSF-61 for Drinking Water System components, ANSI/NSF-14 for Plastic Piping System Components and certified to the low lead requirements of NSF-372.

SUBMITTALS
Submit the following:
List of piping materials indicating the service it is being used for. (Do not submit piping product data).
Product data on mechanical couplings and related components, double wall fuel oil pipe and fittings, and polypropylene waste and vent pipe.
Test Reports and Certificates: Submit certificates of inspections and pipe tests to Owner.
Other: Make certified welders' certificates available.

PART 2 - PRODUCTS

MANUFACTURERS
As indicated.

CAST IRON SOIL PIPE, SERVICE WEIGHT (NO-HUB)
General: A code approved hubless system conforming to Cast Iron Soil Pipe Institute Standard 301.
Pipe and Fittings:
Service weight hubless cast iron conforming to ASTM A 888, marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
Manufacturers:
Tyler
AB&I
Charlotte

Gaskets: Compression type conforming to ASTM C 564.
Above Grade Couplings: Band type coupling in conformance with Cast Iron Soil Pipe Institute (CISPI) 310-90, consisting of stainless steel clamp, and corrugated shield assemblies with a neoprene sealing sleeve ANSI A21.6, ANSI A21.10 Fittings.
Above Grade – Critical Areas:
Stainless steel shield.
Neoprene gasket, one piece.
Stainless steel screws.
Approvals: FM 1680 class I Certified.
Based on: Clamp-All HI-TORQ 125.
Buried: Husky 28 gauge 304 stainless steel hubless type clamp and orange corrugated shield assemblies (80-inch pound torque) with neoprene sealing gaskets (ASTM-C-564), or Clamp-All (125-inch pound torque), 24 gauge 304 stainless steel hubless type clamp, and shield assemblies with neoprene sealing gaskets (ASTM-C-564).
Service:
Sanitary drain.
Vent piping 2 inches and above.

COPPER PIPE
Pipe: Hard drawn copper tubing (unless otherwise noted),
Type L: ASTM B 88
Type DWV: ASTM B 306
Fittings:
Wrought copper, 150 psi; ANSI B16.22 for soldered joints ; Chase, Revere, Mueller or approved equal.
System using mechanically extracted collars in main with branch line inserted to not obstruct flow may be used on domestic water piping above ground, similar to T-drill.
Refer to Solder and Brazing Section below.
Joints:
Soldered:
Wrought Copper Pipe Fittings: All-State 430 with Duzall Flux, Engelhard Silvabrite with Engelhard General Purpose Flux or J.W. Harris Co.
Valves, Cast Fittings or Bronze Fittings: Harris Stay-Silv-15 or Handy & Harmon Sil-Fos.
Applied locations:
Piping 3 inches and smaller above grade
Service:
Type L:
Domestic Water (above grade)

PEX POTABLE WATER TUBING
Manufacturers:
Uponor (aka Wirsbo)
Other Manufacturers: Submit substitution request.
Regulatory Listings: Submit appropriate NSF International, UL, Warnock Hesey, or CSA listings as proof of compliance with local building and plumbing codes.
PEX tubing and components installed in full compliance with local jurisdictional codes, standards, and requirements.
Submit listings that indicated that the PEX tubing system has been certified to ANSI/NSF Standards 14 and 61.
Quality Assurance:
Installer Qualifications: Installer experienced in performing work of this Section who has specialized in installation of work similar to that required for this project.
Provide in writing to the Owner that the PEX tubing and components furnished under this Section conforms to the material and mechanical requirements specified herein.
Provide letters of certification indicating: Installer uses skilled workers holding a trade qualification license or equivalent, or apprentices under the supervision of a licensed trades person.
Materials:
Tube Materials:
Cross-linked polyethylene (PEX) manufactured by PEX-A or Engle method.

Provide blue colored PEX for cold water systems and red colored PEX for hot water systems for pipe size 1/2-inch thru 1 inch.
Tubing Type:
PEX tubing manufactured in accordance with ASTM F876, ASTM F877 and CAN/CDA-B137.5.
Listed to ASTM by an independent third party agency.
PEX tubing to have Standard Grade hydrostatic design and pressure ratings of 200 degrees F at 80 psi and 180 degrees F at 100 psi. Temperature and pressure ratings issued by the Plastic Pipe Institute (PPI) report TR-4/06.
Minimum bend radius for cold bending of the PEX tubing not less than 6 times the outside diameter. Bends with the radius less than stated requires the use of a bend support as supplied by tube manufacturer.
PEX-a Fittings: elbows, adapters, couplings, plugs, tees and multi-port tees (1/2 inch through 3 inch nominal pipe size): ASTM F1960 cold-expansion fitting manufactured from the following material types:
UNS No. C69300 Lead-free (LF) Brass.
20 percent glass-filled polysulfone as specified in ASTM D 6394.
Unreinforced polysulfone (Group 01, Class 1, Grade 2) as specified in ASTM D 6394.
Polyphenylsulfone (group 03, class 1, grade 2) as specified in ASTM D 6394.
Blend of polyphenylsulfone (55-80%) and unreinforced polysulfone (rem.) as specified in ASTM D 6394.
Reinforcing cold-expansion rings manufactured from the same source as PEX-a piping manufacturer and marked F1960.
Multi-Port Tees: Multiple-outlet fitting complying with ASTM F 877; with ASTM F 1960 inlets and outlets.
Engineered polymer branch multi-port tee.
Engineered polymer flow-through multi-port tee.
Engineered polymer commercial branch multi-port tee.
Engineered polymer commercial branch multi-port elbow.
Engineered polymer commercial flow-through multi-port tee.
Manifolds: Multiple-outlet assembly complying with ASTM F 877; with ASTM F 1960 outlets.
Engineered polymer valved manifold.
Engineered polymer valve less manifold.
Lead - free copper branch manifold.
Lead-free copper valved manifold.
PEX-to-Metal Transition Fittings:
Manufacturers: Provide fittings from the same manufacturer of the piping.
Threaded Brass to PEX-a Transition: one-piece brass fitting with male or female threaded adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
Brass Sweat to PEX-a Transition: one-piece brass fitting with sweat adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
PEX-a to Flange Transition: two-piece brass fitting with lead-free ProPEX adapter and steel flange conforming to ASME B 16.5.
PEX-to-Thermoplastic Transition Fittings: CPVC to PEX-a Transition: Thermoplastic fitting with one spigot or socket end and one ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
Accessories:
Wall Penetration Brackets: Brackets designed for wall membrane penetrations supplied by PEX tubing manufacturer; Uponor Drop Ear Bend Support.
Concrete Tube Support Brackets: Brackets to hold PEX tubing in place in structural concrete slabs rigid PVC construction and be designed for that purpose.
Uponor Stand-Up bracket.
Service:
Trap priming lines below grade.

UNIONS
150 psi malleable iron, brass to iron seat, ground joint, black or galvanized to match pipe. 200 psi WOG bronze, ground joint, solder type for copper tubing.
Unions or flanges for servicing or disconnect are not required in installations using grooved mechanical joint couplings. Couplings serve as disconnect points.
Dielectric fittings nationally listed, have a dielectric thermoplastic interior lining, and meet requirements of ASTM F1545. Fittings suitable for the pressure and temperature to be encountered.

SOLDER

Soldered Joints:
Wrought Copper Pipe Fittings: All-State 430 with Duzall Flux, Engelhard Silvabrite with Engelhard General Purpose Flux or J.W. Harris Co.
Valves, Cast Fittings or Bronze Fittings: Harris Stay-Silv-15 or Handy & Harmon Sil-Fos.
Service:
Above grade copper piping 3-inch and smaller

FLEXIBLE CONNECTOR
Expansion Joint/Seismic Connector:
T304 stainless steel hose and braid, Schedule 40 radius elbows and 180° bend, flange or weld end Schedule 40 fittings. ASA certified when used for natural gas service. Metraflex Metaloop only.
Accept differential support displacement without damaging pipe, equipment connections, or support connections.
In steel piping systems, three Victaulic flexible couplings may be used in lieu of a flexible connector for vibration attenuation and stress relief at equipment connections. Place couplings in close proximity to the vibration source.
Service:
Miscellaneous drains and overflows.
Domestic hot and cold water piping.

ABS DWV EXPANSION JOINT
Expansion Joint:
DWV expansion/compression joint made from ABS. Certified by NSF International. UPC approved. Canplas.
See ABS Pipe (DWV) piping specifications for required pressure and temperature rating.
Service: Sanitary waste and vent, storm and overflow piping above grade.

PART 3 - EXECUTION

PREPARATION
Measurements, Lines and Levels:
Check dimension at the building site and establish lines and levels for work specified in this Section.
Establish inverts, slopes, and manhole elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
Use established grid and area lines for locating trenches in relation to building and boundaries.

EXCAVATION AND BACKFILL
General:
Perform necessary excavation and backfill required for the installation of mechanical work in accord with Division 02, Existing Conditions
Repair pipelines or other work damaged during excavation and backfilling.
Excavation:
Excavate trenches to the necessary depth and width, removing rocks, roots, and stumps.
Include additional excavation to facilitate utility crossovers, additional offsets, etc.
Excavation material is unclassified. Width of trench adequate for proper installation of piping.
Widen trench if not wide enough for a proper installation.
Bedding:
Cast iron, steel, and copper piping full bedded on sand.
Place a minimum 4-inch deep layer on the leveled trench bottom for this purpose.
Remove the sand to the necessary depth for piping bells and couplings to maintain contact of the pipe on the sand for its entire length.
Lay other piping on a smooth level trench bottom so that contact is made for its entire length.
Backfill:
Place in layers not exceeding 8 inches deep, and compact to 95 percent of standard proctor maximum density at optimum moisture content.
Earth backfill free of rocks over 2 inches in diameter and foreign matter.
Disposal of excess material as directed.
Interior: Backfill under interior slabs bank sand or pea gravel.

Exterior:
Excavated material may be used outside of buildings at the Contractor's option.
First 4-inches sand, and final 12-inch layer course soil.

PIPING INSTALLATION
Install unions in non-flanged piping connections to apparatus and adjacent to screwed control valves, traps, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.
Install piping as to vent and drain. Install according to manufacturer's recommendations.
Support piping independently at apparatus so that its weight not carried by the equipment.
Run piping clear of tube cleaning or removal/replacement access area on heat exchangers, water heaters, etc.
Underground Water System:
Prior to testing pipe provide concrete thrust blocks at changes in direction.
Block size as required for types of fittings involved.
Dielectric Fittings:
Provide dielectric couplings, unions, or flanges between dissimilar metals.
Provide dielectric couplings as required to isolate cathodically protected piping and equipment.
No-Hub Couplings: Install per manufacturer's instructions.
PEX System:
Installation complies with manufacturer's product data, including product technical bulletins, installation instructions, and product carton instructions for installation.
PEX tubing passing through metal studs provided with grommets or sleeves at the penetration.
Protect PEX tubing with sleeves where abrasion may occur.
Use strike protectors where PEX tubing has the potential for being struck with a screw or nail.

PIPING JOINTS
Pipe and fittings joined using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.
Copper Piping:
Pipe cut evenly with cutter, ream to full inside diameter; end of pipe and inside of fitting thoroughly cleaned and polished.
Joints uniformly heated, and capillary space completely filled with solder or braze material, leaving full bead around entire circumference.
No couplings installed in floor or wall sleeves.
Flexible Connector: Provide where indicated on the Drawings.
Above Grade No-Hub Couplings: Install in accordance with manufacturer recommendations.

ABS DWV EXPANSION JOINT
ABS DWV Expansion Joint:
Install per manufacturer's installation instructions.
Determine quantities and locations required.

INSTALLATION, PIPE WRAP
Apply per manufacturer's written instructions.
Apply wrapping to fittings in field after installation.

ADJUSTING AND CLEANING
General:
Clean interior of piping before installation.
Flush sediment out of piping systems after installation before connecting plumbing fixtures to the piping.

END OF SECTION

PART 1 - GENERAL

SUMMARY
This Section includes:
Fixture Trim
Plumbing Fixtures
Drainage Products

RELATED SECTIONS
Division 01, General Requirements
Division 22, Plumbing

QUALITY ASSURANCE
Water Closets: Maximum Performance (MaP) score of no less than 800
Faucets: Certify to NSF/ANSI 61 and California AB1953
Electric Water Coolers and Drinking Fountains: Certified to NSF/ANSI 61 and California AB1953
Emergency Eyewash and Emergency Shower Equipment: Comply with ANSI Standard Z358.1

SUBMITTALS
Submit the following:
Product data for each item specified.
Operating and Maintenance Data:
Electric Water Coolers and Drinking fountains.
Hot Water Dispensers
Mounting heights for fixtures.

PART 2 - PRODUCTS

MANUFACTURERS
Manufacturers are stated for each fixture specified. Refer to P-002, Plumbing fixture schedule for required fixture models. The following manufacturers are also acceptable, except when indicated only.
Supply Stops:
Chicago
NPT McGuire (LK series)
Brasscraft (SCR series)

Traps:
McGuire
Kenney
Brasscraft

Support Rims:
Hudee
Vacuum Breakers:
Chicago Faucet
A.W. Cash
Febco, chrome plated

Drainage Products and Carrier Products:
J.R. Smith
Zurn
Wade
Sioux Chief (for Supply boxes)

FIXTURES:
Zurn
Sloan
Kohler

American Standard
Seats:
Bemis
Zurn
Kohler

Electric Water Coolers:
Elkay
Halsey Taylor
Oasis
Sunroc
Haws

Mixing Valves:
Powers
Leonard
Symmons
Chicago
Powers

Stainless Steel Products:
Elkay
Just
Franke

SHOWER/TUB CONTROLS:
Delta Commercial
Kohler
Symmons
Powers
Moen Commercial
Faucets:
Chicago
Delta Commercial
Kohler
Symmons
Moen Commercial

HOT WATER DISPENSER:
In-Sink-Erator

Flush Valves:
Sloan
Zurn
Kohler

SHOCK ARRESTORS:
PPP
J.R. Smith

Trap Primer Stations:
PPP

Exposed Waste and Supply Piping Insulation Kits:
Truebro
McGuire
Other Manufacturers: Submit substitution request.

FIXTURE TRIM
Supply Stops: Chicago cast brass rigid riser supplies with loose key angle stops, wall flanges, NPT female inlet, chrome plate finish; equivalent NPT McGuire (LK series), Brasscraft (SCR series), or NPT stops by fixture supplier.
Traps:
For floor drains, provide coated cast iron P-trap; recessed, screw jointed or bell and spigot.
For other fixtures, provide 17 gauge, chrome plated cast brass P-Traps with solder bushings, and clean-out.
Support Rims: Hudee stainless steel rims, if sink not furnished with integral rim.
Vacuum Breakers:
Chicago Faucet
A.W. Cash
Febco, chrome plated

PLUMBING FIXTURES
In-Sink-Erator Model H-Wave SS hot water dispenser, w/ 2/3 gallon hot water tank with adjustable temperature from 160 Degrees F – 210 Degrees F. 750W, 6.5 amps, 115V.
Mixing Valve (Point-of-Use):
Leonard 270 series thermostatic point-of-use mixing valve.
ASSE 1070 certified.
Bronze body.
Locked temperature adjustment cap (vandal resistant).
Integral check valves on hot and cold inlets.
Minimum flow 0.5 GPM.
Maximum flow 3.5 GPM at 5 PSI loss.
Trap Priming Valves:
Precision Plumbing Products PO-500 pressure drop activated trap primer or similar. Automatic pressure drop activated trap primer valve to serve up to 4 drains/traps.
Water Hammer Arrester: Precision Plumbing Products Model SC (Maintenance-Free).

PART 3 - EXECUTION

FIXTURE TRIM
Provide plumbing fixture trim where applicable on fixtures, including but not limited to supply stops, traps, support rims, flush valve, and vacuum breakers.
Provide rough-in and final piping connection to fixtures. Carefully review all construction documents to assure that all fixtures are provided with necessary services for a complete operating system.
Rigidly secure rough-in piping, carriers and supports, and other service piping to structure.

PLUMBING FIXTURES
Americans with Disabilities Act:
Those fixtures indicated by ADA complies with and be installed in accordance with Americans with Disabilities Act Guidelines (ADAAG). Where applicable building code requirements are more stringent than ADAAG guidelines, building code requirements followed.
Water Closets:
Mounting height of ADA water closet 17-inches to 19-inches from floor to top of the toilet seat.
Mount flush valve for ADA water closets on wide side of enclosure.
Lavatories:
Mounting height of ADA lavatories at a maximum height of 34 inches from floor to rim.
Provide insulation kits on exposed hot water and waste piping beneath ADA lavatories.
Sinks: Provide insulation kits on exposed hot water and waste piping beneath ADA sinks.
Urinals: Mounting height of ADA water closet at a maximum height of 17-inches from floor to top rim.
Fixture Mounting Heights: Fixtures standard rough-in catalogued heights unless shown otherwise on the Architectural Drawings.
Showers:
Piping from shower mixing valve to shower head rigid pipe. PEX piping not allowed.
Shower Head Mounting Heights: Mount so that face of head is at 6-feet-6-inches above finished floor and not to conflict with shower enclosure.

Water Supplies: When both hot and cold water to a fixture is required, connect the hot on the left and the cold on the right.
Floor Mounted Supports and Chair Carriers:
Secure floor mounted supports and chair carriers to slab with a minimum of 1/2-inch bolts.
Install supports and carriers per manufacturer's installation instructions.
Lavatories:
Public Toilet Room: Grid strainers.
Private Toilet Room: Pop-up waste assemblies.
Those lavatories indicated as ADA are ADA compatible. Coordinate with Architect to verify if all wall hung lavatories are to be installed at ADA height.
Floor Drain and Floor Sinks:
Set top flush with finished floor.
Provide flashing clamp for all drain bodies installed in floors provided with waterproof membranes.
Cleanout:
Where shown or required.
Cover set flush with finished surface.
Water Hammer Arresters: Provide where shown and where recommended by Plumbing Drainage Institute (PDI).
Water Coolers and Drinking Fountains:
Water-bearing materials comply with the Safe Drinking Water Act of 1986 and the Lead Contamination Control Act of 1988. The waterway system of the unit manufactured of copper components and other completely lead-free materials.
Water cooler refrigerants will be non-CFC.
Provide fixture manufacturer's wall mounting plate or floor mounted support for all wall-hung water coolers or drinking fountains.
Mixing Valves: Provide piping connections per manufacturer's installation instructions.

PRIMING VALVES
All floor drains, floor sinks, and similar traps primed. Use minimum 3/8-inch type K annealed copper tubing. Primer line to be continuous and without joints.
Where priming valves are installed in finished rooms, conceal in wall and provide access panel.
Coordinate locations of electronic trap primer stations with electrical contractor for 120V service.

END OF SECTION

PART 1 GENERAL

SUMMARY

The intent of this Division's Specifications and Drawings is to provide a complete and workable facility, with complete systems as required by applicable codes, as indicated, and as specified.

Provide a complete and workable facility with complete systems that comply with the requirements of the state codes, local codes, and other authorities having jurisdiction. Include design, labor and materials required to install, test and place into operation the systems as called for in the Contract Documents and according to applicable codes and regulations.

Specifications and the accompanying Drawings are complementary and what is called for by one is as binding as if called for by both.

The General and Supplemental Conditions apply to this Division, including but not limited to:
Drawings and Specifications.
Public ordinances and permits.
Payments and fees required by governing authorities for work of this Division.

The Drawings that accompany this Division are diagrammatic. They do not show every offset, bend, or elbow, which may be required to install work in the space provided and avoid conflicts with other construction.

Provide all connections, raceway, wiring, breakers and installation required for systems specified, as required by the manufacturers installation documents, and for complete system functionality.

Offsets and transitions are to be assumed at a minimum at each crossing of services, structural penetrations through shear walls or beams, structural grids, where ceiling heights are restricted, and at piping and conduit mains.

Follow the Drawings as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions, and without additional cost to the Owner. Significant deviations from the routing shown on the drawings is subject for approval prior to installation. The right is reserved by the design team to make reasonable changes in locations of system components prior to roughing-in, without cost impact.

Verify dimensions, field conditions, quantities, and measurements prior to installing work.

Work done under this Division of the specifications includes the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings or as specified herein.

Work installed contrary to Drawings and Specifications is subject to change as directed by the Owner and no extra compensation will be allowed for making those changes.

PRICE AND PAYMENT PROCEDURES

Allowances
Comply with Division 01, General Requirements.

Alternates
Comply with Division 01, General Requirements.
Refer to Drawings for detailed information relating to the appropriate alternates.

RELATED REQUIREMENTS

Division 00, Procurement and Contracting Requirements

Division 01, General Requirements

Section 23 05 19 - Meters and Gauges for HVAC Piping

Section 23 05 23 - General-Duty Valves for HVAC Piping

Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

Section 23 05 48 - Vibration and Seismic Controls for HVAC

Section 23 05 53 - Identification for HVAC Piping and Equipment

Section 23 05 90 - Pressure Testing for HVAC Systems

Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
Section 23 07 13 - Duct Insulation
Section 23 07 19 - HVAC Piping Insulation
Section 23 08 00 - Commissioning of HVAC
Section 23 09 13 - Instrumentation and Control Devices for HVAC
Section 23 09 23 - Direct-Digital Control System for HVAC
Section 23 21 13 - Hydronic Piping
Section 23 21 14 - Hydronic Specialties
Section 23 23 00 - Refrigerant Piping
Section 23 31 00 - HVAC Ducts and Casings
Section 23 33 00 - Air Duct Accessories
Section 23 34 13 - Axial HVAC Fans
Section 23 34 16 - Centrifugal HVAC Fans
Section 23 36 00 - Air Terminal Units
Section 23 37 00 - Air Outlets and Inlets
Section 23 63 13 - Air Cooled Refrigerant Condensers
Section 23 73 13 - Modular Central-Station Air-Handling Units
Section 23 81 26.13 - Small-Capacity Split-System Air Conditioners
Section 23 82 16 - Air Coils

REFERENCE STANDARDS

Refer to individual sections under this Division for applicable reference standards.

ADMINISTRATIVE REQUIREMENTS

Coordination

Review Drawings of other trades and Owner provided equipment to avoid conflicts.
Report potential conflicts to Architect, prior to rough-in.
Architectural Drawings take precedence regarding exact placement of system components and equipment.
Verify the physical dimensions of equipment to fit the space available.
Coordinate access routes through the construction, equipment move-in planning, and provide all required equipment, transport and services necessary to facilitate installation of equipment.
Where connections are required for equipment provided as Work of other Divisions, coordinate rough in and connection requirements for that equipment with its supplier and installer prior to commencing work.
Notify Architect of any discrepancies between the actual rough in and connection requirements, and those identified on Drawings for resolution prior to installation.
Coordinate underground work with other trades working on the site.
Common trenches may be used with other trades, providing clearances required by codes and ordinances are maintained.
Coordinate installation of required supporting devices and set sleeves in architectural and structural components as they are constructed.
Coordinate location of access panels and doors for items concealed behind finished surfaces with Architect.
Coordinate sleeve selection and application with firestopping specified elsewhere.
Finishes: Coordinate with Architect, finish to match surrounding surfaces.

Permits

Obtain permits and inspections for the installation of work and pay charges required. Deliver certificates of inspection issued by authorities to the Owner.

SUBMITTALS

General Submittal Requirements:
Refer to Division 00 and Division 01 for general submittal requirements.
Requirements set forth in this Section pertain to all specifications included in this Division of work.
Refer to individual Division sections for additional Submittal requirements.

Pre-Bid Submittal Requirements
Submit Questions and Substitution Requests before the Questions deadline, defined in Division 00 and Division 01.

Bid Submittal Requirements
Refer to individual Division sections for specific requirements due with Bid.

Contractor Responsibilities:
Provide submittals one time and organized in proper order.
Indicate deviations from Drawings and Specifications explicitly in the submittals. Failure to comply will void review automatically.

Submittal Schedule:
General:
Submit a schedule that is coordinated with the project construction schedule.
Allow for time required for review of submittals, making corrections/revisions to submittals, ordering, manufacturing, fabrication, and delivery.
Submittal Schedule to include the following for each submittal as a minimum:
Identify submittal by specification section number and title.
Date the item will be submitted. Arrange items in chronological order by scheduled date for first submittal.
Identify critical submittals and long lead items explicitly.
Submittal Category:
Product Data
Coordination Drawings
Shop Drawings
Samples
Certificates
Delegated Design Submittals
Test and Evaluation Reports
Manufacturers' Instructions
Source Quality Control
Site Quality Control
Manufacturer Reports
Qualification Statements
Closeout Submittal Category:
Maintenance Contracts
Operations and Maintenance Data
Bonds
Warranty Documentation
Final Test and Evaluation Reports
Record Documentation
Demonstration and Training

Product Data:
General:
Assemble complete submittal package for this Division into a single submittal.
Partial submittals will not be accepted.
Submit product data on following equipment for review:
Equipment scheduled on Drawings.
Equipment requiring electrical connections or connections by other trades.
As required by each specification section or by notes on the Drawings.
Format:
Electronic: Submit electronic copies for Work of this Division in PDF format.

Include a complete index in the original submittal.
Incorporate links enabling navigation to each item.
Identify with each item filed under a folder and labeled with its respective specification section number, Article, and paragraph.
Provide cover sheet for each applicable section number.
Include for each item as a minimum:
Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified.
Manufacturer’s detailed shop drawings including clearances required.
Manufacturer’s detailed specifications.
Manufacturer’s data sheets including capacities, operating speeds, power requirements, design and operating conditions, performance curves, characteristics scheduled or described on the Drawings, and similar data.
List the name of the motor manufacturer and service factor for each piece of equipment.
Indicate equipment operating weights including bases and weight distribution at support points.
Wiring diagrams showing factory installed wiring.

Coordination Drawings:
General:
Assemble complete submittal package for the project into a minimum of two submittals.
Coordination Drawings - Above Grade
Prepare project-specific information, drawn accurately to scale.
Submit coordination drawings for review prior to beginning fabrication.
Sheet Size: Match sheet size of Construction Drawings.
Prepare in three-dimensional format utilizing the same digital data software program, version, and operating system utilized to develop the Construction Drawings.
Format:
Electronic: Submit electronic copies in PDF format.
Include as a minimum:
Color code and overlay shop drawings for each trade:
Ceiling Systems
HVAC Equipment
HVAC Ductwork
HVAC Piping
Plumbing Equipment
Plumbing Piping
Fire Suppression
Lighting
Electrical Power
Communications
Electronic Safety and Security
Complete floor plans to a minimum of 1/4-inch equals 1-foot scale.
Mechanical rooms to a minimum of 1/2-inch equals 1-foot scale.
Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.

Shop Drawings:
General:
Assemble complete submittal package for this Division into a single submittal.
Partial submittals will not be accepted.
Prepare project-specific information, drawn accurately to scale.
Prepare new Shop Drawings by Contractor and not reproductions or tracings of Engineer's Design Drawings.
Submit shop drawings for review prior to beginning fabrication.
Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.
Sheet Size: Match sheet size of Construction Drawings.

Prepare in three-dimensional format utilizing the same digital data software program, version, and operating system utilized to develop the Construction Drawings.
Format:
Electronic: Submit electronic copies for Work of this Division in PDF format.
Include a complete index in the original submittal.
Incorporate links enabling navigation to each item.
Identify with each item filed under a folder and labeled with its respective specification section number, Article and paragraph.
Include as a minimum:
Complete floor plans to a minimum of 1/4-inch equals 1-foot scale.
Mechanical, Electrical, and Technology rooms to a minimum of 1/2-inch equals 1-foot scale.
Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.
Fabricated equipment to a minimum of 1/4-inch equals 1-foot scale.

CLOSEOUT SUBMITTALS

Maintenance Contracts
Refer to individual Division sections for Submittal requirements.

Operations and Maintenance Data
General:
Assemble complete submittal package for this Division into a single submittal.
Partial submittals will not be accepted.
Submit when the work is substantially complete.
Submit manufacturer's operation and maintenance instruction manuals and parts lists for review on following equipment:
Equipment scheduled on Drawings.
Equipment requiring electrical connections or connections by other trades.
As required by each specification section or by notes on the Drawings.
Format:
Electronic: Submit electronic copies for Work of this Division in PDF format.
Include a complete index in the original submittal.
Incorporate links enabling navigation to each item.
Identify with each item filed under a folder and labeled with its respective specification section number, Article and paragraph.
Include for each item as a minimum:
Include name and contact information for location of source parts and service for each piece of equipment.
Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified.
Manufacturer's operation and maintenance instruction manuals.
Manufacturer's detailed shop drawings including clearances required.
Manufacturer's detailed specifications.
Manufacturer's data sheets including capacities, operating speeds, power requirements, design and operating conditions, performance curves, characteristics scheduled or described on the Drawings, and similar data.
List the name of the motor manufacturer and service factor for each piece of equipment.
Indicate equipment operating weights including bases and weight distribution at support points.
Wiring diagrams showing factory installed wiring.

Warranty Documentation
Refer to individual Division 00 and Division 01 sections for Submittal requirements.

Final Test and Evaluation Reports
Refer to individual Division sections for Submittal requirements.

Record Documentation
Shop Drawings
Shop drawings updated with as-built information and submitted as the record drawing set.

Record Drawings
General:
Provide drawings with notations reflecting the as-built conditions.
Notations to include any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.
Prepare project-specific information, drawn accurately to scale.
Provide project specific title block.
Sheet Size: Match sheet size of Construction Drawings.
Prepare in two-dimensional format utilizing the same digital data software program, version, and operating system utilized to develop the Construction Drawings.
Format:
Electronic: Submit electronic copies of record drawings for Work of this Division in PDF format.
Include a complete index in the original submittal.
Incorporate links enabling navigation to each item.
Identify with each item filed under a folder and labeled with its respective specification section number, Article and paragraph.

Demonstration and Training
Training Plan:
Submit outline of instructional program for demonstration and training.
Include the following:
List of training modules.
Schedule of proposed dates, times, length of instruction time.
Instructors' names for each training module.
Learning objective and outline for each training module.
Training Video Recordings:
Identification: On each copy, provide an applied label with the following information:
Name of Project.
Name and address of videographer.
Name of Architect.
Name of Contractor or Construction Manager.

QUALITY ASSURANCE

Regulatory Requirements
Products and equipment are prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
General:
Conform Work and materials to requirements of the local, State, and Federal authorities having jurisdiction and other applicable laws and regulations.
Where codes or standards are referenced, the applicable portions apply.
Drawings, specifications, codes and standards are minimum requirements. Where requirements differ, apply the more stringent.
Should any change in drawings or specifications be required to comply with governing regulations, notify the Architect prior to submitting bid.
Execute work in strict accordance with the best practices of the trades in a thorough, substantial, skillful and well-executed manner by competent workers. Provide a competent, experienced full-time Superintendent who is authorized to make decisions on behalf of the Contractor.
The Architect or Architect’s Representative may conduct unannounced field reviews of any work completed or in progress during the Contractor’s working hours. A report will be issued to the Contractor if the field review of the systems construction has revealed elements of the work which are inconsistent with the Contract Documents. All items in the report are to be addressed in writing by the Contractor within 2 weeks and corrections in the field made as directed.

Apparatus:
Build and install to deliver full rated capacity at the efficiency for which it was designed.

Provide entire system and apparatus that operate at full capacity without objectionable noise or vibration.

Install equipment level and true. Provide housekeeping pads and curbs accounting for floor or roof slope.

Materials and Equipment:
Provide new work of good quality, free of faults and defects and in conformance with the Construction documents.
Each piece of equipment furnished will meet the detailed requirements of the Drawings and Specifications and will be suitable for the installation shown. Equipment not meeting the requirements will not be acceptable, even though specified by name along with other manufacturers.
Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
Furnish materials and equipment of size, make, type, and quality herein specified.
Equipment scheduled by performance or model number is considered as the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the Contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.

Workmanship:
General: Install materials in a neat and professional manner.
Manufacturer’s Instructions:
Follow manufacturer’s directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division Specifications, obtain clarification before starting work.

Cutting and Patching:
Provide cutting, patching, and repairing for the proper installation and completion of the work specified in this Division by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work. This work includes but is not limited to plastering, masonry work, concrete work, carpentry work, and painting.
Make additional openings required in building construction by drilling or cutting. Use of jackhammer is specifically prohibited.
Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
Do not pierce beams, columns or structure members without approval from the Architect and structure engineer, and then only as directed.
New or existing work cut or damaged will be restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces will be repaired, refinished, and left in condition existing prior to commencement of work.

Visibly damaged goods are to be returned to the supplier and replaced at no additional cost to the Owner.

Contractor Responsibility:
Examination of building and site responsibility:
Examine site and building prior to installation to determine conditions affecting the scope of work.
Contact Owner representative for arrangements.
Respect and protect the privacy and confidentiality of Owner, its employees, processes, products, and intellectual property to the extent necessary, consistent with the legal responsibilities of the State and Owner policies.
Total responsibility for the coordination and installation of the work shown and described in the Drawings and Specifications.
Specified systems installed under the direction of a qualified Contractor. Qualification requirements include submittal by the Contractor to the Architect of the following:
Have experience with three or more installations of systems comparable in size, complexity, type, and design as specified herein.
Perform each of these installations satisfactorily for at least one year after final acceptance by the user.
Include the names, locations, and point of contact for these installations as a part of the initial submittal documentation.
List of previous projects of this scope, size, and nature, including names and sizes of projects, description of work, time of completion, and names of contact persons for reference.

Manufacturers

Equipment in these Sections are the standard products of a manufacturer regularly engaged in the manufacture of such products unless specified otherwise. Provide commercial grade components and products used in the system that comply with these Specifications.
Each component of equipment identifies the manufacturer's name, model, and applicable serial number.
The Owner's authorized representative retains the right to reject products that reflect, in their opinion, sub-standard design practices, manufacturing procedures, support services, or warranty policies.

DELIVERY, STORAGE, AND HANDLING

Assume custody and responsibility for the items upon delivery and determining that the contents are complete and in satisfactory condition for installation.

The Contractor is responsible for handling and control of equipment and liable for material loss due to delivery and storage problems.

Materials and equipment delivered and placed in storage will be stored with protection from the weather, humidity, and temperature variation, dirt, and dust or other contaminants.

Coordinate deliveries and submittals with the General Contractor/Owner to ensure a timely scheduled installation.

Equipment and materials are to be delivered to the site no more than three weeks prior to the commencement of its installation. Coordinate with General Contractor/Owner for the location of storage materials.

SITE CONDITIONS

Existing Conditions:
Prior to bidding, verify and become familiar with existing conditions by visiting the site.
Include related costs associated with site factors in the initial bid proposal.

Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

WARRANTY

Provide a written guarantee covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

Correct warranty items promptly upon notification.

Apparatus:
Free of defects of material and workmanship and in accord with the Contract Documents.
Built and installed to deliver its full rated capacity at the efficiency for which it was designed.

DEMOLITION AND SALVAGE

General:
Where affected by work, remove or relocate equipment, services, and systems encountered during the course of the remodel/construction work to a safe location that will be undisrupted by further construction.

Salvage and Disposal:
Removed materials, not containing hazardous waste, not scheduled for reuse are the property of the Contractor for removal from the site, except for those items specifically indicated on the Drawings for salvage or reuse.
Identify materials containing, or possibly containing, hazardous waste for removal and disposal by the Hazardous Waste Contractor.
Neatly store salvaged items at one location at the site where directed by the Owner's Representative.

PART 2 PRODUCTS

MACHINERY GUARDS

Furnish guards for protection on rotating and moving parts of equipment. Provide guards for metal fan drives and motor pulleys, regardless of being enclosed in a metal cabinet.

Design guards so as not to restrict air flow at fan inlets resulting in reduced capacity.

Provide shaft holes in guards for easy use of tachometers at pulley centers. Guards easily removable for pulley adjustment or removal and changing of belts.

Guards meet OSHA requirements including back plates.

Provide inlet and outlet screens on fans in plenums or where exposed to personnel.

ELECTRICAL EQUIPMENT

General: Equipment and installed work as specified under Division 26, Electrical.

Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available fault current rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment with a Short Circuit Current Rating (SCCR) that meets the bracing requirement.

Starters: Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.

Equipment Wiring:
Interconnecting wiring within or on a piece of mechanical equipment provided with the equipment unless shown otherwise.
This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.

Control Wiring: Control wiring for mechanical equipment provided under Section 23 09 13 - Instrumentation and Control Devices for HVAC.

Codes: Electrical equipment and products bear the UL label as required by governing codes and ordinances.

PART 3 EXECUTION

ACCESSIBILITY

General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.

Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms, and walkways.

ACCESS PANELS

Install in accord with manufacturer’s recommendations, coordinated with architectural features.

Provide 2-hour fire rated doors where required bearing the UL label.

Furnish 24-inch by 24-inch panels for ceilings and for access to equipment in soffits and shafts, and 12-inch by 12-inch for walls unless indicated otherwise.

Furnish where indicated and where required to access valves, fire/smoke dampers, trap primers, shock arresters, and other appurtenances requiring operation, service or maintenance. Submit proposed locations for review prior to installation.

ELECTRICAL EQUIPMENT

Ductwork or piping for mechanical systems not serving electrical space not installed in any switchgear room, transformer vault, telephone room, or electric closet except as indicated.

Ductwork or piping for mechanical systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

EQUIPMENT CONNECTIONS

Make final connections to equipment specified in sections other than Division 23, HVAC of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.

Piping:
Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.
Independently support piping connections to prevent undue strain on equipment.

Ductwork: Make exhaust connections to equipment in strict accordance with manufacturer's instructions.

PAINTING

General:
Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.
Exposed work under this Division receives either a factory painted finish or a field prime coat finish, except:
Exposed copper piping.
Aluminum jacketed outdoor insulated piping.

Equipment Rooms and Finished Areas:
Insulation: Not painted.
Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
Steel Valve Bodies and Bonnets: One coat of black enamel.
Brass Valve Bodies: Not painted.
Equipment:
One coat of grey machinery enamel.
Do not paint nameplates.
Grilles, Diffusers, Registers: Paint sheet metal and visible ductwork behind grilles, diffusers, and registers flat black.

Concealed Spaces (above ceilings, not visible):
Insulation: Not painted.
Do not paint the following:
Hangers
Uninsulated Piping
Miscellaneous Iron Work
Valve Bodies and Bonnets

Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.

Roof Mounted Equipment:
Paint two coats of exterior machinery enamel.
Color as selected by Architect.
Where factory standard finish is indicated in the equipment specification, it is assumed that the standard finish is painted.

Exterior Black Steel Pipe:
Wire brush and apply two coats of rust-inhibiting primer and one coat of exterior enamel.
Painting schemes comply with ANSI A13.1.

ADJUSTING

Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.

Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

CLEANING

General: Clean mechanical equipment, piping and ductwork of stampings and markings (except those required by codes), iron cuttings, and other refuse.

Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

Additional requirements are specified under specific Sections of this Division.

PROTECTION

Keep pipe, ductwork, and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, ductwork, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.

Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

Cover or otherwise suitably protect equipment and materials stored on the job site.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Thermometers and thermometer wells.

Test plugs.

RELATED REQUIREMENTS

Section 23 09 23 - Direct-Digital Control System for HVAC.

Section 23 21 13 - Hydronic Piping.

REFERENCE STANDARDS

ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers.

AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC, for submittal procedures.

Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

Project Record Documents: Record actual locations of components and instrumentation.

Operation and Maintenance Data: _____.

FIELD CONDITIONS

Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

STEM TYPE THERMOMETERS

Manufacturers:
Dwyer Instruments, Inc.
Omega Engineering, Inc.
Weksler Glass Thermometer Corp.

Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
Size: 9 inch scale.
Window: Clear Lexan.
Stem: 3/4 inch NPT brass.
Accuracy: 2 percent, per ASTM E77.
Calibration: Degrees F.

TEST PLUGS

Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gauges, one gauge adapters with 1/8 inch probes, two 1 inch dial thermometers.

PART 3 EXECUTION

INSTALLATION

Install in accordance with manufacturer's instructions.

Install positive displacement meters with isolating valves on inlet and outlet to AWWA M6. Provide full line size valved bypass with globe valve for liquid service meters.

Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

Install pressure gages with pulsation dampers. Provide gage cock to isolate each gauge. Provide syphon on gages in steam systems. Extend nipples and siphons to allow clearance from insulation.

Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

Install thermometers in air duct systems on flanges.

Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets. Where thermometers are provided on local panels, duct or pipe mounted thermometers are not required.

Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

Coil and conceal excess capillary on remote element instruments.

Provide instruments with scale ranges selected according to service with largest appropriate scale.

Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

Locate test plugs adjacent thermometers and thermometer sockets.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Globe valves.

Ball valves.

Check valves.

RELATED REQUIREMENTS

Section 23 05 48 - Vibration and Seismic Controls for HVAC.

Section 23 05 53 - Identification for HVAC Piping and Equipment.

Section 23 07 19 - HVAC Piping Insulation.

Section 23 21 13 - Hydronic Piping.

ABBREVIATIONS AND ACRONYMS

CWP: Cold working pressure.

EPDM: Ethylene propylene copolymer rubber.

NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

NRS: Nonrising stem.

OS&Y: Outside screw and yoke.

PTFE: Polytetrafluoroethylene.

RS: Rising stem.

TFE: Tetrafluoroethylene.

WOG: Water, oil, and gas.

REFERENCE STANDARDS

ASME B1.20.1 - Pipe Threads, General Purpose, Inch.

ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.

ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves.

ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

ASME B16.34 - Valves — Flanged, Threaded, and Welding End.

ASME B31.1 - Power Piping.

ASME B31.9 - Building Services Piping.

ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators.

ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

AWWA C606 - Grooved and Shouldered Joints.

MSS SP-45 - Drain and Bypass Connections.

MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves.

MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC, for submittal procedures.

Product Data: Provide data on valves including manufacturers catalog information.
Performance ratings
Rough-in details

Weights
Support requirements
Piping connections

Warranty: Submit manufacturer warranty and ensure that forms have been completed with Owner named and registered with manufacturer.

Operation and Maintenance Data:
Manufacturer's descriptive literature
Operating instructions
Maintenance and repair data
Parts listings

QUALITY ASSURANCE

Obtain valves for each valve type from single manufacturer.

Welding Materials and Procedures: Comply with ASME BPVC-IX.

DELIVERY, STORAGE, AND HANDLING

Prepare valves for shipping as follows:
Minimize exposure of operable surfaces by setting plug and ball valves to open position.
Protect valve parts exposed to piped medium against rust and corrosion.
Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
Adjust globe, gate, and angle valves to the closed position to avoid clattering.
Secure check valves in either the closed position or open position.
Adjust butterfly valves to closed or partially closed position.

Use the following precautions during storage:
Maintain valve end protection and protect flanges and specialties from dirt.
Provide temporary inlet and outlet caps.
Maintain caps in place until installation.
Store valves in shipping containers and maintain in place until installation.
Store valves indoors in dry environment.
Store valves off the ground in watertight enclosures when indoor storage is not an option.

Exercise the following precautions for handling:
Handle large valves with sling, modified to avoid damage to exposed parts.
Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

MANUFACTURERS:

Apollo

Armstrong

Bell and Gossett

Crane

DeZurik

Hammond

Kennedy

Metraflex

Milwaukee

Mueller

Nibco

Stockham

Taco

Tour and Andersson

Walworth

Wheatley

APPLICATIONS

See drawings for specific valve locations.

Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

Provide the following valves for the applications if not indicated on drawings:
Throttling (Hydronic): Globe.
Isolation (Shutoff): Butterfly, Gate, and Ball.
Swing Check (Pump Outlet):
Size 2 inch and Smaller: Bronze with bronze disc.
2-1/2 NPS and Larger: Iron with lever and spring, center-guided metal, or center-guided with resilient seat.
Dead-End: Butterfly, single-flange (lug) type.

Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

Required Valve End Connections for Non-Wafer Types:
Steel Pipe:
Size 2 inch and Smaller: Threaded ends.
2-1/2 NPS and Larger: Flanged ends.
Copper Tube:
2 NPS and Smaller: Soldered ends.
2-1/2 NPS and Larger: Brazed ends.

GENERAL REQUIREMENTS

Valve Pressure and Temperature Ratings:
No less than rating indicated.
As required for system pressures and temperatures.

Valve Sizes: Match upstream piping unless otherwise indicated.

Valve Actuator Types:
Gear Actuator: Quarter-turn valves 8 inch and larger.
Handwheel: Valves other than quarter-turn types.
Hand Lever: Quarter-turn valves 6 NPS and smaller.
Chainwheel:
Device for attachment to valve handwheel, stem, or other actuator.
Refer to Part 3 Installation for applied locations and installation requirements.

Valves in Insulated Piping: Provide stem extensions and the following features to allow full operation of valve without breaking insulation vapor seal or disturbing insulation:
Gate Valves: Rising stem.
Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve.
Butterfly Valves: Extended neck.
Memory Stops: Fully adjustable after insulation is installed.

Valve-End Connections:
Threaded End Valves: ASME B1.20.1.
Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.
Solder Joint Connections: ASME B16.18.
Grooved End Connections: AWWA C606.

General ASME Compliance:
Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
Power Piping Valves: ASME B31.1.
Building Services Piping Valves: ASME B31.9.

Bronze Valves:
Fabricate from dezincification resistant material.
Copper alloys containing more than 15 percent zinc are not permitted.

Valve Bypass and Drain Connections: MSS SP-45.

Source Limitations: Obtain each valve type from a single manufacturer.

BRONZE, GLOBE VALVES

Comply with MSS SP-80, Type 1.

Class 125: CWP Rating: 200 psig.

Class 150: CWP Rating: 300 psig.

Body: Bronze; ASTM B62, with integral seat and screw in bonnet.

Ends: Threaded or solder joint.

Stem and Disc: Bronze.

Packing: Asbestos free.

Operator: Handwheel or chainwheel.

BRONZE, BALL VALVES

General:
Fabricate from dezincification resistant material.
Copper alloys containing more than 15 percent zinc are not permitted.

Two Piece, Full Port with Bronze or Brass Trim:
Comply with MSS SP-110.
Class 125: CWP Rating: 200 psig.
Class 150: CWP Rating: 600 psig.
Ends: Threaded or soldered joint.
Stem: Bronze or brass.
Ball: Chrome plated brass.

BRONZE, SWING CHECK VALVES

Class 125:
Pressure and Temperature Rating: MSS SP-80, Type 3.
Design: Y-pattern, horizontal or vertical flow.
WSP Rating: 200 psi.
Body: Bronze, ASTM B62.
End Connections: Threaded or soldered.

Class 150:
Pressure and Temperature Rating: MSS SP-80, Type 3.
Design: Y-pattern, horizontal or vertical flow.
CWP Rating: 300 psi.
Body: Bronze, ASTM B62.
End Connections: Threaded or soldered.
Disc: Bronze.

PART 3 EXECUTION

EXAMINATION

Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.

Verify valve parts to be fully operational in all positions from closed to fully open.

Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

Should valve be determined to be defective, replace with new valve.

INSTALLATION

Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welds.

Install swing check valves horizontal maintaining hinge pin level.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Support and attachment components.

Metal Channel (Strut) Framing Systems.

Hanger Rods.

Steel Cable.

Pipe Supports.

Insulation Clamps.

Pipe Hangers.

Pipe Shields for Insulated Piping.

Anchors and Fasteners.

RELATED REQUIREMENTS

REFERENCE STANDARDS

ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.

ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.

ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

MFMA-4 - Metal Framing Standards Publication.

MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

ADMINISTRATIVE REQUIREMENTS

Coordination:

Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.

Coordinate the work with other trades to provide additional framing and materials required for installation.

Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

Sequencing:
Do not install products on or provide attachment to concrete surfaces until concrete has fully cured.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC, for submittal procedures.

Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

Delegated-Design Submittal: Provide for each anchor, alignment guide, trapeze pipe hanger, engineered support system, and equipment support to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer.
Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.

Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

QUALITY ASSURANCE

Comply with applicable building code.

Maintain at the project site a copy of each referenced document that prescribes execution requirements.

Installer Qualifications for Field-Welding.

Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

DELIVERY, STORAGE, AND HANDLING

Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

SUPPORT AND ATTACHMENT COMPONENTS

General Requirements:
Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of work.
Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
Select support and attachment component types and sizes in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
Structural Performance: Hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE 7.
Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
Steel Components: Use corrosion resistant materials suitable for the environment where installed.
Indoor Dry Locations: Use zinc-plated steel unless otherwise indicated.
Outdoor and Damp or Wet Indoor Locations: Use stainless steel unless otherwise indicated.
Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

Engineered Support Systems:
Provide design services for the following support systems:
Supports and seismic restraints for suspended piping, ductwork, and equipment.

Support frames such as pipe racks or stanchions for piping, ductwork, and equipment which provide support from below.
Equipment, ductwork, and piping support frame anchorage to supporting slab or structure.
Submit product submittals as part of this design package and not separately.

Prefabricated Trapeze-Framed Metal Strut Systems:
Manufacturers:
Cooper B-Line, a division of Eaton Corporation.
Unistrut, a brand of Atkore International Inc.
PHD Manufacturing, Inc.
Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
Strut Channel or Bracket Material:
Indoor Dry Locations: Use galvanized steel.
Outdoor and Damp or Wet Indoor Locations: Use stainless steel.
Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

Hanger Rods:
Threaded zinc-plated steel unless otherwise indicated.

Steel Cable:
Manufacturers:
Ductmate Industries, Inc, a DMI Company.
Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

Pipe Supports:
Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
Liquid Temperatures Up To 122 degrees F:
Overhead Support: MSS SP-58 Types 1, 3 through 12.
Support From Below: MSS SP-58 Types 35 through 38.

Insulation Clamps:
Two bolt-type clamps designed for installation under insulation.
Material: Carbon steel with epoxy copper or zinc finish.

Pipe Hangers:
Split Ring Hangers:
Provide hinged split ring and yoke roller hanger with epoxy copper or plain finish.
Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
Provide hanger rod and nuts of the same type and material for a given pipe run.
Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

Pipe Shields for Insulated Piping:
MSS SP-58 Type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel
General Construction and Requirements:
Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
Shields Material: UV-resistant polypropylene with glass fill.
Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
Minimum Service Temperature: Minus 40 degrees F.
Maximum Service Temperature: 178 degrees F.
Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

Anchors and Fasteners:
Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
Hollow Masonry: Use toggle bolts.
Hollow Stud Walls: Use toggle bolts.

Sheet Metal: Use sheet metal screws.
Wood: Use wood screws.
Plastic and lead anchors are not permitted.
Powder-actuated fasteners are not permitted.
Hammer-driven anchors and fasteners are not permitted.
Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
Comply with MFMA-4.
Channel Material: Use galvanized steel.
Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

EXAMINATION

Verify that field measurements are as indicated.

Verify that mounting surfaces are ready to receive support and attachment components.

Verify that conditions are satisfactory for installation prior to starting work.

INSTALLATION

Install products in accordance with manufacturer's instructions.

Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

Unless specifically indicated or approved by Architect, do not provide support from roof deck.

Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

Equipment Support and Attachment:
Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch high concrete pad.
Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

Secure fasteners according to manufacturer's recommended torque settings.

Remove temporary supports.

FIELD QUALITY CONTROL

See Division 01 for additional requirements.

Inspect support and attachment components for damage and defects.

Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Vibration isolation requirements.

Seismic control requirements.
Includes requirements for seismic qualification of equipment not specified in this section.

Vibration isolators.

Seismic restraint systems.

RELATED REQUIREMENTS

Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

DEFINITIONS

HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., ductwork, piping).

Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

REFERENCE STANDARDS

ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

ASCE 19 - Structural Applications of Steel Cables for Buildings.

ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications.

FEMA 412 - Installing Seismic Restraints for Mechanical Equipment.

FEMA 413 - Installing Seismic Restraints for Electrical Equipment.

FEMA 414 - Installing Seismic Restraints for Duct and Pipe.

FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage.

ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components.

MFMA-4 - Metal Framing Standards Publication.

SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems.

ADMINISTRATIVE REQUIREMENTS

Coordination:
Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
Coordinate the work with other trades to provide additional framing and materials required for installation.
Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
Seismic Controls:
Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

Sequencing:
Do not install products on or provide attachment to concrete surfaces until concrete has fully cured.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC for submittal procedures.

Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
Seismic Controls: Include seismic load capacities.

Shop Drawings - Vibration Isolation Systems:
Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.

Shop Drawings - Seismic Controls:
Include dimensioned plan views and sections indicating proposed HVAC component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
Identify mounting conditions required for equipment seismic qualification.
Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
Indicate proposed arrangement of distributed system trapeze support groupings.
Indicate proposed locations for distributed system flexible fittings and/or connections.
Indicate locations of seismic separations where applicable.
Include point load drawings indicating design loads transmitted to structure at each attachment location.

Seismic Design Data:
Compile information on project-specific characteristics of actual installed HVAC components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
Component operating weight and center of gravity.
Component elevation in the building in relation to the roof elevation (z/h).
Component importance factor (Ip).
For distributed systems, component materials and connection methods.
Component amplification factor (ap) and component response modification factor (Rp), determined in accordance with ASCE 7 tables.
Applicability of overstrength factor (for certain anchorage in concrete and masonry).
Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

Certification for seismically qualified equipment; identify basis for certification.

Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.

Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

Evidence of qualifications for seismic controls designer.

Evidence of qualifications for manufacturer.

Manufacturer’s detailed field testing and inspection procedures.

Field quality control test reports.

QUALITY ASSURANCE

Comply with applicable building code.

Maintain at the project site a copy of each referenced document that prescribes execution requirements.

Seismic Controls Designer Qualifications:
Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.
Designer may be employed by the manufacturer of the seismic restraint products.

Manufacturer Qualifications:
Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
Member of Vibration Isolation and Seismic Control Manufacturers Association (VISCMA).

Perform design and installation in accordance with applicable codes.

Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

DELIVERY, STORAGE, AND HANDLING

Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

VIBRATION ISOLATION REQUIREMENTS

Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

General Requirements:
Select vibration isolators to provide required static deflection.
Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
Select vibration isolators for outdoor equipment to comply with wind design requirements.
Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

Equipment Isolation: As indicated on drawings and as scheduled.

Piping Isolation:
Provide vibration isolators for piping supports:
Located in equipment rooms.
Located within 50 feet of connected vibration-isolated equipment and pressure-regulating valve (PRV) stations.
Minimum Static Deflection:
First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
Remainder of Supports: 0.75 inch deflection unless otherwise indicated.
Suspended Piping, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
Floor-Mounted Piping, Seismic Applications: Use seismic type restrained spring isolators.
Use modular seal or approved resilient material where vibration-isolated piping penetrates building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

SEISMIC CONTROL REQUIREMENTS

Design and provide HVAC component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor HVAC components.

Seismic Design Criteria: Obtain from project Structural Engineer of Record.

Component Importance Factor (Ip): HVAC components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:
HVAC components required to function for life safety purposes after an earthquake.
HVAC components that support or otherwise contain hazardous substances.

Seismic Qualification of Equipment:
Provide special certification for HVAC equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.
Notify Architect and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.

Premanufactured Modular HVAC Equipment: Where not otherwise seismically qualified, premanufactured modules 6 feet high and taller furnished under other sections to be designed in accordance with seismic provisions for nonbuilding structures.

Seismic Restraints:
Provide seismic restraints for HVAC components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
Seismic Restraint Exemptions:
Exemptions for Seismic Design Category C:
HVAC components where either of the following apply:
The component importance factor (Ip) is 1.0 and the component is positively attached to the structure.
The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
HVAC piping with component importance factor (Ip) of 1.5 and nominal pipe size of 2 inch or less, where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).
Exemptions for Seismic Design Category D, E, and F:
Discrete HVAC components that are positively attached to the structure where either of the following apply:
The component weighs 400 pounds or less, has a center of mass located 4 feet or less above the adjacent floor level, flexible connections are provided between the component and associated ductwork, piping, and conduit, and the component importance factor (Ip) is 1.0.
The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
HVAC piping with component importance factor (Ip) of 1.0 and nominal pipe size of 3 inch or less, or with component importance factor (Ip) of 1.5 and nominal pipe size of 1 inch or less, where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).
Duct System Exemptions, All Seismic Design Categories:
Duct systems not designed to carry toxic, highly toxic, or flammable gases and not used for smoke control with component importance factor (Ip) of 1.0, where flexible connections or other assemblies are provided between duct system and associated components, where duct system is positively attached to the structure, and where one of the following apply:
Trapeze supported duct with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
Trapeze supported duct with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 200 pounds or less.

Trapeze supported duct with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.

Hanger supported duct with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single rod is 50 pounds or less.

Duct systems not designed to carry toxic, highly toxic, or flammable gases and not used for smoke control, where there are provisions to avoid impact with other ducts or mechanical components or to protect ducts in the event of such impact, and where duct system is positively attached to the structure and has a cross sectional area of less than 6 square feet and weighs 20 pounds per foot or less.

HVAC Piping Exemptions, All Seismic Design Categories:

HVAC piping where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, where piping is positively attached to the structure, and where one of the following apply:

Trapeze supported piping weighing less than 10 pounds per foot, where all pipes supported meet size requirements for exemption as single pipes described under specific seismic design category exemptions above.

Trapeze supported piping with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.

Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 200 pounds or less.

Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.

Hanger supported piping with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, where pipe has a component importance factor (Ip) of 1.0 and meets size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single rod is 50 pounds or less.

Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:

ASHRAE (HVACA).

FEMA 412.

FEMA 413.

FEMA 414.

FEMA E-74.

SMACNA (SRM).

Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.

Seismic Type Vibration Isolators:

Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.

External Seismic Snubber Assemblies:

Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).

Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.

Seismic Restraint Systems:

Except where otherwise restricted, use of either cable or rigid restraints is permitted.
Use only cable restraints to restrain vibration-isolated HVAC components, including distributed systems.
Use only one restraint system type for a given HVAC component or distributed system (e.g., ductwork, piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain HVAC component in all lateral directions; consider bracket geometry in anchor load calculations.
Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported HVAC component weight.
Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported HVAC component weight.
Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.
Manufacturer's certified seismic restraint design may be submitted as an alternative to project-specific design and documentation, subject to approval of authorities having jurisdiction.
Ductwork Applications:
Provide independent support and seismic restraint for in-line components (e.g., fans, heat exchangers, humidifiers) having an operating weight greater than 75 pounds.
Positively attach appurtenances (e.g., dampers, louvers, diffusers) with mechanical fasteners.

Seismic Attachments:
Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
Do not use power-actuated fasteners.
Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
Concrete Housekeeping Pads:
Increase size of pad as required to comply with anchor requirements.
Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

Seismic Interactions:
Include provisions to prevent seismic impact between HVAC components and other structural or nonstructural components.
Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
Comply with minimum clearance requirements between HVAC equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

Seismic Relative Displacement Provisions:
Use suitable fittings or flexible connections to accommodate:
Relative displacements at connections between components, including distributed systems (e.g., ductwork, piping); do not exceed load limits for equipment utility connections.
Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
Design displacements at seismic separations.
Anticipated drifts between floors.

MANUFACTURERS

Kinetics Noise Control, Inc.

Mason Industries.

VMC Group.

Source Limitations: Furnish products and associated components and accessories produced by a single manufacturer and obtained from a single supplier.

VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

Vibration-Isolated Structural Steel Bases:
Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.

VIBRATION ISOLATORS

General Requirements:
Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
Spring Elements for Spring Isolators:
Color code or otherwise identify springs to indicate load capacity.
Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
Selected to provide designed deflection of not less than 75 percent of specified deflection.
Selected to function without undue stress or overloading.
Seismic Snubbing Elements for Seismic Isolators:
Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

Vibration Isolators for Seismic Applications:
Resilient Material Isolator Mounts, Seismic:
Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.
Restrained Spring Isolators, Seismic:
Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
Furnished with integral leveling device for positioning and securing supported equipment.
Provides constant free and operating height.
Resilient Material Isolator Hangers, Seismic:
Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
Spring Isolator Hangers, Seismic:
Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
Combination Resilient Material/Spring Isolator Hangers, Seismic:

Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) isolator material for the upper hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

Acoustical and Vibration Isolators
General Requirements:
Acoustical Isolation System: Through-stud isolators, pipe clamps, riser clamp pads, neoprene and felt lining material and associated support brackets.

SEISMIC RESTRAINT SYSTEMS

Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

Cable Restraints:
Comply with ASCE 19.
Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
Use protective thimbles for cable loops where potential for cable damage exists.

Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

EXAMINATION

Verify that field measurements are as shown on the drawings.

Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

Verify that conditions are satisfactory for installation prior to starting work.

CODE-REQUIRED SPECIAL INSPECTIONS

Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.

Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

Seismic special inspections include, but are not limited to:
Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with the certificate of compliance.
Installation and anchorage of piping systems designed to carry hazardous materials and their associated mechanical units for Seismic Design Categories C, D, E, and F; periodic inspection.
Installation and anchorage of ductwork designed to carry hazardous materials for Seismic Design Categories C, D, E and F; periodic inspection.
Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where the approved Contract Documents require a nominal clearance of 1/4 inch or less between equipment support frame and seismic restraint; periodic inspection.
Verification of required clearances between HVAC equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.

Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

INSTALLATION

Install products in accordance with manufacturer's instructions.

Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

Secure fasteners according to manufacturer's recommended torque settings.

Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

Vibration Isolation Systems:
Vibration-Isolated Equipment Support Bases:
Provide specified minimum clearance beneath base.
Spring Isolators:
Position equipment at operating height; provide temporary blocking as required.
Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
Isolator Hangers:
Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
Adjust isolators to be free of isolation short circuits during normal operation.
Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

Seismic Controls:
Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
Equipment with Sheet Metal Housings:
Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
Attach additional steel as approved by manufacturer where required to transfer loads to structure.
Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
Concrete Housekeeping Pads:
Size in accordance with seismic design to meet anchor requirements.
Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
Seismic Restraint Systems:
Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
Install restraints within permissible angles in accordance with seismic design.
Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.

Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.

Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

FIELD QUALITY CONTROL

See Division 01, for additional requirements.

Inspect vibration isolation and/or seismic control components for damage and defects.

Provide manufacturer representative or authorized technician services to assist with inspection and testing of vibration isolation systems and seismic controls. Submit a detailed copy of manufacturer recommended inspection, testing, and field report procedures.

Vibration Isolation Systems:
Verify isolator static deflections.
Verify required clearance beneath vibration-isolated equipment support bases.
Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

Seismic Controls:
Verify snubbing element air gaps.

Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

Submit detailed reports indicating inspection and testing results and corrective actions taken.

SCHEDULE

Equipment Isolation Schedule.
Air Cooled Refrigerant Condensers.
Base: Structural steel base.
Isolator Type: Restrained open spring isolators.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Nameplates.

Tags.

Pipe markers.

REFERENCE STANDARDS

ASTM D709 - Standard Specification for Laminated Thermosetting Materials.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC for submittal procedures.

List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

Product Data: Provide manufacturers catalog literature for each product required.

Manufacturer's Installation Instructions: Indicate special procedures, and installation.

Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

IDENTIFICATION APPLICATIONS

Air Handling Units: Nameplates.

Air Terminal Units: Tags.

Automatic Controls: Tags. Key to control schematic.

Control Panels: Nameplates.

Heat Transfer Equipment: Nameplates.

Instrumentation: Tags.

Major Control Components: Nameplates.

Piping: Pipe markers.

Small-sized Equipment: Tags.

Valves: Tags and adhesive laminated tape where located above lay-in ceiling .

NAMEPLATES

Manufacturers:
Advanced Graphic Engraving, LLC.
Brimar Industries, Inc.
Kolbi Pipe Marker Co.
Marking Services, Inc.
Seton Identification Products, a Tricor Direct Company.

Letter Color: White.

Letter Height: 1/2 inch.

Background Color: Black.

Plastic: Comply with ASTM D709.

TAGS

Manufacturers:
Advanced Graphic Engraving.
Brady Corporation.
Brimar Industries, Inc.

Kolbi Pipe Marker Co.
Marking Services, Inc.
Seton Identification Products, a Tricor Company.

Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

PIPE MARKERS

Manufacturers:
Brady Corporation.
Brimar Industries, Inc.
Kolbi Pipe Marker Co.
Seton Identification Products, a Tricor Company.

Color: Comply with ASME A13.1.

PART 3 EXECUTION

PREPARATION

Degrease and clean surfaces to receive adhesive for identification materials.

INSTALLATION

Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

Install tags with corrosion resistant chain.

Use tags on piping 3/4 inch diameter and smaller.
Identify service, flow direction, and pressure.
Install in clear view and align with axis of piping.
Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

Locate permanent tag at the access location (T-bar ceiling grid, access door, etc.) to locate valves, dampers, and equipment above ceilings.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Pressure Testing of Medium Pressure Ductwork

Pressure Testing of Low Pressure Ductwork

Pressure Testing of Piping Systems

RELATED REQUIREMENTS

Division 01, General Requirements

Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC .

Test and Evaluation Reports:
Certificate of completion, inspection, and test by authority having jurisdiction on required systems.
Certificate of test approval by Owner's representative for all systems.
Test Reports:
Description of testing procedure.
Results of tests, including recommendations for actions to remedy any deficiencies identified.

QUALITY ASSURANCE

Code Compliance: perform required test in the presence of the authority having jurisdiction.

Owner Witness: Perform tests in the presence of the Owner’s representative.

Engineer Witness: The Engineer or Engineer’s representative reserves the right to observe test or selected tests to assure compliance with the specifications.

Simultaneous Testing: Test observations by the authority having jurisdiction, the Owner’s representative, and the Engineer’s representative need not occur simultaneously.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

GENERAL

Piping:
Test prior to concealment, insulation being applied, and connection to equipment, fixtures, or specialties.
Conduct test with all valves except those used to isolate the test section 10 percent closed.

Ductwork: Test prior to connection equipment and before applying insulation.

Leaks: Repair all leaks and retest until stipulated end results are achieved.

Notification:
Advice Architect 72 hours in advance of each test.
Failure to notify will require test to be rescheduled.

Testing Equipment: Provide all necessary pumps, gauges, connections, and similar items required to perform the tests.

TESTING REQUIREMENTS

Medium Pressure Ductwork:
Conduct ductwork testing in accordance with the latest published version of the SMACNA HVAC Air Duct Leakage Test Manual.
Test at 4-inch static pressure.
Prior to testing verify that all medium pressure ductwork has been sealed to meet the SMACNA Seal Class A for all joints, seams, and duct wall penetrations.
SMACNA Leakage Classes:
Rectangular Metal – Class 6
Round or Flat Oval – Class 3

Maximum allowable air leakage (Lmax) is 4.0 as defined by the following equation:
Lmax = CL x P^0.65
Where:
Lmax = The measured leakage rate in CFM per 100 square feet of duct surface area.
CL = Duct leakage class in CFM per 100 square feet of duct surface area per inch of water ^0.65.
P = The static pressure of the test in inches of water.
Test a representative sample totaling no less than 25 percent of installed ductwork.

Low Pressure Ductwork:
Conduct ductwork testing in accordance with the latest published version of the SMACNA HVAC Air Duct Leakage Test Manual.
Test at 1-inch static pressure.
Prior to testing verify that all medium pressure ductwork has been sealed to meet the SMACNA Seal Class C for all joints, seams, and duct wall penetrations.
SMACNA Leakage Classes:
Rectangular Metal – Class 24
Round or Flat Oval – Class 12
Maximum allowable air leakage (Lmax) is 4.0 as defined by the following equation:
Lmax = CL x P^0.65
where:
Lmax = The measured leakage rate in CFM per 100 square feet of duct surface area.
CL = Duct leakage class in CFM per 100 square feet of duct surface area per inch of water ^0.65.
P = The static pressure of the test in inches of water.
Test a representative sample totaling no less than 25 percent of installed ductwork.

Piping:
General: Test all piping as noted below, and with no leaks or loss in pressure for time indicated.
Heating Water Systems:
Test Pressure: 150 psig
Test Medium: Water
Test Duration: 4 hours
Refrigerant Piping - R-32:
Test Pressure: 450 psig, or as recommended by equipment manufacturer.
Test Medium: Nitrogen
Test Duration: 24 hours
Refrigerant Piping - R-410A:
Test Pressure: 450 psig, or as recommended by equipment manufacturer.
Test Medium: Nitrogen
Test Duration: 24 hours

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Testing, adjustment, and balancing of air systems.

Testing, adjustment, and balancing of hydronic systems.

Measurement of final operating condition of HVAC systems.

RELATED REQUIREMENTS

Section 23 08 00 - Commissioning of HVAC.

REFERENCE STANDARDS

AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition.

ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.

SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC, for submittal procedures.

Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor.

TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.

Include at least the following in the plan:

List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

Identification and types of measurement instruments to be used and their most recent calibration date.

Discussion of what notations and markings will be made on the duct and piping drawings during the process.

Final test report forms to be used.

Detailed step-by-step procedures for TAB work for each system and issue, including:

Terminal flow calibration (for each terminal type).

Diffuser proportioning.

Branch/submain proportioning.

Total flow calculations.

Rechecking.

Diversity issues.

Expected problems and solutions, etc.

Details of how TOTAL flow will be determined; for example:

Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.

Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.

Confirmation of understanding of the outside air ventilation criteria under all conditions.

Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).

Method of checking building static and exhaust fan and/or relief damper capacity.

Time schedule for TAB work to be done in phases (by floor, etc.).

Description of TAB work for areas to be built out later, if any.

Exhaust fan balancing and capacity verifications, including any required room pressure differentials.

Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
Procedures for formal deficiency reports, including scope, frequency and distribution.

Field Logs: Submit at least twice a week to the Construction Manager.

Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
Revise TAB plan to reflect actual procedures and submit as part of final report.
Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
Include actual instrument list, with manufacturer name, serial number, and date of calibration.
Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
Units of Measure: Report data in I-P (inch-pound) units only.
Include the following on the title page of each report:
Name of Testing, Adjusting, and Balancing Agency.
Address of Testing, Adjusting, and Balancing Agency.
Telephone number of Testing, Adjusting, and Balancing Agency.
Project name.
Project location.
Project Architect.
Project Engineer.
Project Contractor.
Project altitude.
Report date.

Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

GENERAL REQUIREMENTS

Perform total system balance in accordance with one of the following:
AABC (NSTSB), AABC National Standards for Total System Balance.
SMACNA (TAB).
Maintain at least one copy of the standard to be used at project site at all times.

Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

TAB Agency Qualifications:
Company specializing in the testing, adjusting, and balancing of systems specified in this section.
Having minimum of three years documented experience.
Certified by one of the following:
AABC, Associated Air Balance Council; upon completion submit AABC National Performance Guaranty.
NEBB, National Environmental Balancing Bureau.
TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute.

TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

EXAMINATION

Verify that systems are complete and operable before commencing work. Ensure the following conditions:
Systems are started and operating in a safe and normal condition.
Temperature control systems are installed complete and operable.
Proper thermal overload protection is in place for electrical equipment.
Final filters are clean and in place. If required, install temporary media in addition to final filters.
Duct systems are clean of debris.
Fans are rotating correctly.
Fire and volume dampers are in place and open.
Air coil fins are cleaned and combed.
Access doors are closed and duct end caps are in place.
Air outlets are installed and connected.
Duct system leakage is minimized.
Hydronic systems are flushed, filled, and vented.
Pumps are rotating correctly.
Proper strainer baskets are clean and in place.
Service and balance valves are open.

Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

Beginning of work means acceptance of existing conditions.

PREPARATION

Hold a pre-balancing meeting at least one week prior to starting TAB work.
Require attendance by all installers whose work will be tested, adjusted, or balanced.

Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

Provide additional balancing devices as required.

ADJUSTMENT TOLERANCES

Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.

Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

Hydronic Systems: Adjust to within plus or minus 10 percent of design.

RECORDING AND ADJUSTING

Field Logs: Maintain written logs including:
Running log of events and issues.
Discrepancies, deficient or uncompleted work by others.
Contract interpretation requests.
Lists of completed tests.

Ensure recorded data represents actual measured or observed conditions.

Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

Check and adjust systems approximately six months after final acceptance and submit report.

AIR SYSTEM PROCEDURE

Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

Measure air quantities at air inlets and outlets.

Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

On fan powered VAV boxes, adjust air flow switches for proper operation.

WATER SYSTEM PROCEDURE

Adjust water systems to provide required or design quantities.

Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

Effect system balance with automatic control valves fully open to heat transfer elements.

Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

SCOPE

Test, adjust, and balance the following:
Fire Pumps.
Sprinkler Air Compressor.
HVAC Pumps.
Water Tube Boilers.
Packaged Steel Water Tube Boilers.
Packaged Steel Fire Tube Boilers.

Forced Air Furnaces.
Direct Fired Furnaces.
Air Cooled Water Chillers.
Centrifugal Water Chillers.
Induced Draft Cooling Tower.
Packaged Roof Top Heating/Cooling Units.
Packaged Terminal Air Conditioning Units.
Unit Air Conditioners.
Computer Room Air Conditioning Units.
Air Coils.
Terminal Heat Transfer Units.
Air Handling Units.
Fans.
Air Filters.
Air Terminal Units.
Air Inlets and Outlets.

MINIMUM DATA TO BE REPORTED

Electric Motors:
Manufacturer.
Model/Frame.
HP/BHP.
Phase, voltage, amperage; nameplate, actual, no load.
RPM.
Service factor.
Starter size, rating, heater elements.
Sheave Make/Size/Bore.

V-Belt Drives:
Identification/location.
Required driven RPM.
Driven sheave, diameter and RPM.
Belt, size and quantity.
Motor sheave diameter and RPM.
Center to center distance, maximum, minimum, and actual.

Pumps:
Identification/number.
Manufacturer.
Size/model.
Impeller.
Service.
Design flow rate, pressure drop, BHP.
Actual flow rate, pressure drop, BHP.
Discharge pressure.
Suction pressure.
Total operating head pressure.
Shut off, discharge and suction pressures.
Shut off, total head pressure.

Combustion Equipment:
Manufacturer.
Model number.
Serial number.
Firing rate.
Overfire draft.
Gas meter timing dial size.

Gas meter time per revolution.
Gas pressure at meter outlet.
Gas flow rate.
Heat input.
Burner manifold gas pressure.
Percent carbon monoxide (CO).
Percent carbon dioxide (CO2).
Percent oxygen (O2).
Percent excess air.
Flue gas temperature at outlet.
Ambient temperature.
Net stack temperature.
Percent stack loss.
Percent combustion efficiency.
Heat output.

Air Cooled Condensers:
Identification/number.
Location.
Manufacturer.
Model number.
Serial number.
Entering DB air temperature, design and actual.
Leaving DB air temperature, design and actual.
Number of compressors.

Chillers:
Identification/number.
Manufacturer.
Capacity.
Model number.
Serial number.
Evaporator entering water temperature, design and actual.
Evaporator leaving water temperature, design and actual.
Evaporator pressure drop, design and actual.
Evaporator water flow rate, design and actual.
Condenser entering water temperature, design and actual.
Condenser pressure drop, design and actual.
Condenser water flow rate, design and actual.

Cooling Tower:
Tower identification/number.
Manufacturer.
Model number.
Serial number.
Rated capacity.
Entering air WB temperature, specified and actual.
Leaving air WB temperature, specified and actual.
Ambient air DB temperature.
Condenser water entering temperature.
Condenser water leaving temperature.
Condenser water flow rate.
Fan RPM.

Heat Exchangers:
Identification/number.
Location.
Service.

Manufacturer.
Model number.
Serial number.
Steam pressure, design and actual.
Primary water entering temperature, design and actual.
Primary water leaving temperature, design and actual.
Primary water flow, design and actual.
Primary water pressure drop, design and actual.
Secondary water leaving temperature, design and actual.
Secondary water flow, design and actual.
Secondary water pressure drop, design and actual.

Cooling Coils:
Identification/number.
Location.
Service.
Manufacturer.
Air flow, design and actual.
Entering air DB temperature, design and actual.
Entering air WB temperature, design and actual.
Leaving air DB temperature, design and actual.
Leaving air WB temperature, design and actual.
Water flow, design and actual.
Water pressure drop, design and actual.
Entering water temperature, design and actual.
Leaving water temperature, design and actual.
Saturated suction temperature, design and actual.
Air pressure drop, design and actual.

Heating Coils:
Identification/number.
Location.
Service.
Manufacturer.
Air flow, design and actual.
Water flow, design and actual.
Water pressure drop, design and actual.
Entering water temperature, design and actual.
Leaving water temperature, design and actual.
Entering air temperature, design and actual.
Leaving air temperature, design and actual.
Air pressure drop, design and actual.

Electric Duct Heaters:
Manufacturer.
Identification/number.
Location.
Model number.
Design kW.
Number of stages.
Phase, voltage, amperage.
Test voltage (each phase).
Test amperage (each phase).
Air flow, specified and actual.
Temperature rise, specified and actual.

Air Moving Equipment:
Location.

Manufacturer.
Model number.
Serial number.
Arrangement/Class/Discharge.
Air flow, specified and actual.
Return air flow, specified and actual.
Outside air flow, specified and actual.
Total static pressure (total external), specified and actual.
Inlet pressure.
Discharge pressure.
Sheave Make/Size/Bore.
Number of Belts/Make/Size.
Fan RPM.

Return Air/Outside Air:
Identification/location.
Design air flow.
Actual air flow.
Design return air flow.
Actual return air flow.
Design outside air flow.
Actual outside air flow.
Return air temperature.
Outside air temperature.
Required mixed air temperature.
Actual mixed air temperature.
Design outside/return air ratio.
Actual outside/return air ratio.

Exhaust Fans:
Location.
Manufacturer.
Model number.
Serial number.
Air flow, specified and actual.
Total static pressure (total external), specified and actual.
Inlet pressure.
Discharge pressure.
Sheave Make/Size/Bore.
Number of Belts/Make/Size.
Fan RPM.

Duct Traverses:
System zone/branch.
Duct size.
Area.
Design velocity.
Design air flow.
Test velocity.
Test air flow.
Duct static pressure.
Air temperature.
Air correction factor.

Duct Leak Tests:
Description of ductwork under test.
Duct design operating pressure.
Duct design test static pressure.

Duct capacity, air flow.
Maximum allowable leakage duct capacity times leak factor.
Test apparatus:
Blower.
Orifice, tube size.
Orifice size.
Calibrated.
Test static pressure.
Test orifice differential pressure.
Leakage.

Air Monitoring Stations:
Identification/location.
System.
Size.
Area.
Design velocity.
Design air flow.
Test velocity.
Test air flow.

Flow Measuring Stations:
Identification/number.
Location.
Size.
Manufacturer.
Model number.
Serial number.
Design Flow rate.
Design pressure drop.
Actual/final pressure drop.
Actual/final flow rate.
Station calibrated setting.

Terminal Unit Data:
Manufacturer.
Type, constant, variable, single, dual duct.
Identification/number.
Location.
Model number.
Size.
Minimum static pressure.
Minimum design air flow.
Maximum design air flow.
Maximum actual air flow.
Inlet static pressure.

Air Distribution Tests:
Air terminal number.
Room number/location.
Terminal type.
Terminal size.
Area factor.
Design velocity.
Design air flow.
Test (final) velocity.
Test (final) air flow.

Percent of design air flow.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Duct insulation.

Duct liner.

Acoustical wrap.

RELATED REQUIREMENTS

Section 23 05 53 - Identification for HVAC Piping and Equipment.

Section 23 31 00 - HVAC Ducts and Casings.

REFERENCE STANDARDS

ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation.

ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC, for submittal procedures.

Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

QUALITY ASSURANCE

Prohibit insulating products from containing pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products within this specification contain these banned substances, provide complying products from approved manufacturers with equal performance characteristics.

Source Quality Control:
Insulation and accessories not to provide nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin, not to react corrosively with equipment, piping, or ductwork, and asbestos free.

DELIVERY, STORAGE, AND HANDLING

Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

FIELD CONDITIONS

Maintain ambient temperatures and conditions during and after installation as required by manufacturers of adhesives, mastics, and insulation cements.

PART 2 PRODUCTS

REGULATORY REQUIREMENTS

Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50 for insulation installed indoors and within ductwork and 75/150 for insulation installed outdoors, maximum, when tested in accordance with ASTM E84 or UL 723.

GLASS FIBER, FLEXIBLE

Manufacturer:
Johns Manville.
Knauf Insulation.
Owens Corning Corporation.
_____.

Insulation: ASTM C553; flexible, noncombustible blanket.
'K' value: 0.25 at 75 degrees F BTU-IN/HR-SF-deg F, when tested in accordance with ASTM C518.
Maximum Service Temperature: 250 degrees F.
Maximum Water Vapor Absorption: 5.0 percent by weight.

Vapor Barrier Jacket:
Kraft paper with glass fiber yarn and bonded to aluminized film.
Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
Secure with pressure-sensitive tape.

Vapor Barrier Tape: Pressure sensitive, weather resistant, and for temperatures up to 150 degrees F.
Manufacturers:
Zeston.
Substitutions: Submit substitution request.
Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

Tie Wire: Annealed steel, 20 gage, 0.0508 inch diameter at 24 inches on center and at all joints.

DUCT LINER

Manufacturers:
Johns Manville.
Knauf Insulation.
Owens Corning Corporation.

Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
Fungal Resistance: No growth when tested according to ASTM G21.
Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
Service Temperature: Up to 250 degrees F.
Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
Minimum Noise Reduction Coefficients:
1 inch Thickness: 0.45.
1-1/2 inches Thickness: 0.60.
2 inch Thickness: 0.70.

Adhesive: Waterproof, fire-retardant type, ASTM C916. Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
Manufacturers:
Foster.
Design Polymerics.

Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

ACOUSTICAL WRAP

Barrier:
Construct barrier of a 0.10-inch thick mass loaded, limp vinyl sheet bonded to a layer of reinforced aluminum foil on one side.
Nominal density of 2 pound per square-foot and minimum STC rating of 34.
Minimum thermal conductivity value of 0.11 BTU-IN/HR-SF-deg F and a rated service temperature range of -20 degrees F to 200 degrees F.
Flame spread index of no more than 25 and a smoke development index of less than 50.

Decoupling Layer:
Combination of fiberglass batting, non-woven porous scrim-coated glass cloth, quilted together in a matrix of 4-inch diamond stitch pattern, which encapsulates the glass fibers.

Composite Material:
Fabricated to include a nominal 6-inch wide barrier overlap tab extending beyond the quilted fiberglass to facilitate a leak-tight seal around field joints.

PART 3 EXECUTION

EXAMINATION

Test ductwork for design pressure prior to applying insulation materials.

Verify that surfaces are clean, foreign material removed, and dry.

INSTALLATION

Install in accordance with manufacturer's instructions.

Install in accordance with NAIMA National Insulation Standards.

Insulated Ducts Conveying Air Below Ambient Temperature:
Provide insulation with vapor barrier jackets.
Finish with tape and vapor barrier jacket.
Continue insulation through walls, sleeves, hangers, and other duct penetrations.
Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

Insulated Ducts Conveying Air Above Ambient Temperature:
Provide insulation with vapor barrier jackets.
Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

Ducts Exposed in Mechanical Equipment Rooms: Finish with canvas jacket sized for finish painting.

Exterior Applications: Provide insulation with vapor barrier jacket. Cover with caulked aluminum jacket with seams located on bottom side of horizontal duct section.

Slope exterior ductwork to shed water.

External Blanket Insulation Application:
Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
Joints and seams lapped a minimum of 3 inches.
Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

Duct and Plenum Liner Application:
Adhere insulation with adhesive for 100 percent coverage.
Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
Seal and smooth joints. Seal and coat transverse joints.
Seal liner surface penetrations with adhesive.
Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

Existing Insulation:
Repair existing insulation damaged during construction.
Make neat connections where new and existing insulation meet.
Where existing piping, ductwork, or equipment is removed, cover existing surfaces neatly to match existing.
Where existing insulation is damaged or missing, notify the Architect prior to performing the work.

SCHEDULES

Supply Ducts:
Medium Pressure:
Concealed locations:
Duct Insulation, Glass Fiber: 1-1/2 inches thick.
Low Pressure:
Within 15 feet of fan:
Duct Insulation, Glass Fiber: 1-1/2 inches thick.
Duct Insulation, Glass Fiber: 1-1/2 inches thick.
Concealed locations:
Duct Insulation, Glass Fiber: 1-1/2 inches thick.
Downstream of terminal units:
Duct Insulation, Glass Fiber: 1-1/2 inches thick.

Return Ducts:
Within 15 feet of fan:
Duct Liner, Glass Fiber: 1-1/2 inches thick.
Duct Liner, Glass Fiber: 1 inches thick.

Exhaust Ducts:
Within 15 feet of fan:
Duct Liner, Glass Fiber: 1 inches thick.
Within 10 feet downstream of grilles serving restrooms:
Duct Liner, Glass Fiber: 1 inches thick.

Transfer Ducts: Duct Liner, Glass Fiber: 1 inches thick.

Acoustical Wrap:
Terminal Units with maximum air volumes exceeding 2,000 cfm.
Where indicated on drawings.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Glass fiber, rigid.

Flexible elastomeric cellular.

Jacketing and accessories.

Accessories.

RELATED REQUIREMENTS

Section 23 21 13 - Hydronic Piping.

Section 23 23 00 - Refrigerant Piping.

REFERENCE STANDARDS

ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces.

ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC for submittal procedures.

Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

QUALITY ASSURANCE

Insulating products containing pentabrominated, octabrominated, and decabrominated diphenyl ethers are prohibited. Where products within this specification contain these banned substances, provide complying products from approved manufacturers with equal performance characteristics.

Insulation and accessories providing nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin are prohibited.

Insulation and accessories containing asbestos are prohibited.

Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

Applicator Qualifications: Company specializing in performing the type of work specified in this section and approved by manufacturer.

DELIVERY, STORAGE, AND HANDLING

Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

FIELD CONDITIONS

Maintain ambient conditions during and after installation as required by manufacturers of each product.

Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

REGULATORY REQUIREMENTS

Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50 for insulation installed indoors and 75/150 for insulation installed outdoors, maximum, when tested in accordance with ASTM E84 or UL 723.

GLASS FIBER, RIGID

Manufacturers:
Johns Manville Corporation.
Knauf Insulation.
Owens Corning Corporation.

Insulation: ASTM C547and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
'K' Value: ASTM C177, 0.23 at 75 degrees F BTU-IN/HR-SF-deg F.
Maximum Service Temperature: 650 degrees F.
Maximum Moisture Absorption: 0.2 percent by volume.

Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

Vapor Barrier Lap Adhesive: Compatible with insulation.

Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

Fibrous Glass Fabric:
Cloth: Untreated; 9 oz/sq yd weight.
Blanket: 1.0 pcf density.
Weave: 5 by 5.

Indoor Vapor Barrier Finish:
Cloth: Untreated; 9 oz/sq yd weight.
Vinyl emulsion type acrylic, compatible with insulation, black color.

Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

Insulating Cement: ASTM C449.

FLEXIBLE ELASTOMERIC CELLULAR INSULATION

Manufacturers:
Armacell LLC.
K-Flex USA LLC.

Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1 with fitting covers and paintable surface.
Minimum Service Temperature: Minus 40 degrees F.
Maximum Service Temperature: 180 degrees F.
Connection: Waterproof vapor barrier adhesive.

Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

JACKETING AND ACCESSORIES

Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.
Lagging Adhesive: Compatible with insulation.

Aluminum Jacket:
Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
Thickness: 0.016 inch sheet.
Finish: Embossed.
Joining: Longitudinal slip joints and 2 inch laps.
Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

ACCESSORIES

General Requirements:
Provide required accessories in accordance with and subject to the recommendations of the insulation manufacturer.
Furnish compatible materials which do not contribute to corrosion, soften, or otherwise attack surfaces to which applied, in either the wet or dry state.
Comply with ASTM C795 requirements for materials to be used on stainless steel surfaces.
Supply materials that are asbestos free.

Corrosion Inhibitors:
Corrosion Control Gel:
Corrosion Protection: Comply with ASTM B117 and ASTM D610.

PART 3 EXECUTION

EXAMINATION

Verify that surfaces are clean and dry, with foreign material removed.

INSTALLATION

Install in accordance with manufacturer's instructions.

Install in accordance with NAIMA National Insulation Standards.

Exposed Piping: Locate insulation and cover seams in least visible locations.

Joints: Coat both sides of complete joining area with applicable adhesive.
Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except foam plastic, seal with closure system or 3-inch wide tape.
Butt Joints: Butt lightly together and, except for foam plastic, seal with 3-inch wide tape or butt straps.
Multiple Layered Insulation: Joints staggered.

Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.

Voids:
Fill voids, chipped corners and other openings with insulating cement or material compatible with insulating material.

Insulated Pipes Conveying Fluids Below Ambient Temperature:
Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

Unions and flanges need not be insulated on the following systems:
High, medium, and low pressure steam, inside building, 2-inch and smaller.
Condensate, pumped condensate, feed water, inside building.

The following piping is not insulated:
Refrigerant relief valve discharge.
Condenser water, inside building, except where used for water side economizer.
Steam safety valve discharge higher than 8-feet above floor.

Steam vents from condensate, higher than 8-feet above floor pumps, deaerators, etc.
Steam traps.

Glass fiber insulated pipes conveying fluids below 65 degrees F:
Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

Glass fiber insulated pipes conveying fluids above 65 degrees F:
Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

Inserts and Shields:
Application: Piping 1/2 inches diameter or larger.
Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
Insert location: Between support shield and piping and under the finish jacket.
Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 84 00.

Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation.

Buried Piping: Provide factory-fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil, 0.001 inch thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Bed heat tape into heat transfer cement with insulation over heat tape and cement. Size large enough to enclose pipe and heat tracer.

SCHEDULE

Heating Systems:
Heating Water Supply and Return: Glass Fiber.
Pipe size less than 1-1/2 inches: 1 inch thick.
Pipe size greater than or equal to 1-1/2 inches: 1-1/2 inches thick.

Cooling Systems:
Chilled Water: Glass Fiber.
Pipe size less than 1-1/2 inches: 1/2 inch thick.
Pipe size greater than or equal to 1-1/2 inches: 1 inch thick.
Cold Condensate Drains: Flexible Elastomeric Cellular.
1/2 inch thick.
Refrigerant Suction: Flexible Elastomeric Cellular.
Pipe size less than 1 inch: 1/2 inch thick (CA Residential applications 3/4 inch thick).
Pipe size greater than or equal to 1 inch: 1 inch thick.
Refrigerant Hot Gas: Flexible Elastomeric Cellular.
Pipe size less than 1 inch: 1/2 inch thick.

Pipe size greater than or equal to 1 inch: 1 inch thick.

END OF SECTION

GENERAL

SECTION INCLUDES

General requirements that apply to implementation of commissioning of HVAC systems and components. It will assist operating staff training and familiarization with new systems. It will serve as a tool to reduce post-occupancy critical systems operational difficulty or failure. It will, also, be used to develop test protocol and record the associated test data in an effort to advance the building systems from a state of substantial completion to operation.

All mechanical systems in the project shall perform in accordance with the design intent and the Owner's operational needs.

Commissioning Process Overview, applying to the HVAC systems and HVAC commissioning team members, can be found in specifications section 019113, General Commissioning Requirements.

Systems to be commissioned

HVAC and mechanical system and all integral equipment controls. All HVAC systems shall be commissioned, including, but not limited to:

- Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems (mechanical and passive)
- Associated Building Automation System (BAS)

RELATED SECTIONS

Commissioning requirements and related issues are given in the following Sections of the Specifications.

Division 01 Section "General Requirements", Closeout Procedures: Lists some tasks required for substantial completion and final acceptance.

Division 01 Section "General Requirements", Execution and Closeout Requirements: Lists some tasks required for substantial completion, final acceptance, and training.

Division 01 Section "General Requirements", Closeout Submittals: Lists some tasks required for O&M requirements.

Division 01 Section "General Requirements", General Commissioning Requirements: Alerts Trade Subcontractor to commissioning in other sections.

RESPONSIBILITIES

Overview

The responsibilities of the HVAC commissioning team members in the commissioning process are summarized in specifications section 019113, General Commissioning Requirements.

SUBMITTALS

Other Equipment and System Information

When not included with the standard submittals, the Trade Subcontractors shall provide to the Commissioning Provider requested shop drawings, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures and control drawings. In addition, the manufacturer installation and checkout materials that are shipped inside the equipment and the field checkout forms to be used by the factory or field technicians shall be submitted to the Commissioning Provider. This documentation may be required prior to the normal O&M manual submittals.

All equipment and system documentation requested by the Commissioning Provider shall be included by the Trade Subcontractors later in the O&M manuals.

The Trade Subcontractors shall submit startup forms and procedures. Startup forms (all commissioning divisions), satisfactory to the Commissioning Provider, TAB reports, satisfactory to the Commissioning Provider, Controls point to point device checkout

If manufacturer startup forms are unavailable, Trade Subcontractors are responsible to document baseline operation of their equipment including but not limited to:

- Operational electrical data
- Seasonal operational mechanical performance data
- Photos of installation conditions
- Deficiencies found and resolved during startup

QUALITY ASSURANCE

Test Equipment

All standard testing equipment required for the Trade Subcontractors to perform installation, start-up and initial checkout and required functional testing shall be provided by the Trade Subcontractors.

Special tools and instruments, only available from vendor, specific to a piece of equipment, required for testing equipment according to these Contract Documents shall be provided.

Instrumentation will be provided by the Subcontractor. Instruments used for measurements shall be accurate. Calibration histories for each instrument shall be available for examination. Calibration and maintenance of instruments shall be in accordance with the requirements of NEBB or AABC Standards.

Application of instruments and accuracy of measurements shall be in accordance with NEBB or AABC Standards.

The Trade Subcontractors shall provide datalogging equipment for setting up and testing of equipment required to perform specified electrical equipment testing.

Datalogging equipment required for testing equipment in support areas shall be provided and used by the Commissioning Provider.

COORDINATION

Commissioning Team

The members of the commissioning team consist of the Commissioning Provider, the Owner/Owner Representative, the GC, the Architect and Design Engineers, the mechanical contractor, the electrical contractor, the plumbing contractor, the testing adjusting and balancing contractor, the controls contractor, any other installing subcontractors or suppliers of commissioned equipment or systems and the facility or plant operator/engineer.

PRODUCTS NOT USED

EXECUTION

MEETINGS

Kick-off Meeting

The Commissioning Provider will schedule, plan and conduct a commissioning kick-off meeting with the entire commissioning team in attendance, including the controls, electrical, plumbing, mechanical, adjusting and balancing and other appropriate Trade Subcontractors and the facility operator or Owner Representative in attendance. Prior to this meeting, the commissioning plan will be distributed to all members. The commissioning plan, the overall commissioning process and general responsibilities of each team member, reporting and communication protocols and next steps will be discussed. Meeting minutes will be distributed to all parties by the Commissioning Provider.

Miscellaneous Meetings

Deficiencies identified through the commissioning process shall be discussed, as needed, in portions of regular construction meetings. Meetings dedicated to deficiencies or commissioning: status, coordination and planning shall also be conducted, if needed. The Commissioning Provider will plan, conduct and take minutes at commissioning meetings. When practical, commissioning meetings will be an appendage to regular construction meetings. All commissioning meetings shall be attended by the GC, the mechanical and the controls subcontractor. Selected meetings shall require the attendance of the electrical, plumbing, fire alarm, TAB or other trades of commissioned systems.

Controls Integration Meeting

The Commissioning Provider coordinates the meeting to go over the control drawings, sequences of operation included in the controls submittal. This meeting is held prior to the approval of the controls submittal. The intent is to clarify control related issues for the controls contractor, mechanical, fire alarm, plumbing and electrical contractor, facility staff and Commissioning Provider prior to startup, testing and balancing and functional testing.

The controls contractor shall attend the meeting. The mechanical, electrical and general contractor shall attend when issues regarding equipment they are responsible for are discussed. The control technicians attending the meetings must be the same technicians that are/will install and program the DDC system.

Primary issues discussed and clarified are:

- Control drawing content
- Point database (points (monitored points, software points, naming conventions, alarms, report format)
- Sequences of operation and setpoints
- Interlocks to packaged controls and other systems
- Operator workstation graphics
- Field sensor and panel locations

The Commissioning Provider takes minutes at these meetings.

COMMISSIONING CHECKLISTS, START-UP, AND INITIAL CHECKOUT

Commissioning Checklists

The Commissioning Provider develops and completes the commissioning checklists and procedures for commissioned equipment and systems.

Execute pre-functional system checks using the Commissioning Provider's created forms on the web based commissioning software PlanRadar (or project Cx app).

Calibrations

The construction checklists will contain requirements for calibrations when applicable. The Trade Subcontractors is responsible to calibrate all field-installed sensors and actuators using checkout documentation methods approved by the Commissioning Provider.

Manufacturer Installation and Startup Procedures

A start-up plan shall be developed and submitted by the installing Subcontractor. Start-up plan to include the following:

- Flushing and cleaning of pipe.
- Chemical treatment.
- Cleaning of Filters, strainers, and screens.
- Balancing of system, setting valve/damper positions.
- Manufacturer’s tests.
- Equipment electrical tests.
- Piping pressure tests.
- Any necessary tie-ins with building safety systems.

The Trade Subcontractors shall complete the pre-start procedures in the manufacturer startup forms prior to starting equipment, including but not limited to verification of completion of wiring, safeties, lubrication, drive rotation and proper electrical test readings. Startup shall be conducted under supervision of responsible manufacturer representatives for major pieces of equipment. The GC shall notify the Commissioning Provider at

least 5 days in advance of any equipment start-up, providing the Commissioning Provider a copy of the start-up plan at that time.

The Commissioning Provider shall observe startup and checkout of selected systems.

The Trade Subcontractors and manufacturer representatives shall execute start-up and provide the Commissioning Provider with a signed and dated copy of the completed start-up documentation. The Trade Subcontractors shall clearly note any items that have not been completed and the plan for their completion.

The Trade Subcontractors shall operate each commissioned device or system to the full extent of its capability, from minimum to maximum, under automatic and manual control and verify that the equipment, system and assembly is functioning according to the specifications, manufacturer recommendations and good operating practice.

The manufacturer startup reports and procedures for a given system shall be successfully completed and submitted prior to testing, adjusting and balancing of the equipment.

The Commissioning Provider will review startup documentation and identify incomplete areas.

The Trade Subcontractors shall correct all areas that are deficient or incomplete in the startup documentation in a timely manner.

Designated systems requiring test and balance work shall have this activity commence after systems have successfully completed start-up. System and equipment deficiencies observed during this activity is to be noted and corrected.

FUNCTIONAL TESTING

Functional tests for a given system shall not be conducted until they are fully operational under normal and reliable control with control calibrations, programming and control system graphics complete and checked out and the Trade Subcontractors have submitted completed, applicable startup reports, satisfactory to the Commissioning Provider.

Objectives and Scope

The objective of testing is to demonstrate that each system is operating according to the documented Contract Documents. During the functional testing process, areas of deficient performance are identified and corrected.

In general, functional testing shall include testing each sequence in the sequence of operations, and other significant modes; including, but not limited to startup, shutdown, unoccupied and manual modes, modulation up and down the unit's range of capacity, alarms, component staging and backup upon failure, interlocks with other equipment, and sensor and actuator calibrations. Interlocks and interactions between systems shall be tested. Larger equipment shall be individually tested. Units or systems that are numerous (many smaller rooftop packaged units, air terminal units, exhaust fans, windows, etc.) may have an appropriate sampling strategy applied. Heating equipment must be tested appropriately during winter and air conditioning equipment must be tested appropriately during summer to demonstrate performance under near-design conditions.

Development of Functional and Performance Test Procedures

Test procedures and documentation forms are not finalized until after equipment and control system submittals and shop drawings are approved.

The Commissioning Provider writing the test procedures obtains needed documentation which generally includes equipment Specifications, testing requirements, O&M manuals, approved submittals and shop drawings, start-up instructions, sequences of operation, and mechanical, electrical and control drawings and writes detailed step-by-step testing procedures to comply with the testing requirements.

DEFICIENCIES AND NON-CONFORMANCE

Deficiency Management

The Commissioning Provider will record the results of document reviews, field observations, tests conducted or reviewed and trend logs or monitoring. All deficiencies will be recorded on a Deficiency Log kept by the Commissioning Provider. The Deficiency Log will be kept updated by the Commissioning Provider.

Participate and respond to commissioning related issues by using the Commissioning Provider's web based commissioning software PlanRadar (or project Cx app).

A current copy of the Deficiency Log will be provided to the GC and Owner/Owner Representative on a regular basis, as requested. New deficiencies will be identified.

Items that are incomplete or are requiring Designer input will be sent to the Designer and Owner/Owner Representative by the Commissioning Provider via appropriate channels.

When completion of a deficiency has been identified by the Commissioning Provider as holding up or is likely to delay any commissioning process, particularly functional testing, the GC, shall be required to notify the Commissioning Provider providing the planned actions and an expected date of completion. The GC shall notify the Commissioning Provider listing the actions taken to resolve the issue. It is not the responsibility of the Commissioning Provider to obtain this status information through meeting attendance, asking questions or field observation.

The Commissioning Provider documents resolutions in the Deficiency Log and schedules retesting and back-checking as needed.

Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Provider will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so.

The time for the Commissioning Provider to direct, document and evaluate any retesting required because a specific construction checklist or start-up test item, reported to have been successfully completed, but determined during testing to be faulty, will be charged to the GC.

The GC shall reimburse the Commissioning Provider for costs when a scheduled test cannot be completed due to:

Failure of the GC to schedule the test with all parties required to perform the test or with regulatory authorities required to witness the test.

Failure of the GC to provide required notice for tests that have been cancelled or rescheduled.

Failure of the GC or Trade Subcontractors to have in place test equipment, support equipment, instrumentation, permits, or other ancillary equipment or systems required for successful execution of the test.

Failure of the Trade Subcontractors to complete pre-start or start-up procedures or other work required as a prerequisite for execution of the test.

The GC shall respond in writing to the Commissioning Provider at least as often as commissioning meetings are being scheduled concerning the status of each outstanding deficiency identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

Approval and Acceptance

The Commissioning Provider will note each satisfactorily demonstrated function on the test form. Functional testing or acceptance of a system is indicated after all testing and monitoring is complete and there are no outstanding deficiencies for that equipment or system in the Commissioning Provider’s Deficiency Log.

DEFERRED TESTING

Unforeseen Deferred Tests

If any functional test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of functional testing may be delayed.

ADDITIONAL DOCUMENTATION

Documentation required of the Trade Subcontractors shall consist of the following:

- Submitted completed documented, equipment startup reports, satisfactory to the Commissioning Provider
- Submitted completed documented, applicable TAB reports, satisfactory to the Commissioning Provider
- Submitted completed documented, division 23 controls point to point device checkout noting that all controlled points and devices are functional, calibrated and confirmed by the controls trade subcontractor pulled into the network
- Record of deficiencies and incomplete items for tests they are responsible to document.
- Training record (see Division 01 section for contractual training requirements).

TRAINING FACILITY PERSONNEL

The Trade Subcontractors are responsible to provide training for facility personnel per the Contract Documents.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Control panels.

Control Valves:
Ball valves with factory-mounted actuators.
Globe valves with factory-mounted actuators.

Control Valve Operators:
Electronic valve actuators.

VAV Operators.

Wall-, Surface-, and Duct-Mounted Sensors:
Temperature sensors.
Static air pressure sensors.
Carbon monoxide sensors.
Carbon dioxide sensors.
Refrigerant detectors.

Thermostats:
Electric thermostats.
Electric high/low limit duct thermostats.

REFERENCE STANDARDS

AMCA 500-D - Laboratory Methods of Testing Dampers for Rating.

ANSI/FCI 70-2 - Control Valve Seat Leakage.

IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code).

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

UL 2075 - Standard for Gas and Vapor Detectors and Sensors.

ADMINISTRATIVE REQUIREMENTS

Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

SUBMITTALS

Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

Shop Drawings:
Prepare in AutoCAD format, include the following:
Operating data
System drawings
Instrumentation and control diagrams
List of connected data points, including DDC panels to which they are connected, and input device (sensor, etc.)
Wiring diagrams
Details of connections to power sources, including grounding
Details of surge protection device installations
Written, detailed operational description of sequences
System graphics
Schedule of valves, include the following:
Size
Flow
Pressure drop
Operator type

Schedule of automatic dampers, include the following:
Arrangement
Velocities
Static pressure drop
Operator type

Design Data: Provide design data for sizing and selection of compressor.

Manufacturer's Instructions: Provide for all manufactured components.

Designer's qualification statement.

Manufacturer's qualification statement.

Installer's qualification statement.

Operation and Maintenance Manuals:

Project Record Documents: Record actual location of control components, including panels, thermostats, and sensors.

Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

Valve schedule indicating flow, pressure drop, CVs, and actuator type.

Damper schedule indicating flow, pressure drop, CVs, and actuator type.

Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
See Section 01 60 00 - Product Requirements for additional provisions.
Extra Thermostats and Other Exposed Sensors: One of each type.

QUALITY ASSURANCE

Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State in which the Project is located.

Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

Installer Qualifications: Company specializing in performing the work of this section documented experience approved by manufacturer.

ACCEPTANCE TESTING AND TRAINING

Site Testing:
General: Provide personnel, equipment, instrumentation, and supplies necessary to perform testing.
Owner or Owner's representative will witness and sign off on acceptance testing.
Acceptance Test: Demonstrate compliance of completed control system with contract documents. Using approved test plan, physical and functional requirements of project demonstrated.

PART 2 PRODUCTS

EQUIPMENT - GENERAL

Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

CONTROL PANELS

Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

NEMA 250, general purpose utility enclosures with enameled finished face panel.

Provide common keying for all panels.

CONTROL VALVES

Ball Valves with Factory-Mounted Actuators:
Service: Use for brine (30 percent glycol), chilled water, or hot water.

Flow Characteristic: Include 2-way, 3-way diverting, 3-way mixing, and 6-way (with pressure relief in closed position) operation configured to fail as indicated on drawings.
Replacements in Kind: Provide pressure-independent type.
Rangeability: 500 to 1.
ANSI Rating: Class 150.
Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
Body Size:
Under 2-1/2 inches:
Connection: Union sweat.
Materials:
Body: Brass.
Flanges: Ductile iron.
Ball: Chrome-plated brass.
Stem: Nickel-plated brass.
Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
Stem Seal: EPDM O-Rings.
Flow Control Disk: Thermoplastic synthetic-resin.
Service Temperature:
Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.
Ambient Side: From minus 4 to 122 degrees F.
Actuator Requirements:
Assembly: Factory-mounted.
Input: 4 to 20 mA configured as indicated on drawings.
Accessories: Provide with valve position indicator and manual override.

Globe Valves with Factory-Mounted Actuators:
Up to 2 inches: Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends with backseating capacity repackable under pressure.
Over 2 inches: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.
Hydronic Systems:
Rate for service pressure of 125 psig at 250 degrees F.
Replaceable plugs and seats of stainless steel.
Size for 5 psig maximum pressure drop at design flow rate.
Two-way valves: Equal percentage characteristics.
Three-way valves: Linear characteristics.

CONTROL VALVE OPERATORS

Electronic Valve Actuators:
Provide valve spring return to normal position as indicated on freeze, fire, or temperature protection.
Select operator for full shut-off at maximum pump differential pressure.
Brushless DC motor with enclosed gear train, protected from overload at all angles of rotation.
Position indicator.
Power: 24 VDC or 24 VAC.
External adjustable stops to limit the travel in either direction.
Modulating: Accept 0-10 VDC or 2-10 VDC or 4-20 mA input signal.
Clamp position feedback signal of 2-10 VDC, independent of the input signal, and may be used to parallel other actuators and provide true position indication.

VAV OPERATORS

Brushless DC motor with enclosed gear train, protected from overload at all angles of rotation.

Position indicator.

Power: 24 VDC or 24 VAC.

External adjustable stops to limit the travel in either direction.

Modulating: Accept 0-10 VDC or 2-10 VDC or 4-20 mA input signal.

Clamp position feedback signal of 2-10 VDC, independent of the input signal, and may be used to parallel other actuators and provide true position indication.

Proportional control: floating point, zero our floating point control daily 4 - 20 mA range of control signals.

Furnished by the controls manufacturer and factory installed and tested by the terminal unit manufacturer.

WALL-, SURFACE-, AND DUCT-MOUNT SENSORS

Temperature Sensors:
Use RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.
Temperature Sensing Device: Compatible with project DDC controllers.
Performance Characteristics:
RTD:
Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.
All Other Accuracy: Plus/minus 0.75 degrees F minimum.
Range: Minus 40 degrees F through 220 degrees F minimum.
Temperature Transmitter:
Accuracy: 0.10 degree F minimum or plus/minus 0.20 percent of span.
Output: 4 to 20 mA.
Sensing Range:
Provide limited range sensors if required to sense the range expected for a respective point.
Use RTD type sensors for extended ranges beyond minus 30 to 230 degrees F.
Use temperature transmitters in conjunction with RTDs when RTDs are incompatible with DDC controller direct temperature input.
Wire Resistance:
Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F or use temperature transmitter when offset is greater than 1.0 degree F due to wire resistance.
Compensate for wire resistance in software input definition when feature is available in the DDC controller.
Room Sensors: NEMA 250 Type 1 with locking cover.
Outside Air Sensors: NEMA 250 Type 4X watertight inlet fitting shielded from direct rays of the sun.
Immersion Temperature Sensors: Indoor locations: NEMA 250 Type 1. Outdoor locations NEMA 250 Type 4X. Sensor encased in a corrosion-resistant probe with a junction box service entry body.
Ceiling and Recessed Mount Temperature Sensors: NEMA 250 Type 1. Ceiling-mounted sensor in a low-profile housing.
Room Security Sensors: Stainless steel cover plate with insulated back and security screws.
Room Temperature Sensors:
Construct for surface or wall box mounting.
Provide the following:
Setpoint reset slide switch with an adjustable temperature range.
Individual heating/cooling setpoint slide switches.
Momentary override request push button for activation of after-hours operation.
Analog thermometer.
Room Temperature Sensors with Integral Digital Display:
Construct for surface or wall box.
Provide a four button keypad with the following capabilities:
Indication of space and outdoor temperatures.
Setpoint adjustment to accommodate room setpoint, DDC Input/Output Points List, and Sequence of Operation.
Display and control fan operation status.
Manual occupancy override and indication of occupancy status.
Controller mode status.
Password enabled setpoint and override modes.

Temperature Averaging Elements:
Use on duct sensors for ductwork 10 sq ft or larger.
Use averaging elements where prone to stratification with sensor length 8 ft or 16 ft.
Provide for all mixed air and heating coil discharge sensors regardless of duct size.
Insertion Elements:
Use in ducts not affected by temperature stratification or smaller than 11 sq inches.
Provide dry type, insertion elements for liquids, installed in immersion wells, with minimum insertion length of 2.5 inches.

Static-Air Pressure Sensors:
Unidirectional with ranges not exceeding 150 percent of maximum expected input.
Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
Accuracy: One percent of full scale with repeatability 0.3 percent.
Output: 0 to 5 vdc with power at 12 to 28 vdc.

Carbon Monoxide Sensors:
Gas sensing module that holds fixed or replaceable carbon monoxide gas-sensor cartridge.
Form Factor: IEC 60529, IP20 enclosure, single-gang electrical box mounted.
Electromechanical sensor with 0 to 500 ppm measurement range.
Accuracy: Plus/minus Five percent of range with 1 ppm resolution.
Hardwired Output: Three-wire, 4 to 20 mA, loop powered.
Alarm: Auxiliary dry contact relay driven by setpoint adjustable between 25 to 180 ppm.

Carbon Dioxide Sensors, Duct and Wall:
General: Provide nondispersive infrared (NDIR), diffusion sampling CO2 sensors with integral transducers and linear output.
Air Temperature: Range of 32 to 122 degrees F.
Relative Humidity: Range of 0 to 95 percent (noncondensing).
Power Input: Class 2; 12 to 30VDC or 24VAC 50/60 Hz; 100mA max.
Calibration Characteristics:
Automatically compensating algorithm for sensor drift due to sensor degradation.
Maximum Drift: 2 percent.
User calibratable with a minimum calibration interval of 5 years.
Construction:
Sensor Chamber: Noncorrosive material for neutral effect on carbon dioxide sample.
Provide duct mounted sensors with duct probe designed to protect sensing element from dust accumulation and mechanical damage.
Housing: High impact plastic.

Emergency Stop Switch: Red, mushroom type, pull out to operate.

Piping Pressure Transmitter:
Operating range 0 to 50 psig, linear to DDC.
Provide threadolet for mounting to pipe installed by others.
Accuracy ±1 percent of range.

THERMOSTATS

Electric High/Low Limit Duct Thermostats:
Snap acting, single pole, single throw, manual reset switch that trips if temperature sensed across any 12 inches of bulb length is above, equal to, or below setpoint,
Bulb length: Minimum 20 feet.
Provide one thermostat for every 20 sq ft of coil surface.

PIPE-MOUNTED SENSORS AND TRANSMITTERS

PNEUMATIC SIGNAL TRANSDUCERS

ENERGY METERING

DOOR/WINDOW SWITCHES

Magnetic contact switch.
Magnetic type contact switch, flush mount, concealed within window frame.
Switch provides input to Building Management System on status of door/window (open/closed).

CARBON DIOXIDE SENSOR

Infrared sensing carbon dioxide gas monitor.
Detection Range: 0-2000 ppm
Accuracy: +/- 3 percent of measured value
Response Time: 2 minutes
Outputs: 0-10V, 4-20 Ma
Calibration: Self-calibrating, calibration not required
Power Requirement: 24 VAC/VDC ±20 percent, 50-60Hz (half-wave rectified)
Operating Temperature Range: 32 degrees F to 122 degrees F
Operating Humidity Range: 0 percent - 95 percent RH, Non-Condensing
Display: Provide sensor with digital display.

CARBON MONOXIDE DETECTOR

Electrochemical sensing carbon monoxide gas monitor.
Detection Range: 0-250 PPM
Accuracy: +/- 3 percent
Outputs: 4-20 mA, at Contractor's option, a Network Converter may be used
Relay Output Rating: 5A, 30 Vdc or 250 Vac (resistive load)
Power Requirements: 17-27 Vac, 24-38 Vdc, 250Ma
Operating Temperature Range: -4 degrees F to 122 degrees F
Operating Humidity Range: 10 percent -95 percent RH, Non-condensing
Display: Provide sensor with digital display.

GAS DETECTION SYSTEM NETWORK CONVERTER

Power Requirement: 17-27 Vac, 24-38 Vdc, 250Ma
Operating Temperature Range: -4 degrees F to 122 degrees F
Operating Humidity Range: 10 percent - 95 percent RH, Non-Condensing
Communication: Daisy-chain hook-up (RS-485) with VA201T series
Output: Discreet 4-20MA output per each transmitter

NITROGEN DIOXIDE DETECTOR

Catalytic sensing Nitrogen Dioxide gas monitor.
Based on Vulcain VA201T Series.
Detection Range: 0-10 PPM
Accuracy: +/- 3 percent
Outputs: 4-20 mA, at Contractor's option, a Network Converter may be used.
Relay Output Rating: 5A, 30 VDC or 250 VAC (resistive load)
Power Requirements: 17-27 VAC, 24-38 VDC, 250Ma

Operating Temperature Range: -22 degrees F to 122 degrees F (-30 to 50 degrees C)
Operating Humidity Range: 15 percent - 90 percent RH, Non-Condensing
Display: Provide sensor with digital display.

PRODUCTS OF COMBUSTION DETECTORS

Duct smoke detectors are provided under division 28 - Electronic Safety and Security.

PART 3 EXECUTION

EXAMINATION

Verify existing conditions before starting work.

Verify that systems are ready to receive work.

Beginning of installation means installer accepts existing conditions.

Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

Ensure installation of components is complementary to installation of similar components.

Verify electrical metering equipment is connected to the Building Management System (BMS) and/or BMS network and communicating.

INSTALLATION

Install in accordance with manufacturer's instructions.

Room Thermostats and Room Sensors:
Wall Thermostats and Room Sensors with User Adjustment: Mount at height of 42-inches above finished floor.
Wall Thermostats and Room Sensors without User Adjustment: Mount at height of 60 inches above finished floor.
Provide insulating back on thermostats mounted on exterior walls.
Provide one thermostat for each zone of temperature control.
Submit proposed locations for approval prior to preparing control drawings, where not shown or alternate location is proposed.

Carbon Dioxide Sensor:
Mount sensor at 5 feet above finished floor or as indicated on the plans.
Provide sensor quantity as indicated on plans or as required by sensor coverage rating (maximum 20-foot radius).
Alarm above 850 ppm.
Refer to sequence of operations for more information on sensor use.

Carbon Monoxide Detector:
Mount sensors at 5 feet above finished floor as indicated on the plans.
Provide sensor quantity as indicated on plans or as required by sensor coverage rating (maximum 50-foot radius).
Operate system to maintain less than 25 ppm. Alarm if levels exceed 200 ppm for longer than 15 minutes.
Refer to sequence of operations for more information on sensor use.

Nitrogen Dioxide Detector:
Mount sensor at 1-foot below ceiling structure or as indicated on the plans.
Provide sensor quantity as indicated on plans or as required by sensor coverage rating (maximum 50-foot radius).
Operate system to maintain less than 0.75 ppm. Alarm if levels exceed 2 ppm for longer than 15 minutes.
Refer to sequence of operations for more information on sensor use.

Oxygen Detector:

Mount sensor at 5-feet above finished floor or as indicated on the plans.
Provide sensor quantity as indicated on plans or as required by sensor coverage rating (maximum 20-foot radius).
Operate system to maintain 19.5 percent. Alarm if levels exceed 23 percent for longer than 15 minutes.
Refer to sequence of operations for more information on sensor use.

Refrigeration Machinery Room Ventilation System and Refrigerant Vapor Monitor:
Mount sensor at 1-foot above finished floor.
Normal operating condition:
Normal ventilation mode initiates on chiller start-up.
Room sensor modulates fan speed through a VFD. Make-up damper opens.
Refrigerant Vapor Monitors: The refrigerant vapor monitors produces three levels of alarm signals and a failure relay output. In addition to the local alarm at the monitor, the following will also occur:
Refrigerant concentration exceeds 25% of maximum allowed by local codes: Level 1 alarm to DDC.
Refrigerant concentration exceeds 50% of maximum allowed by local codes: Level 2 alarm to DDC.
Refrigerant concentration exceeds 90% of maximum allowed by local codes: Level 3 alarm to DDC.
Refrigerant monitor failure: Failure alarm to DDC.

Airflow Station (Duct-Mounted):
Install grid array in ductwork according to manufacturer's recommendations.
Provide gasket between frame and duct.

Airflow Station (Fan Inlet): Install in fan inlet bell in accordance with the manufacturer's instructions.

Automatic Air Flow Station Measuring Damper: Install in accordance with the manufacturer's recommendations.

Steam, Condensate, and Water Flow Meters: Install devices in accordance with the manufacturer's recommendations, with sufficient upstream and downstream straight pipe to obtain accurate readings.

Leak Detection System:
Refer to Drawings for required locations and extent of area to be covered.
Install in accordance with the manufacturer's instructions.

Window Switch:
Installation of window switches in accordance with window manufacturer's requirements and not to void window warranty.
Provide necessary components for a complete installation.
Coordinate with window manufacturer for factory or field installation of components.
Align magnet with proximity switch.
Coordinate installation with Architect and other trades.

Mount freeze protection thermostats using flanges and element holders.

Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

Provide separable sockets for liquids and flanges for air bulb elements.

Provide thermostats in aspirating boxes in front entrances.

Provide guards on thermostats in entrances.

Provide valves with position indicators and with pilot positioners where sequenced with other controls.

Provide separate steam valves for each bank of coils. Provide two valves in parallel where steam load exceeds 1,500 lb/hr with 1/3 to 2/3 load capacities sequenced with smaller valve opening first.

Provide mixing dampers of parallel blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors. Provide separate minimum outside air damper section adjacent to return air dampers with separate damper motor.

Provide isolation (two-position) dampers of parallel blade construction.

Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

Mount control panels adjacent to associated equipment on vibration free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

Provide conduit and electrical wiring in accordance with Section 26 05 83. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

MAINTENANCE

See Section 01 70 00 - Execution and Closeout Requirements for additional requirements relating to maintenance service.

Provide a separate maintenance contract for specified maintenance service.

Provide service and maintenance of control system for one year from Date of Substantial Completion.

Provide complete service of controls systems, including call backs, and submit written report of each service call.

In addition to normal service calls, make minimum of ____ complete normal inspections of approximately ____ hours duration to inspect, calibrate, and adjust controls.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

System description.

Operator interface.

Controllers.

Input/Output interface.

Power supplies and line filtering.

Uninterruptible power supply (UPS).

Local area network (LAN).

System software.

Controller software.

HVAC control programs.

Energy management system.

RELATED REQUIREMENTS

Section 23 09 13 - Instrumentation and Control Devices for HVAC.

Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

Section 28 46 00 - Fire Detection and Alarm.

REFERENCE STANDARDS

ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks.

ASHRAE Std 147 - Reducing the Release of Halogenated Refrigerants from Refrigerating and Air-Conditioning Equipment and Systems.

MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests.

NFPA 70 - National Electrical Code.

UL (DIR) - Online Certifications Directory.

ADMINISTRATIVE REQUIREMENTS

Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC for submittal procedures.

Product Data: Provide data for each system component and software module.

Shop Drawings:
Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
List connected data points, including connected control unit and input device.
Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
Indicate description and sequence of operation of operating, user, and application software.

Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.

Designer's Qualification Statement.

Manufacturer's Qualification Statement.

Installer's Qualification Statement.

Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
Revise shop drawings to reflect actual installation and operating sequences.
Include submittals data in final "Record Documents" form.

Software Data:
Submittals consist of complete descriptions of system, command, and applications software as specified.
Include description of control sequences which are software based using detailed logic flow diagrams.
Diagrams indicate logic used to achieve control sequence of calculation specified, and show relationship between control sequence and application software packages specified.

Testing Submittals:
Provide test plan and test procedures for approval.
Explain in detail, step-by-step actions and expected results to demonstrate compliance with the requirements of this specification and methods for simulating necessary conditions of operation to demonstrate performance of the system.
Test plan and test procedures demonstrate capability of system to monitor and control equipment and to accomplish control and monitoring specified.

Operation and Maintenance Data:
Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
Include keyboard illustrations and step-by-step procedures indexed for each operator function.
Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
Hardware Manual: Furnish a hardware manual describing equipment provided, including:
General description and specifications.
Installation and checkout procedures.
Equipment electrical schematics and layout drawings.
System schematics and I-O wiring lists.
Alignment and calibration procedures.
Software Manual:
Describe furnished software.
Oriented to programmers and describe calling requirements, data exchange requirements, data file requirements and other information necessary to enable proper integration, loading, testing, and program execution.
Provide one software manual per Operator’s Terminal.
Operator’s Manual: Provide procedures and instructions for operation of the system, including:
DDC Panels and Peripherals
System start-up and shutdown procedures.
Use of system, command, and applications software.
Alarm Presentation
Recovery and Restart Procedures
Report Generation
System Schematic Graphics
Provide one Operator’s Manual per Operator’s Terminal
Maintenance Manual: Provide descriptions of maintenance for equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
Acceptance Test Forms: Maintenance manual includes copies of signed-off acceptance test forms.

Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

ACCEPTANCE TESTING AND TRAINING

Site Testing:
General: Provide personnel, equipment, instrumentation, and supplies necessary to perform testing.
Owner or Owner’s representative will witness and sign off on acceptance testing.
Acceptance Test: Demonstrate compliance of completed control system with contract documents. Using approved test plan, physical and functional requirements of project demonstrated.

Training:
General:
Conduct training courses for designated personnel in operation and maintenance of system.
Oriented to specific system being installed under this contract.
Provide trainee with two additional copies provided for archival at project site.
Manuals include detailed description of the subject matter for each lesson.
Provide copies of audiovisuals to Owner.
Training day is defined as 8 hours of classroom instruction, including two, 15-minute breaks and excluding lunch time, Monday through Friday, during normal first shift in effect at training facility.
Notification of any planned training given to the Owner's representative at least 15 days prior to the training.
Operator's Training I:
Teach first course at supplier's facility for period of two consecutive training days.
Upon completion, each student, using appropriate documentation, perform elementary operations with guidance and describe general hardware architecture and functionality of system.
Operator's Training II:
Teach second course at project site for a period of one training day after completion of Contractor's field testing.
Include instruction on specific hardware configuration of installed system and specific instructions for operating the installed system.
Upon completion, each student able to start system, operate the system, recover the system after failure, and describe the specific hardware architecture and operation of system.
Operator's Training III:
Teach third course at project site for period of one training day no later than six months after completion of the acceptance test.
Structure course to address specific topics that students need to discuss and to answer questions concerning operation of system.
Upon completion, students fully proficient in system operation and have no unanswered questions regarding operation of installed system.

QUALITY ASSURANCE

Perform work in accordance with NFPA 70.

Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

Provide work by single company with specialists in the type of work required, so that only one control manufacturer is responsible for control and automation work for project.

Provide coordination with other contractors or subcontractors for work required by other trades for accomplishment of control work.

Demonstrate to Owner that system is operating per the Specifications and final adjustments have been made as approved prior to substantial completion.

System, including components and appurtenances, configured and installed to yield a Mean Time Between Failure (MTBF) of at least 1,000 hours.

WARRANTY

See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

Correct defective Work within a five year period after Substantial Completion.

Provide five year manufacturer's warranty for field programmable micro-processor based units.

PART 2 PRODUCTS

SYSTEM DESCRIPTION

General:
Provide a complete control system, consisting primarily of electronic direct digital control devices.
System consists of modular and distributed microprocessor based control and monitoring units connected together by communications trunks. Capable of global data sharing and communication between controllers.
System architecture distributed and not rely on central processing unit (CPU) for sharing point data between controllers, or for control functions requiring data from other controllers.
Multipurpose controller(s) consisting of CPU, system program, memory, power supply, and input/output drivers which communicated with terminal equipment controllers through a communications network.
Provide operator's interface.
Provide equipment, installation, wiring, and accessories as required but not necessarily specified to accomplish operations as described.

Environmental Conditions:
Rate DDC panels and other field equipment for continuous operation under ambient environmental conditions of 35 degrees F to 120 degrees F dry bulb and 10 percent to 95 percent relative humidity, noncondensing.
Instrumentation and control elements rated for continuous operation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified or normally encountered for the installation.
Install control devices in an enclosure suitable for the installed environment.

System Accuracy and Display:
Space Temperature:
Conditioned Spaces: Within range of 50 degrees F to 85 degrees F ±1 degrees F (display to nearest 0.5 degrees F).
Undonditioned Spaces: Within range of 15 degrees F to 130 degrees F ±1 degrees F (display to nearest 0.5 degrees F).
Duct temperature with a range of 40 degrees F to 140 degrees F ±1 degrees F (display to nearest 0.5 degrees F).
Water Temperature:
Within range of 30 degrees F to 100 degrees F ±1 degrees F (display to nearest 0.5 degrees F).
Within range of 100 degrees F to 300 degrees F ±2 degrees F (display to nearest 0.5 degrees F).
Water temperatures for the purpose of performing BTU calculations using differential temperatures to ±0.5 degrees F using matched sensors (display to nearest 0.5 degrees F).
Pressure with a range for the specific application ±5 percent of range.

OPERATOR INTERFACE

PC Based Work Station:
Resides on high speed network with building controllers.
Connected to server for full access to all system information.

Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.

BACnet protocol to comply with ASHRAE Std 135.

Hardware:
Desktop:
Computer(s) and display(s) to be provided by DDC controls manufacturer.
Quantity: As indicated on the drawings.
Minimum RAM: 512 MB.
Minimum Processing Speed: 2.8 GHz.
Monitor: Minimum 17-inch (nominal) flat screen color monitor, supporting a minimum display resolution of 1280x1024 pixels, with separate controls for color contrast and brightness, and non-reflective screen..
Location(s): As indicated on the drawings.
Network Connection:

Ethernet interface card.
Minimum Speed: _____.
System Printer:
Printer(s) to be provided by DDC controls manufacturer.
Quantity: As indicated on the drawings.
Type: _____.
Resolution: _____.
Minimum Print Speed: _____.
Locations(s): As indicated on the drawings.
Web-Based Access:
Provide a web-based controls interface with at least three user login accounts and password each with the capability of different access privileges that performs data access, operator's commands, alarm notification, requests for reports, file generation, diagnostics, and modifications.
Controls accessible in mechanical room by direct connection from a laptop to a data port.
Provide a temporary computer located on-site in the mechanical room until the commissioning, testing, and balancing has been completed.
Provide a temporary computer located on-site in the mechanical room, with software and capabilities necessary to support commissioning, testing, and balancing and other activities required for project completion.
Graphics: Provide a complete graphics package with the following features:
Provide separate schematic diagram depicting each system. Diagrams to show major components such as fans, dampers, heating and cooling coils, humidifiers, pumps, heat exchangers, chillers, boilers, towers, ductwork, piping, etc., arranged to convey to viewer system configuration and flow of each system.
Provide plot plan, riser plan, and selected floor plans of buildings with the location of each mechanical room and major equipment location indicated.
Provide symbols superimposed on each schematic to indicate each control device including control valves, damper motors, temperature sensors, pressure sensors, etc. Provide real time dynamic displays of the temperature, humidity, pressure, flow rate, run status, alarm status, and etc., adjacent to each control symbol. Arrange CPU to update each displayed analog and digital value minimum of every 15 seconds.
Provide indication of setpoints, with each setpoint value located adjacent to each sensed value.
Provide means to allow the user to easily change or add graphics via computer assisted drawing function utilizing freehand mouse.
Provide means to allow user to transfer repeated system schematics and symbols between graphics without redrawing them. Provide symbol library arranged to store commonly used symbols.
Provide a "telescoping" or "zoom" program to allow use to move from plot plan to mechanical room plan to system graphic to control device display by simply clicking the mouse.
Provide dual function windowing program to allow user to view a split screen and toggle between simultaneous operations.

CONTROLLERS

Building Controllers:
General:
Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
Provide sufficient memory to support controller's operating system, database, and programming requirements.
Share data between networked controllers.
Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
Utilize real-time clock for scheduling.
Continuously check processor status and memory circuits for abnormal operation.
Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
Communication with other network devices to be based on assigned protocol.
Communication:

Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
Perform routing when connected to a network of custom application and application specific controllers.
Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

Custom Application Controller:
General:
Provide sufficient memory to support controller's operating system, database, and programming requirements.
Share data between networked, microprocessor based controllers.
Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
Utilize real-time clock for scheduling.
Continuously check processor status and memory circuits for abnormal operation.
Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
Communication with other network devices to be based on assigned protocol.
Communication:
Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

Application Specific Controllers:
General:
Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
Customized for operation within the confines of equipment served.
Communication with other network devices to be based on assigned protocol.
Communication:
Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

Input/Output Interface:
Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.
All Input/Output Points:
Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
Provide universal type for building and custom application controllers where input or output is software designated as either digital or analog type with appropriate properties.
Digital Inputs:
Allow monitoring of On/Off signals from remote devices.
Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
Sense dry contact closure with power provided only by the controller.
Pulse Accumulation Input Objects: Comply with all requirements of digital input objects and accept up to 10 pulses per second.
Analog Inputs:
Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
Compatible with and field configurable to commonly available sensing devices.
Digital Outputs:
Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
Outputs provided with three position (On/Off/Auto) override switches.
Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.

Analog Outputs:
Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
Drift to not exceed 0.4 percent of range per year.
Tri State Outputs:
Coordinate two digital outputs to control three point, floating type, electronic actuators without feedback.
Limit the use of three point, floating devices to the following zone and terminal unit control applications:
VAV terminal units.
Duct mounted heating coils.
Zone dampers.
Radiation.
Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
System Object Capacity:
System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

POWER SUPPLIES AND LINE FILTERING

Power Supplies:
Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
Limit connected loads to 80 percent of rated capacity.
Match DC power supply to current output and voltage requirements.
Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
Operational Ambient Conditions: 32 to 120 degrees F.
EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD-810 for shock and vibration.
Line voltage units UL recognized and CSA approved.

Power Line Filtering:
Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
Minimum surge protection attributes:
Dielectric strength of 1000 volts minimum.
Response time of 10 nanoseconds or less.
Transverse mode noise attenuation of 65 dB or greater.
Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

UNINTERRUPTIBLE POWER SUPPLY (UPS)

General:
Provide an uninterruptible power supply (UPS) for each DDC field panel.
Fed by 120V AC emergency power circuits.
Floor or wall mountable.

UPS:
Provide MGE Pulsar UPS or pre-bid approved equal.
Products carry UL 1778 listing.
Base sizing on peak current requirements of connected load plus 15 percent factor of safety.
Provide manufacturer's standard three-year comprehensive warranty, including batteries.

LOCAL AREA NETWORK (LAN)

Provide communication between control units over dedicated local area network (LAN).

LAN Capacity: Not less than 60 stations or nodes.

Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.

LAN Data Speed: Minimum 19.2 Kb.

Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.

Transmission Median: Fiber optic or single pair of solid 24 gauge twisted, shielded copper cable.

Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

SYSTEM SOFTWARE

Operating System:
Concurrent, multi-tasking capability.
Common Software Applications Supported: Microsoft Excel.
Acceptable Operating Systems: _____.
System Graphics:
Allow up to 10 graphic screens, simultaneously displayed for comparison and monitoring of system status.
Animation displayed by shifting image files based on object status.
Provide method for operator with password to perform the following:
Move between, change size, and change location of graphic displays.
Modify on-line.
Add, delete, or change dynamic objects consisting of:
Analog and digital values.
Dynamic text.
Static text.
Animation files.
Custom Graphics Generation Package:
Create, modify, and save graphic files and visio format graphics in PCX formats.
HTML graphics to support web browser compatible formats.
Capture or convert graphics from AutoCAD.
Standard HVAC Graphics Library:
HVAC Equipment:
Chillers.
Boilers.
Air Handlers.
Terminal HVAC Units.
Fan Coil Units.
Unit Ventilators.
Ancillary Equipment:
Fans.
Pumps.
Coils.
Valves.
Piping.
Dampers.
Ductwork.
File Format Compatible with Graphics Generation Package Program.

Workstation System Applications:
Automatic System Database Save and Restore Functions:
Current database copy of each Building Controller is automatically stored on hard disk.

Automatic update occurs upon change in any system panel.
In the event of database loss in any system panel, the first workstation to detect the loss automatically restores the database for that panel unless disabled by the operator.
Manual System Database Save and Restore Functions by Operator with Password Clearance:
Save database from any system panel.
Clear a panel database.
Initiate a download of a specified database to any system panel.
Software provided allows system configuration and future changes or additions by operators under proper password protection.
On-line Help:
Context-sensitive system assists operator in operation and editing.
Available for all applications.
Relevant screen data provided for particular screen display.
Additional help available via hypertext.
Security:
Operator log-on requires user name and password to view, edit, add, or delete data.
System security selectable for each operator.
System supervisor sets passwords and security levels for all other operators.
Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable, time period.
All system security data stored in encrypted format.
System Diagnostics:
Operations Automatically Monitored:
Workstations.
Printers.
Modems.
Network connections.
Building management panels.
Controllers.
Device failure is annunciated to the operator.
Alarm Processing:
All system objects are configurable to "alarm in" and "alarm out" of normal state.
Configurable Objects:
Alarm limits.
Alarm limit differentials.
States.
Reactions for each object.
Alarm Messages:
Descriptor: English language.
Recognizable Features:
Source.
Location.
Nature.
Configurable Alarm Reactions by Workstation and Time of Day:
Logging.
Printing.
Starting programs.
Displaying messages.
Dialing out to remote locations.
Paging.
Providing audible annunciation.
Displaying specific system graphics.
Custom Trend Logs:
Definable for any data object in the system including interval, start time, and stop time.

Trend Data:
Sampled and stored on the building controller panel.
Archivable on hard disk.
Retrievable for use in reports, spreadsheets and standard database programs.
Archival on LAN accessible storage media including hard disk, tape, Raid array drive, and virtual cloud environment.
Protected and encrypted format to prevent manipulation, or editing of historical data and event logs.
Alarm and Event Log:
View all system alarms and change of states from any system location.
Events listed chronologically.
Operator with proper security acknowledges and clears alarms.
Alarms not cleared by operator are archived to the workstation hard disk.
Object, Property Status and Control:
Provide a method to view, edit if applicable, the status of any object and property in the system.
Status Available by the Following Methods:
Menu.
Graphics.
Custom Programs.
Reports and Logs:
Reporting Package:
Allows operator to select, modify, or create reports.
Definable as to data content, format, interval, and date.
Archivable to hard disk.
Real-time logs available by type or status such as alarm, lockout, normal, etc.
Stored on hard disk and readily accessible by standard software applications, including spreadsheets and word processing.
Set to be printed on operator command or specific time(s).
Reports:
Standard:
Objects with current values.
Current alarms not locked out.
Disabled and overridden objects, points and SNVTs.
Objects in manual or automatic alarm lockout.
Objects in alarm lockout currently in alarm.
Logs:
Alarm History.
System messages.
System events.
Trends.
Custom:
Daily.
Weekly.
Monthly.
Annual.
Time and date stamped.
Title.
Facility name.
Tenant Override:
Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
Annual report showing override usage on a monthly basis.
Electrical, Fuel, and Weather:
Electrical Meter(s):
Monthly showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.

Annual summary showing monthly electrical consumption and peak demand with time and date stamp for each meter.
Fuel Meter(s):
Monthly showing daily natural gas consumption for each meter.
Annual summary showing monthly consumption for each meter.
Weather:
Monthly showing minimum, maximum, average outdoor air temperature and heating/cooling degree-days for the month.
Daily Operating Condition of Chiller(s) Based on ASHRAE Std 147:
Chilled water inlet and outlet temperature.
Chilled water flow.
Chilled water inlet and outlet pressure.
Evaporator refrigerant pressure and temperature.
Condenser refrigerant pressure and temperature.
Condenser refrigerant pressure and liquid temperature.
Condenser water flow.
Refrigerant levels.
Oil pressure and temperature.
Oil level.
Compressor refrigerant discharge temperature.
Refrigerant suction temperature.
Addition of refrigerant.
Addition of oil.
Vibration levels or observation that vibration is not excessive.
Motor amperes per phase.
Motor volts per phase.
PPM refrigerant monitor level.
Purge exhaust time or discharge count.
Ambient temperature (dry-bulb and wet-bulb).
Date and time logged.

Workstation Applications Editors:
Provide editing software for each system application at PC workstation.
Downloaded application is executed at controller panel.
Full screen editor for each application allows operator to view and change:
Configuration.
Name.
Control parameters.
Set-points.
Scheduling:
Monthly calendar indicates schedules, holidays, and exceptions.
Allows several related objects to be scheduled and copied to other objects or dates.
Start and stop times adjustable from master schedule.
Custom Application Programming:
Create, modify, debug, edit, compile, and download custom application programming during operation and without disruption of all other system applications.
Programming Features:
English oriented language, based on BASIC, FORTRAN, C, or PASCAL syntax allowing for free form programming.
Alternative language graphically based using appropriate function blocks suitable for all required functions and amenable to customizing or compounding.
Insert, add, modify, and delete custom programming code that incorporates word processing features such as cut/paste and find/replace.
Allows the development of independently, executing, program modules designed to enable and disable other modules.

Debugging/simulation capability that displays intermediate values and/or results including syntax/execution error messages.
Support for conditional statements (IF/THEN/ELSE/ELSE-F) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
Support for floating-point arithmetic utilizing plus, minus, divide, times, square root operators; including absolute value; minimum/maximum value from a list of values for mathematical functions.
Language consisting of resettable, predefined, variables representing time of day, day of the week, month of the year, date; and elapsed time in seconds, minutes, hours, and days where the variable values cab be used in IF/THEN comparisons, calculations, programming statement logic, etc.
Language having predefined variables representing status and results of the system software enables, disables, and changes the set points of the controller software.

CONTROLLER SOFTWARE

All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

System Security:
User access secured via user passwords and user names.
Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
User Log On/Log Off attempts are recorded.
Automatic Log Off occurs following the last keystroke after a user defined delay time.

Object or Object Group Scheduling:
Weekly Schedules Based on Separate, Daily Schedules:
Include start, stop, optimal stop, and night economizer.
10 events maximum per schedule.
Start/stop times adjustable for each group object.
Exception Schedules:
Based on any day of the year.
Defined up to one year in advance.
Automatically discarded and replaced with standard schedule for that day of the week upon execution.
Holiday or Special Schedules:
Capability to define up to 99 schedules.
Repeated annually.
Length of each period is operator defined.

Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.

Alarms:
Digital object is set to alarm based on the operator specified state.
Analog object to have high/low alarm limits.
All alarming is capable of being automatically and manually disabled.
Alarm Reporting:
Operator determines action to be taken for alarm event.
Alarms to be routed to appropriate workstation.
Reporting Options:
Start programs.
Print.
Logged.
Custom messaging.
Graphical displays.
Dial out to workstation receivers via system protocol.

Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.

Sequencing: Application software based upon specified sequences of operation.

PID Control Characteristics:

Direct or reverse action.
Anti-windup.
Calculated, time-varying, analog value, positions an output or stages a series of outputs.
User selectable controlled variable, set-point, and PED gains.

Staggered Start Application:
Prevents all controlled equipment from simultaneously restarting after power outage.
Order of equipment startup is user selectable.

Energy Calculations:
Accumulated instantaneous power or flow rates are converted to energy use data.
Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.

Anti-Short Cycling:
All digital output objects protected from short-cycling.
Allows minimum on-time and off-time to be selected.

On-Off Control with Differential:
Algorithm allows digital output to be cycled based on a controlled variable and set-point.
Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.

Run-Time Totalization:
Totalize run-times for all digital input objects.
Provides operator with capability to assign high run-time alarm.

HVAC CONTROL PROGRAMS

General:
Support Inch-pounds and SI (metric) units of measurement.
Identify each HVAC Control system.

Optimal Run Time:
Control start-up and shutdown times of HVAC equipment for both heating and cooling.
Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
Use outside air temperature to determine early shut down with ventilation override.
Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day.
Operator commands:
Define term schedule.
Add/delete fan status point.
Add/delete outside air temperature point.
Add/delete mass temperature point.
Define heating/cooling parameters.
Define mass sensor heating/cooling parameters.
Lock/unlock program.
Request optimal run time control summary.
Request optimal run time mass temperature summary.
Request HVAC point summary.
Request HVAC saving profile summary.
Control Summary:
HVAC Control system begin/end status.
Optimal run time lock/unlock control status.
Heating/cooling mode status.
Optimal run time schedule.
Start/Stop times.

Selected mass temperature point ID.
Optimal run time system normal start times.
Occupancy and vacancy times.
Optimal run time system heating/cooling mode parameters.
Mass temperature summary:
Mass temperature point type and ID.
Desired and current mass temperature values.
Calculated warm-up/cool-down time for each mass temperature.
Heating/cooling season limits.
Break point temperature for cooling mode analysis.
HVAC point summary:
Control system identifier and status.
Point ID and status.
Outside air temperature point ID and status.
Mass temperature point ID and point.
Calculated optimal start and stop times.
Period start.

ENERGY MANAGEMENT SYSTEM

General:
Provide a complete system consisting of metering instruments, communications between components; communications network; data loggers; protocol converters and other appurtenances as required for a complete system.
Provide meters, network controllers, and Ethernet gateways with non-volatile flash memory sufficient to maintain system programming indefinitely.

Data Acquisition Network:
Connect meters to DDC system via TCP/IP communications over Ethernet LAN. Communications in BACnet/IP protocol.
The system may utilize Modbus for communication with field devices over local RS-485 communications links.
Connection to the building Ethernet network made at the nearest wall data outlet in a mechanical or electrical room.
Limit cabling lengths between devices in accordance with manufacturers published requirements.

Data Access and Display:
Measured values, both instantaneous readings and historical data, available to users on any computer with an Internet connection without requiring a specific operating system or proprietary software that is not publically available freeware.
Assign each metering a unique network address and by entering that address or corresponding URL into a web browser, HTML web pages of data available for that device.
Specific browser software permitted to be required to access system features beyond the measured values.

Data Format:
The complete system synchronizes to a single time base so that events on the system can be compared at different locations on the system using a common time base. Time base synchronized with DDC system.
Data stored in DDC system database.

Software:
Seamless BACnet/IP integrated with building Direct Digital Control, DDC system, and have the ability to display individual meter output data.
Calculation engine to virtually calculate, display, and store-derived values.3.Minimum download meter data every 15 minutes.

Interface and Display:
Provide 32-inch LED flat panel display.
Scroll through display features in 20 second intervals (adjustable).

Display:
Monthly Utility Total Energy (kbtu) and EUI (kbtu/sf/yr) bar chart overlaid with the prior year by month. Use different colors to indicate the contribution of gas and electricity to each monthly total bar.
Monthly System Total Energy (kbtu) and EUI (kbtu/sf/yr) bar chart overlaid with the prior year by month. Use different colors to indicate the contribution of each end use (Mechanical, plug loads, plumbing, and lighting) to each monthly total bar.
Current Day's end use energy demand (kW) overlaid with the annual weekday and weekend average demand (kW), and temperature in a line chart. Provide separate slides for Lighting and Plug Load end uses.
Current Day's end use energy demand (kbtu/hr) overlaid with the annual weekday and weekend average demand (kbtu/hr), and temperature in a line chart. Provide separate slides for Mechanical and Plumbing Load end uses.
Energy Meter Gauge indicating real-time end use energy demand (kW and W/sf) for Lighting and Plug Loads.
Energy use pie chart indicating percent of annual energy from each endues (Mechanical, Plumbing, Plug Loads and Lighting).
Monthly water usage (gallons) and WUI (gallons/person/year) bar chart overlaid with the prior year by month.

Current Sensors and Transformers:
Current Transformers, 5 A:
Submetering:
Accuracy: 1.0 percent (10 percent-100 percent of Current Transformer rating).
Split-core: Flex-core, Hawkeye, Square-D, Veris.
Current Sensors; 0-5 VDC, 330 milli-volt:
Submetering:
Accuracy: 1.0 percent (10 percent-100 percent of Current Transformer rating).
Manufacturers: Square-D, Magnelab, Veris, Sentron.

Electrical Energy Meters:
Measured values: Real kWh, Reactive kVARh, apparent kVAh, kW, power factor, RMS power, and current per phase.
Voltage: monitored circuit voltage indicated in documents.
Current Transformers: Provide milli-volt compatible meters where milli-volt Current Transformers are used.
Minimum Current Transformer input amperage (5 Amp Current Transformer only): 10A.
Sampling rate: minimum 3 kHz.
Submetering Meter Accuracy: +/-1 percent accuracy (10 percent to 100 percent of Current Transformer rating).
Manufacturers: Veris E50, Siemens, Square D.

PART 3 EXECUTION

EXAMINATION

Verify existing conditions before starting work.

Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

INSTALLATION

Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation.

Provide with 120v AC, 15 amp dedicated emergency power circuit to each programmable control unit.

Provide conduit and electrical wiring in accordance with Section 26 05 83. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

Provide control wiring for control devices and control panels.

Run control wiring in mechanical rooms or locations susceptible to damage in conduit. Plenum rated cable may be used in other locations .

Provide power wiring for control devices and control panels. Utilize designated circuits in electrical power panels. Refer to Electrical Drawings. If no circuits are designated for DDC Controls, submit detailed request for use of spare circuits at no additional cost.

Install power wiring in conduit.

Grounding: Instrumentation and communication grounding installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.

Control voltage limited to maximum of 120V.

Where relay coil is connected to load side of motor starter to energize with motor operation, external control circuit properly fused with fuse block located in respective starter enclosure.

Where relays are used to control single-phase motors directly, provide contacts rated for not less than horsepower rating of largest motor switched by relay.

MANUFACTURER'S FIELD SERVICES

Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 3 day period.

Provide basic operator training for _____ persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 40 hours dedicated instructor time. Provide training on site.

DEMONSTRATION AND INSTRUCTIONS

Demonstrate complete and operating system to Owner.

MAINTENANCE

See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.

Provide two complete inspections, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.

Provide complete service of systems, including call backs. Make minimum of ____ complete normal inspections of approximately ____ hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Hydronic system requirements.

Heating water and glycol piping, above grade.

Equipment drains and overflows.

Unions, flanges, mechanical couplings, and dielectric connections.

Solder and braze.

Pipe wrapping.

RELATED REQUIREMENTS

Section 23 05 16 - Expansion Fittings and Loops for HVAC Piping.

Section 23 05 23 - General-Duty Valves for HVAC Piping.

Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

Section 23 05 48 - Vibration and Seismic Controls for HVAC.

Section 23 05 53 - Identification for HVAC Piping and Equipment.

Section 23 07 19 - HVAC Piping Insulation.

Section 23 21 14 - Hydronic Specialties.

REFERENCE STANDARDS

ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators.

ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300.

ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

ASME B31.9 - Building Services Piping.

ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.

ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts.

ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

ASTM A536 - Standard Specification for Ductile Iron Castings.

ASTM B32 - Standard Specification for Solder Metal.

ASTM B88 - Standard Specification for Seamless Copper Water Tube.

ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric).

ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.

ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

AWWA C606 - Grooved and Shouldered Joints.

MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

ADMINISTRATIVE REQUIREMENTS

Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC for submittal procedures.

Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.

Product Data:
Include data on pipe materials, pipe fittings, valves, and accessories.
Provide manufacturers catalog information.
Indicate valve data and ratings.
Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.

Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

Project Record Documents: Record actual locations of valves.

Treatment Reports.

Test Reports and Certificates: Submit certificates of inspections and pipe tests to Owner.

Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

Installer Qualifications: Company specializing in performing work of the type specified in this section, with minimum three years of experience.

Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

Date stamp all castings used for coupling housings, fittings, valve bodies, etc. for quality assurance and traceability.

Coupling Manufacturer:
Perform on-site training by factory-trained representative to the Contractor's field personnel in the proper use of grooving tools and installation of grooved joint products.
Periodic job site visits by factory-trained representative to ensure best practices in grooved joint installation.
A distributor's representative is not considered qualified to perform the training.

Welder Qualifications: Certify in accordance with ASME BPVC-IX.
Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

Piping material and installation to meet requirements of the local building codes and serving utility requirements.

Pipe cleaning: Should any pipe be plugged or should foaming of water systems occur, disconnect piping, re-clean, and reconnect without additional expense to the Owner.

Correct damage to the building or systems resulting from failure to properly clean the system without additional expense to the Owner.

DELIVERY, STORAGE, AND HANDLING

Accept valves on site in shipping containers with labeling in place. Inspect for damage.

Provide temporary protective coating on cast iron and steel valves.

Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

HYDRONIC SYSTEM REQUIREMENTS

Comply with ASME B31.9 and applicable federal, state, and local regulations.

Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
Use non-conducting dielectric connections whenever jointing dissimilar metals.
Copper tube joints:
Copper Tube Sizes 1-1/2 inch and below: Soldered.
Copper Tube Sizes 2 inch and above: Brazed.
Grooved mechanical joints may be used in accessible locations only.
Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
Grooved mechanical connections and joints comply with AWWA C606.
Ductile Iron: Comply with ASTM A536, Grade 65-45-12.
Steel: Comply with ASTM A106/A106M, Grade B or ASTM A53/A53M.
Use rigid joints unless otherwise indicated.
Use flexible joints where indicated.
Depending on pipe size, three or four flexible joints may be used in lieu of a flexible connector.
Use gaskets of molded synthetic rubber with central cavity, pressure-responsive configuration, and complying with ASTM D2000, Grade 2CA615A15B44F17Z for circulating medium up to maximum 230 degrees F or Grade M3BA610A15B44Z for circulating medium up to maximum 200 degrees F.
Provide steel coupling nuts and bolts complying with ASTM A183.
Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges or unions to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

Valves: Provide valves where indicated:
Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch ball valves with cap; pipe to nearest floor drain.
On discharge of pumps, use spring loaded check valves.
For throttling, bypass, or manual flow control services, use globe valves.
For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.

Welding Materials and Procedures: Comply with ASME BPVC-IX.

HEATING WATER AND GLYCOL PIPING, ABOVE GRADE

Steel Pipe: ASTM A53/A53M, Schedule 40, black.
Fittings: ASTM A234/A234M, wrought steel welding type. Short radius elbows not acceptable for use except as approved on a case by case basis.
Joints:
Welded: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
Threaded: ASME B16.3, malleable iron fittings.
Grooved: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

Steel Pipe Sizes 12 Inch and Greater: ASTM A53/A53M, 3/8 inch wall, black.
Fittings: ASTM A234/A234M, wrought steel welding type. Short radius elbows not acceptable for use except as approved on a case by case basis.
Joints:
Welded: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
Threaded: ASME A536 ductile iron fittings.
Grooved: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

Copper Tube Sizes 4 inch and below: ASTM B88 (ASTM B88M), Type L, hard drawn.

EQUIPMENT DRAINS AND OVERFLOWS

Copper Tube: ASTM B88 (ASTM B88M), Type L, hard drawn.
Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

Unions:
Ferrous Piping: 150 psig malleable iron, threaded, brass to iron seat, black or galvanized to match pipe.
Copper Pipe: 200 psi WOG, bronze, soldered joints.

Flanges for Pipe 2 Inches and Greater:
Ferrous Piping: Cast iron or steel for screwed piping and forged steel welding neck for welded line sizes.
Copper Piping: Bronze.
Gaskets: 1/8 inch thick, non-metallic type, EPDM, Garlock 3700 or equal.
Pressure Rating and Drilling: In accordance with ASME B16.1; 150 lb. for system pressures 150 psig to 400 psig. Match apparatus, valve, or fitting to which they are attached.
Hardware: Make joint using American Standard hexagon head bolts, lock washers, and nuts (per ASTM A307 GR.B) for service pressures to 150 psig; alloy steel stud bolts, lock washer, and American Standard hexagon head nut (per ASTM A307 GR.B) for service pressures 150 psig to 400 psig. Use length of bolt required for full nut engagement. Provide electro-cad plated bolts and nuts on cold and chilled water lines.

Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
Dimensions and Testing: In accordance with AWWA C606.
Mechanical Couplings: Comply with ASTM F1476.
Housing Material: Ductile iron complying with ASTM A536, rust inhibiting paint.
Gasket Material: Grade E EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F, Flushseal, Installation Ready or Flush Gap configuration.
Bolts and Nuts: ASTM A183, zinc-electroplated steel.
When pipe is field grooved, provide coupling manufacturer's grooving tools.
Manufacturers:
Apollo Valves.
Victaulic.
Anvil Gruvlock.
Grinnell Products, a Tyco Business.
Shurjoint Piping Products, Inc.
Victaulic Company.
Substitutions: See Section 01 60 00 - Product Requirements.

Dielectric Connections:
Waterways:
Nationally listed, have a dielectric thermoplastic interior lining, and meet requirements of ASTM F1545.
Suitable for the required operating pressures and temperatures.
Flanges:
Dielectric flanges with same pressure ratings as standard flanges.
Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
Dry insulation barrier able to withstand 600-volt breakdown test.
Construct of galvanized steel with threaded end connections to match connecting piping.
Suitable for the required operating pressures and temperatures.

SOLDER AND BRAZE

Brazed Joints:
Braze in accordance with Copper Development Association Copper Tube Handbook using BCUP series filler material.

Soldered Joints:
Wrought Copper Pipe Fittings: All-State 430 with Duzall Flux, Engelhard Silvabrite with Engelhard General Purpose Flux or J.W. Harris Co.
Valves, Cast Fittings, or Bronze Fittings: Harris Stay-Silv-15 or Handy & Harmon Sil-Fos.

PIPE WRAPPING

Below ground steel piping and fittings, provide complete covering of Scotchrap 51, 20 mil thickness, protective tape applied over Scotchrap pipe primer applied at 1 gal/800 SF of pipe surface.

Pipe may be furnished with factory applied jacket of X-tru-coat with Scotchrap as previously specified for field joints.

PART 3 EXECUTION

PREPARATION

Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

Remove scale and dirt on inside and outside before assembly.

Prepare piping connections to equipment using jointing system specified.

Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

After completion, fill, clean, and treat systems. See Section 23 25 00 for additional requirements.

INSTALLATION

Install in accordance with manufacturer's instructions.

Install heating water, glycol, chilled water, condenser water, and engine exhaust piping to ASME B31.9 requirements.

Route piping in orderly manner, parallel to building structure, and maintain gradient.

Install piping to conserve building space and to avoid interference with use of space.

Group piping whenever practical at common elevations.

Sleeve pipe passing through partitions, walls, and floors.

Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified _____.

Slope piping and arrange to drain at low points.

Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 23 05 16.
Use flexible couplings in expansion loops.

Inserts:

Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 23 07 19.

Provide access where valves and fittings are not exposed. Coordinate size an dlocation of access doors with Section 08 31 00

Use eccentric reducers to maintain top of pipe level.

Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welds.

Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. See Section 09 91 23.

Install valves with stems upright or horizontal, not inverted.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Strainers.

Pressure-temperature test plugs.

Balancing valves.

Relief valves.

RELATED REQUIREMENTS

Section 23 21 13 - Hydronic Piping.

ADMINISTRATIVE REQUIREMENTS

Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

Scheduling: _____.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC for submittal procedures.

Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

Certificates: Inspection certificates for pressure vessels from authority having jurisdiction.

Project Record Documents: Record actual locations of flow meters.

Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

DELIVERY, STORAGE, AND HANDLING

Accept valves on site in shipping containers with labeling in place. Inspect for damage.

Provide temporary protective coating on cast iron and steel valves.

Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

STRAINERS

Manufacturers:
NIBCO.
Armstrong International, Inc.
McAlear Manufacturing Co.
Sarco, Inc.
Steamflo.
Mueller.
R.P. & C. Company.
Titan Flow Control.
Gruvlok.
Victaulic.

Wye Pattern:
Bronze: Bronze body, 250 psi.
Ductile Iron: Ductile iron body, 300 psi.
Cast Iron: Cast iron body, 125 psi.
Cast Iron, High Pressure: Cast iron body, 250 psi.

Basket Pattern: Semi-steel body, 125 psi WOG, flanged, closed bottom basket, clamped, or bolted cover.

Screen:
Material: 304 stainless steel.
Perforations:
General applications: 1/8-inch.
Upstream of heat exchangers, heat pumps, and chillers: 60-mesh (250 Micron).

PRESSURE-TEMPERATURE TEST PLUGS

Manufacturers:
Universal Lancaster.
Trerice.
Peterson Equipment Company Inc.
Sisco Manufacturing Company Inc.

Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Nordel rated for minimum 300 psig at 275 degrees F.

Application: Use extended length plugs to clear insulated piping.

Gauges and Thermometers: Supply Owner with two pressure gauge adapters with 1/8-inch O.D. probe and two five-inch stem pocket test thermometers 25 degrees -125 degrees F for chilled water, 40 degrees -240 degrees F for heating water.

BALANCING VALVES

Manufacturers:
DeZurik.
Homestead.
Bell and Gossett.
Walworth.
Taco.
Wheatley.
Tour & Andersson.
Victaulic.
Gruvlok.
NIBCO.
Armstrong International, Inc.
Bell & Gossett, a brand of Xylem, Inc.

Calibrated Bronze Globe Valve
Y-pattern globe style design. Precision flow measurement, precision flow balancing, memory stops, positive shut-off to a minimum of 250 psi, drain port suitable for hose bibb fitting. Threaded or solder ends for 1/2-inch through 2-inches. 1/2-inch valve capable of balance to 0.5 GPM. Grooved or flanged ends for 2-1/2-inches through 12-inches.
Throttling Range: 4 turns of valve stem minimum.
Differential pressure read-out ports with integral check valves across valve seat area.
Memory stop.
Calibrated nameplate.
Drain port.

Calibrated Iron Globe Valve

Y-pattern globe style design. Precision flow measurement, precision flow balancing, memory stops, positive shut-off to a minimum of 250 psi, drain port suitable for hose bibb fitting. Threaded or solder ends for 1/2-inch through 2-inches. 1/2-inch valve capable of balance to 0.5 GPM. Grooved or flanged ends for 2-1/2-inches through 12-inches.
Throttling Range: 4 turns of valve stem minimum.
Differential pressure read-out ports with integral check valves across valve seat area.
Memory stop.
Calibrated nameplate.
Drain port.

Size balancing valves based on the published performance curve characteristics for the scheduled flow rate for each location to ensure proper operation at design conditions.

Size 2 inch and Smaller:
Provide calibrated globe style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded or soldered connections.
Metal construction materials consist of bronze or brass.
Non-metal construction materials consist of Teflon or EPDM.
Maximum Service Operation: 300 psi at 250 degrees F.

Size 2-1/2 inch and Larger:
Provide calibrated globe style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and flanged, grooved, or weld end connections.
Valve body construction materials consist of cast iron, carbon steel, or ductile iron.
Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, or NORYL.
Maximum Service Operation: 175 psi at 250 degrees F.

RELIEF VALVES

Manufacturers:
Armstrong International, Inc.
ITT Bell & Gossett.
Consolidated.
Kunkle.
Cash Acme.

Bronze or steel body, stainless steel stem and springs, pressure rated to 160 psi at 250 degrees F, conforming to Section IV of ASME Code, size per manufacturer's recommendations based on Code, setting as indicated on drawings.

PART 3 EXECUTION

INSTALLATION

Install specialties in accordance with manufacturer's instructions.

Provide manual air vents at system high points where automatic air vents are not used, and as indicated.

Provide automatic air vents at high points where air can collect in water systems and where indicated. Route drain lines from vent to nearest floor drain. Install 3/4-inch globe shut-off valve ahead of air vent. Install ball valve where bucket drainage is required.

For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

Provide valved drain and hose connection on strainer blow down connection. Pipe blow off full size and terminate over floor drains except finned tube, reheat coils, fan coils, terminal units, and unit heaters.
Applied Strainer locations:
Cast iron wye, chilled, heating, and heat recovery water, low pressure steam, low pressure condensate.
Bronze wye, in piping 2-inch and smaller, medium, and high pressure steam and condensate.
Cast iron, high pressure wye, in piping 2-1/2-inch and larger, medium, and high pressure steam and condensate.
Basket, in piping 2-1/2-inch and larger, condenser water inlet to pumps.

Provide pump suction fitting on suction side of base mounted centrifugal pumps where inidcated. Support suction diffuser and piping from same surface as pump base is supported unless shown otherwise. Adjust foot so that pump inlet does not carry piping weight. Pipe pressure gauges to gauge port, and blow down to drain with ball shut-off valve. Remove temporary strainers after cleaning systems.

Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps.

Support pump fittings with floor-mounted pipe and flange supports.

Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks and as indicated.

Integral coil connectors are prohibited except where specifically indicated on the drawings.

Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

Pipe relief valve outlet to nearest floor drain.

Clean and flush glycol system before adding glycol solution, see Section 23 25 00.

Feed glycol solution to system through make-up line with pressure regulator, venting system high points.

Perform tests determining strength of glycol and water solution and submit written test results.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Piping.

Refrigerant.

Moisture and liquid indicators.

Valves.

Strainers.

Filter-driers.

RELATED REQUIREMENTS

Section 09 91 23 - Interior Painting.

Section 23 07 19 - HVAC Piping Insulation.

Section 23 63 13 - Air Cooled Refrigerant Condensers.

REFERENCE STANDARDS

ASHRAE Std 15 - Safety Standard for Refrigeration Systems.

ASHRAE Std 34 - Designation and Safety Classification of Refrigerants.

ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators.

ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

ASME B31.5 - Refrigeration Piping and Heat Transfer Components.

ASME B31.9 - Building Services Piping.

ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC, for submittal procedures.

Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

Test Reports: Indicate results of leak test, acid test.

Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

Submit welders certification of compliance with ASME BPVC-IX.

Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

QUALITY ASSURANCE

Designer Qualifications: Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years ofdocumented experience.

DELIVERY, STORAGE, AND HANDLING

Deliver and store piping and specialties in shipping containers with labeling in place.

Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

SYSTEM DESCRIPTION

Filter-Driers:
Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

REGULATORY REQUIREMENTS

Comply with ASME B31.9 for installation of piping system.

Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

Welders Certification: In accordance with ASME BPVC-IX.

Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

PIPING

Copper Tube: ASTM B280 and ASME B31.5, H58 hard drawn.
Fittings: ASME B16.22 wrought copper.
Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

REFRIGERANT

Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

Refrigerant: R-410a as defined in ASHRAE Std 34.

MOISTURE AND LIQUID INDICATORS

Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

VALVES

Diaphragm Packless Valves:
UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, soldered or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

Packed Angle Valves:
Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, soldered or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

Ball Valves:
Two piece forged brass body with teflon ball seals and copper tube extensions, brassbonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

Service Valves:

Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi.

STRAINERS

Straight Line or Angle Line Type:
Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

FILTER-DRIERS

Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

Construction: UL listed.
Connections: As specified for applicable pipe type.

PART 3 EXECUTION

PREPARATION

Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

Remove scale and dirt on inside and outside before assembly.

Prepare piping connections to equipment with flanges or unions.

INSTALLATION

Install refrigeration specialties in accordance with manufacturer's instructions.

Route piping in orderly manner, group with other trades parallel to building structure, and maintain gradient.

Install piping to conserve building space and avoid interference with use of space.

Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

Inserts:
Provide inserts for placement in concrete formwork.
Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

Pipe Hangers and Supports:
Install in accordance with ASME B31.5.
Support horizontal piping as indicated.
Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
Place hangers within 12 inches of each horizontal elbow.

Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

Provide clearance for installation of insulation and access to valves and fittings.

Provide access to concealed valves and fittings.

Flood piping system with nitrogen when brazing and seal each branch outlet with Visqueen and tape or similar method to assure continued cleanliness of interior of piping until system is completed.

Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting.

Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.
Fully charge completed system with refrigerant after testing.
Provide electrical connection to solenoid valves. See Section 26 05 83.

FIELD QUALITY CONTROL
See Division 01, for additional requirements.
Test refrigeration system in accordance with ASME B31.5.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Metal ducts.

Flexible ducts.

RELATED REQUIREMENTS

Section 23 07 13 - Duct Insulation.

Section 23 33 00 - Air Duct Accessories.

Section 23 33 19 - Duct Silencers.

Section 23 36 00 - Air Terminal Units.

Section 23 37 00 - Air Outlets and Inlets: Fabric air distribution devices.

REFERENCE STANDARDS

ASHRAE (FUND) - ASHRAE Handbook - Fundamentals.

ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.

UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.

SUBMITTALS

Product Data: Provide data for duct materials.

Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work.

Manufacturer's Certificate: Certify that installation of glass fiber ductwork meets or exceed specified requirements.

Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate per appropriate seal class, following SMACNA (LEAK).

Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

FIELD CONDITIONS

Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

GENERAL REQUIREMENTS

Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23 33 19.

Duct Shape and Material in accordance with Allowed Static Pressure Range:

Duct Sealing and Leakage in accordance with Static Pressure Class:
Low Pressure Service: Up to 2 in-wc:
Seal: Class C, apply to seal off transverse joints.
Leakage:
Rectangular: Class 24 or 24 cfm/100 sq ft.
Round: Class 12 or 12 cfm/100 sq ft.
Low Pressure Service: From 2 in-wc to 3 in-wc:
Seal: Class B, apply sealing of transverse joints and longitudinal seams.
Leakage:
Rectangular: Class 12 or 12 cfm/100 sq ft.
Medium and High Pressure Service: Above 3 in-wc:
Seal: Class A, apply sealing of transverse joints, longitudinal seams, and duct wall penetrations.
Leakage:
Rectangular: Class 6 or 6 cfm/100 sq ft.
Round: Class 3 or 3 cfm/100 sq ft.

Duct Fabrication Requirements:
Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline.
Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

General Exhaust - Moisture Laden Air: 2 inch w.g. pressure class, aluminum.

Adjustable Elbows: Not allowed.

METAL DUCTS

Material Requirements:
Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
Aluminum: ASTM B209/B209M, aluminum sheet, alloy 3003-H14.

Round Metal Ducts:
Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

Round Spiral Duct:
Round spiral lock seam duct with galvanized steel outer wall.

Connectors, Fittings, Sealants, and Miscellaneous:

Fittings: Manufacture with solid inner wall of perforated galvanized steel.
Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
VOC Content: Not more than 250 g/L, excluding water.
Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
For Use with Flexible Ducts: UL labeled.
SCAQMD Rule 1168 compliant.
Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

FLEXIBLE DUCTS

Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.
Pressure Rating: 10 in-wc positive and 1 in-wc negative.
Maximum Velocity: 4000 fpm.
Temperature Range: Minus 20 degrees F to 250 degrees F.

PART 3 EXECUTION

APPLIED LOCATIONS

Supply ductwork upstream and downstream side of terminal box. Internally lined where indicated on the Drawings or as specified in Section 23 07 13 - Duct Insulation.

Supply Ductwork from Spin-In Fittings to Supply Outlet Collar Connection: Flexible duct, maximum 4-foot length.

Return Air Trunk Ductwork from End Run to Unit Connection: Internally lined where indicated on the Drawings or as specified in Section 23 07 13 - Duct Insulation.

Exhaust Ductwork: Internally lined where indicated on the Drawings or as specified in Section 23 07 13 - Duct Insulation.

Ductwork between Transfer Grilles: Internally lined where indicated on the Drawings or as specified in Section 23 07 13 - Duct Insulation.

Exposed or Visible Ductwork in Finished Spaces: Sheet metal as specified for application, internally lined where indicated on the Drawings or as specified in Section 23 07 13 - Duct Insulation.

Acoustical lined plenums on inlet and outlet of rooftop units. Plenum size sufficient for duct connections as shown on plans, minimum plenum size, and same as unit opening.

INSTALLATION

Install, support, and seal ducts in accordance with SMACNA (DCS).

Install products following the manufacturer's instructions.

During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

Flexible Ducts:
Make connections at ends using draw band strap and a minimum of 2 wraps of duct tape.
Suspend center spans from structure above using wire as required by code. Connect to manufacturer's eyelet on jacket or use 1-inch wide galvanized steel strap with single loop at top and smooth edges.
Suspending duct by laying it on the ceiling is prohibited.
Avoid crimping flex duct. Changes in direction made using 2D radius. Duct connections to grilles, registers, and diffusers using less than 2D radius bends are not acceptable. Where space is constricted, use sheet metal elbows or Thermaflex Flex Boots (or equal).

Kitchen Hood Exhaust: Provide residue traps at the base of vertical risers with provisions for the cleanout.

Aluminum Duct:
Slope minimum of 1/4-inch per foot of run toward the grille.
Install similar to galvanized duct work per SMACNA standards.
Provide dielectric protection when joining aluminum duct to steel duct by utilizing neoprene flexible connections or other approved method.
Use aluminum straps and hangers to support aluminum ductwork.

Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.

Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.

Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with a crimp in the direction of airflow.

Use double nuts and lock washers on threaded rod supports.

Connect terminal units to rigid supply ducts with minimum of 3 ducts diameters of straight duct.

Connect diffusers or light troffer boots to low-pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

At exterior wall louvers, seal duct to louver frame and install blank-out panels.

Ductwork, Exposed or Visible in Finished Areas:
Use extreme care in handling and installing.
Replace dented or damaged sections.
Install ductwork straight and true, parallel to building lines.
Make connections with pop rivets using couplings where applicable. Grind raw edges smooth and apply paintable sealant to cover imperfections.
Remove excess sealant to provide a finished joint.
Provide floor, wall, and ceiling plates as specified in Section 23 33 00 - Air Duct Accessories .
Finish, clean and prime ductwork, and hangers for painting.

Single Wall Housing Plenums:
Install housing plenums in accordance with SMACNA (DCS), latest edition.
Joints and seams sealed with high pressure duct sealer or gaskets and fastened with bolts, screws, or pop rivets.
Pipe, duct, conduit, and control penetrations sealed to prevent air leakage using close off sheets and strips.
Securely anchor housing panels to floor or roof curbs.
Block outside air or return air dampers open to prevent damage during construction until automatic control system is operational and adjusted.
Provide access doors where indicated on drawings and where required to provide access for cleaning and maintenance. Access doors installed to open against air pressure.
Slope plenum and connected ductwork to drain towards the exterior louver or building exterior opening.
For single wall plenums installed behind exterior louvers or wall openings, slope plenum floor and connected ductwork at 1/4-inch/foot to drain towards the exterior louver or opening.
For single wall plenums installed below roof ventilators or roof openings, slope floor of plenum at 1/4-inch/foot to drain connection. Pipe drain connection to floor drain.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Air turning devices/extractors.

Duct access doors.

Duct test holes.

Flexible duct connections.

Volume control dampers.

Miscellaneous Products:
Internal strut end plugs.
Duct opening closure film.
Dryer vent.

RELATED REQUIREMENTS

Section 23 31 00 - HVAC Ducts and Casings.

Section 23 36 00 - Air Terminal Units.

REFERENCE STANDARDS

NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

UL 33 - Safety Heat Responsive Links for Fire-Protection Service.

UL 555 - Standard for Fire Dampers.

UL 1978 - Grease Ducts.

SUBMITTALS

Product Data.

Shop Drawings.

Manufacturer's Installation Instructions.

Project Record Drawings.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

AIR TURNING DEVICES/EXTRACTORS

Manufacturers:
Krueger-HVAC, Division of Air System Components; _____.
Titus HVAC, a brand of Johnson Controls; _____.

Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with push-pull operator strap.

DUCT ACCESS DOORS

Manufacturers:
Ductmate Industries, Inc, a DMI Company; _____:
Nailor Industries, Inc; _____.
Ruskin Company, a brand of Johnson Controls; _____.

SEMCO LLC; _____.

Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 2 inch thick insulation with sheet metal cover.
Less Than 12 inches Square: Secure with sash locks.
Up to 18 inches Square: Provide two hinges and two sash locks.
Up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.
Larger Sizes: Provide an additional hinge.
High Temperature Duct Access Doors:
Comply with NFPA 96.
Comply with UL 1978.

Access doors with sheet metal screw fasteners are not acceptable.

DUCT TEST HOLES

Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

FIRE DAMPERS

Manufacturers:
Nailor Industries, Inc; _____.
NCA, a brand of Metal Industries Inc; _____.
Pottorff; _____.
Ruskin Company, a brand of Johnson Controls; _____.

Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

Partitions up to 2-hour rating: 1-1/2 hour rated dampers.

Partitions over 2-hour rating: 3 hour rated dampers.

Ceiling Dampers: Galvanized steel, 22 gage, 0.0299 inch frame and 16 gage, 0.0598 inch flap, two layers 0.125 inch ceramic fiber on top sideand one layer on bottom side for round flaps, with locking clip.

Horizontal Dampers: Galvanized steel, 22 gage, 0.0299 inch frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

Multiple Blade Dampers: 16 gage, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

Fusible Links: UL 33, separate at 165 degrees F with adjustable link straps for combination fire/balancing dampers.

Provide round or oval duct connections where required.

FLEXIBLE DUCT CONNECTORS

Manufacturers:
Duro Dyne Corporation
Ventfabrics

Fabricate in accordance with SMACNA (DCS) and as indicated.

Fabric crimped into metal edging strip.
Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.
Net Fabric Width: Approximately 2 inches wide.
Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.

Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

Maximum Installed Length: 14 inch.

VOLUME CONTROL DAMPERS

Manufacturers:
Nailor Industries, Inc; _____.
Ruskin Company, a brand of Johnson Controls; _____.

Fabricate in accordance with SMACNA (DCS) and as indicated.

Single Blade Dampers:
Fabricate for duct sizes up to 12 by 12 inch.
Blade: 24 gauge, 0.0239 inch, minimum.

Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches. Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.
Blade: 18 gauge, 0.0478 inch, minimum.

End Bearings: Except in round ducts 6 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

Concealed Damper Regulator: Ceiling mounted bracket with cover plate, self-locking, flexible stainless steel control drive rod or cable, rack and pinion gear drive.
Manufacturers:
Young Regulator
Ventfabrics
Metropolitan Air Technology

MISCELLANEOUS PRODUCTS

Internal Strut End Plugs: Combination end-mounting and sealing plugs for metal conduit used as internal reinforcement struts for metal ducts; plug crimped inside conduit with outside gasketed washer seal.
Manufacturers:
Carlisle HVAC Products; Dynair Internal Duct Reinforcement - Conduplugs.

Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
Thickness: 2 mils.
High tack water based adhesive.
UV stable light blue color.
Elongation Before Break: 325 percent, minimum.
Manufacturers:
Carlisle HVAC Products; Dynair Duct Protection Film.

DRYER VENT:

Aluminum wall cap.

Hinged backdraft damper.

Without bird screen.

PART 3 EXECUTION

PREPARATION

Verify that electric power is available and of the correct characteristics.

INSTALLATION

Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 31 00 for duct construction and pressure class.

Provide duct access doors for inspection and cleaning before and after filters, coils, fans, humidifiers, air flow stations, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 and every 10-feet and at each change in direction of kitchen exhaust duct. Provide minimum 8 by 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch for balancing dampers only. Review locations prior to fabrication.

Provide duct test holes where indicated and required for testing and balancing purposes.

Demonstrate re-setting of fire dampers to Owner's representative.

At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

For fans developing static pressures of 5.0 inches and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.

Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.

Provide balancing dampers on high velocity systems where indicated.

Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

Provide concealed damper regulators where balancing dampers are installed in inaccessible locations. Mount flush with ceiling, coordinate finish of cover plate with Architect.

Drip Pans:
Install under each cooling coil and exhaust heat recovery coil as indicated.
Provide drain connection from each drip pan and pipe to nearest floor drain through trap.
Drip pans over 6-feet in length require drain connections from both ends.
Pitch drip pans in direction of air flow and to drain.

Louver Blank-off Panels: Install blank-off panels on unused portions of louvers.

Water Eliminators: Install water eliminators as indicated on drawings.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Propeller fans.

RELATED REQUIREMENTS

Section 23 05 48 - Vibration and Seismic Controls for HVAC.

REFERENCE STANDARDS

29 CFR 1910 - Occupational Safety and Health Standards.

UL 705 - Power Ventilators; Current Edition, Including All Revisions.

SUBMITTALS

Product Data: Provide data on axial fans and accessories, including fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

Shop Drawings: Indicate assembly of axial fans and accessories including fan curves with specified operating point plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

Test Reports: Indicate performance data for adjustable axial fan blades for at least five-blade settings, including maximum.

Manufacturer's Instructions: Indicate installation instructions.

Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

Maintenance Materials: Furnish the following for the Owner's use in the maintenance of the project.
Extra Fan Belts: One set for each individual fan.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

Smoke Control Fans: Provide UL 705 - Supplement SD - Smoke Control listing where used as a smoke control fan.

Commercial Kitchen Exhaust Fans: Provide UL 705 - Supplement SC - Restaurant Exhaust listing where used to exhaust commercial kitchen hoods.

DELIVERY, STORAGE, AND HANDLING

Protect motors, shafts, and bearings from weather and construction dust.

FIELD CONDITIONS

Do not use permanent fans for ventilation during construction.

Permanent fans may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings lubricated, and fan run tested under observation.

PART 2 PRODUCTS

MANUFACTURERS

Greenheck.

Strobic Air.

Trane.

Pace.

Loren Cook Company.

PennBarry, Division of Air Systems Components.

Twin City Fan & Blower.

RESIDENTIAL CEILING FANS

Construction: Aluminum blades, statically and dynamically balanced, locked to shaft, directly connected to direct-drive, reversible motor.

Mounting Options: Ceiling.

PROPELLER FANS

Impeller: Shaped steel or steel-reinforced aluminum blade with heavy hubs, statically and dynamically balanced, keyed and locked to shaft, directly connected to motor or provided with V-belt drive.

Frame: One-piece, square steel with die-formed venturi orifice, mounting flanges, and supports, with baked enamel finish.

Accessories:
Safety Screens: Expanded galvanized metal over inlet, motor, drive; to comply with 29 CFR 1910.
Hood: Weathershield, to exclude rain and snow.

Performance Ratings: As indicated on drawings.

PART 3 EXECUTION

INSTALLATION

Install in accordance with manufacturer's instructions.

Install with resilient mountings and flexible electrical leads; see Sections 23 05 48 and 26 05 83.

Install flexible connections between axial fan inlet and discharge ductwork; see Section 23 33 00. Ensure metal bands of connectors are parallel with a minimum one inch flex between ductwork and axial fan while running.

Install fan-restraining snubbers; see Section 23 05 48. Adjust snubbers to prevent tension in flexible connectors when fan is operating.

Provide safety screen where inlet or outlet is exposed.

Provide backdraft dampers on discharge of exhaust fans and as indicated.

Provide access to adjustable blade axial fan wheels for varying blade angle setting. Adjust blades for varying range of volume and pressure.

Provide floor-mounted axial fans fitted with reinforced legs. Provide ceiling-suspended units with support brackets bolted to casing flange.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Radial centrifugal fans.

Bearings and drives.

Accessories.

RELATED REQUIREMENTS

Section 23 05 48 - Vibration and Seismic Controls for HVAC.

Section 23 07 13 - Duct Insulation.

REFERENCE STANDARDS

ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings.

AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program.

AMCA 99 - Standards Handbook.

AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.

AMCA 300 - Reverberation Room Methods of Sound Testing of Fans.

AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

UL 705 - Power Ventilators; Current Edition, Including All Revisions.

SUBMITTALS

Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point plotted, power, rpm, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

Manufacturer's Instructions: Include complete installation instructions.

Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
Extra Fan Belts: One set for each individual fan.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

Smoke Control Fans: Provide UL 705 - Supplement SD - Smoke Control listing where used as a smoke control fan.

Commercial Kitchen Exhaust Fans: Provide UL 705 - Supplement SC - Restaurant Exhaust listing where used to exhaust commercial kitchen hoods.

DELIVERY, STORAGE, AND HANDLING

Protect motors, shafts, and bearings from weather and construction dust.

FIELD CONDITIONS

Permanent fans may not be used for ventilation during construction.

PART 2 PRODUCTS

MANUFACTURERS

Greenheck.

Strobic Air.

Trane.

Pace.

Loren Cook Company.

PennBarry, Division of Air System Components.

Rosenberg USA, Inc.

Twin City Fan & Blower.

PERFORMANCE REQUIREMENTS

Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

Fabrication: Comply with AMCA 99.

Performance Base: Sea level conditions.

Temperature Limit: Maximum 300 degrees F.

Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.

WHEEL AND INLET

Radial: Steel construction with inlet flange, heavy reinforced back plate, plate blades with reinforcing gussets welded or riveted to back plate and flange; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.

HOUSING

Heavy gauge steel, spot welded for AMCA 99 Class I and II fans, and continuously welded for Class III, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut.

Factory finish before assembly to manufacturer's standard. For fans handling air downstream of humidifiers, provide two additional coats of paint. Prime coating on aluminum parts is not required.

Provide bolted construction with horizontal flanged split housing, where indicated.

Fabricate plug fans without volute housing using steel-lined cabinet; see Section 23 07 13.

BEARINGS AND DRIVES

Bearings: Heavy duty pillow block type, selfgreasing ball bearings, with ABMA STD 9 life at 50,000 hours.

Shafts: Hot rolled steel, ground and polished, with keyway, protectively coated with lubricating oil, and shaft guard.

Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors 15 hp and under, selected so required rpm is obtained with sheaves set at mid-position. Fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

Belt Guard: Fabricate to SMACNA (DCS); 0.106 inch thick, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

ACCESSORIES

Inlet/Outlet Screens: Galvanized steel welded grid.

Access Doors: Shaped to fit scroll, with quick opening latches and gaskets.

Scroll Drain: 1/2 inch steel pipe coupling welded to low point of fan scroll.

PART 3 EXECUTION

INSTALLATION

Install in accordance with manufacturer's instructions.

Install fans with resilient mountings and flexible electrical leads, see Sections 23 05 48 and 26 05 83.

Install flexible connections between fan inlet and discharge ductwork; see Section 23 33 00. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

Install fan restraining snubbers; see Section 23 05 48. Adjust snubbers to prevent tension in flexible connectors when fan is operating.

Provide fixed sheaves required for final air balance.

Provide safety screen where inlet or outlet is exposed.

Pipe scroll drains to nearest floor drain.

Provide backdraft dampers on exhaust fans located at discharge side; see Section 23 33 00.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Single-duct terminal units.

RELATED REQUIREMENTS

Section 23 05 48 - Vibration and Seismic Controls for HVAC.

Section 23 09 13 - Instrumentation and Control Devices for HVAC.

Section 23 31 00 - HVAC Ducts and Casings.

Section 23 82 00 - Convection Heating and Cooling Units.

REFERENCE STANDARDS

AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

AHRI 880 (I-P) - Performance Rating of Air Terminals.

AHRI 885 - Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.

ASHRAE Std 130 - Laboratory Methods of Testing Air Terminal Units.

ASTM A492 - Standard Specification for Stainless Steel Rope Wire.

ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope.

ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements.

NFPA 70 - National Electrical Code.

NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems.

UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.

UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

ADMINISTRATIVE REQUIREMENTS

Preinstallation Meeting: Conduct a preinstallation meeting one week before to the start of the work of this section; require attendance by affected installers.

Sequencing: Completion utility connections in an orderly and expeditious manner.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC for submittal procedures.

Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate both heating and cooling conditions for airflow, static pressure drop, and NC designation; heating coil data including fluid flow, rows, water pressure drop, and leaving air temperature. Include electrical characteristics and connection requirements.

Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
Include schedules listing discharge and radiated sound power level for each of the second through sixth-octave bands at inlet static pressures of 1 to 4 in-wc.

Certificates: Certify that coils are tested and rated in accordance with AHRI 410.

Manufacturer's Installation Instructions: Indicate support and hanging details, installation instructions, recommendations, and service clearances required.

Project Record Documents: Record actual locations of units and locations of access doors required for access of valving.

Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.

Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

WARRANTY

See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

Provide five year manufacturer warranty for air terminal units.

PART 2 PRODUCTS

MANUFACTURERS:

Carnes.

Titus.

Enviro-Tec.

Trane.

Price.

Tuttle and Bailey.

Nailor.

Anemostat.

Krueger.

Johnson Controls.

Greenheck.

MetalAire.

SINGLE-DUCT, VARIABLE-VOLUME AND CONSTANT-VOLUME UNITS

Acoustic Performance Requirements:
Sound ratings of air distribution assemblies: Not to exceed 36 NC at a 1.5 in. wg. static pressure drop across the unit, and the downstream static pressure of 0.5 in. wg.
Use attenuation values found in appendix E of AHRI 885.

General:
Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.

Unit Casing:
Minimum 22 gauge, 0.0299 inch galvanized steel.
Assembled with longitudinal lock seam construction.
Casing leakage to meet ASHRAE Std 130.
Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
Unit Discharge: Rectangular, with slip-and-drive connections.
Acceptable Liners:

1/2 inch thick, coated, fibrous-glass complying with ASTM C1071.
Secure with adhesive.
Coat edges exposed to airstream with NFPA 90A approved sealant.
Cover liner with non-porous foil.
3/4 inch thick polyurethane foam adhesive complying with UL 181 erosion requirements in accordance with ASHRAE Std 62.1, and having a maximum smoke developed index of 50 for both insulation and adhesive, when tested in accordance with ASTM E84.
Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.

Damper Assembly:
Heavy-gauge, galvanized steel, or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
Incorporate low leak damper blades for tight airflow shutoff.
Air Leakage Past Closed Damper: Maximum two percent of unit maximum airflow at 3 in-wc inlet static pressure, tested in accordance with ASHRAE Std 130.

Hot Water Heating Coil:
Coil Casing: Minimum 22 gauge, 0.0299 inch galvanized steel, factory-installed on terminal discharge with rectangular outlet, duct connection type.
Access Door: Gasketed and insulated located on bottom, upstream, and downstream of coils.
Right or left coil inlets.
Coil Fins: Aluminum or aluminum plated 0.0045 inch fins, mechanically-bonded to seamless 0.50 by 0.016 inch copper tubes.
Fins to be formed in a high heat transfer sine wave configuration.
Two rows minimum with twelve fins-per-inch heating capacity density.
Coil leak tested to minimum 350 psig.
Minimum Burst Pressure: 1800 psi.
Base performance data on tests run in accordance with AHRI 410 and units to bear AHRI 410 label.

Electrical Requirements:
Single-point power connection.
Equipment wiring to comply with requirements of NFPA 70.

Control Transformers: Factory supplied and mounted for electric and electronic control applications.

Controls:
DDC (Direct-Digital Controls):
Include a factory-installed, unit-mounted, direct-digital controller.
Bi-directional Damper Actuator: 24 volt, powered closed, spring return open.
Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFMs.
Occupied and unoccupied operating mode.
Remote reset of temperature or CFM set points.
Proportional, plus integral control of room temperature.
Monitoring and adjusting with portable terminal.
Time-proportional reheat coil control.
Airflow Sensor: Differential pressure airflow device measuring total, static, and wake pressures.
Signal accuracy: Plus/minus five percent throughout terminal operating range.
Suitable for operation with duct pressures between 0.25 and 3.0 inch wg inlet static pressure.
Include factory-mounted and piped, 5-micron filter; and adjustable, velocity-resetting high-limit control with amplifying relay.

PART 3 EXECUTION

EXAMINATION

Verify that conditions are suitable for installation.

Verify that field measurements are as indicated on drawings.

INSTALLATION

Install in accordance with manufacturer's instructions.

Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.

See drawings for the size(s) and duct location(s) of the air terminal units.

Provide ceiling access doors or locate units above easily removable ceiling components.

Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.

Embed anchors in concrete in accordance with ASTM E488/E488M.

Do not support from ductwork.

Connect to ductwork in accordance with Section 23 31 00.

Provide minimum of 5 ft of 2 inch thick lined ductwork downstream of units.

Install heating coils in accordance with Section 23 82 00.

Verify that electric power is available and of the correct characteristics.

ADJUSTING

Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to zero percent full flow. Set units with heating coils for minimum 50 percent full flow.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Diffusers and grilles.

REFERENCE STANDARDS

AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.

ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets.

SMACNA (ASMM) - Architectural Sheet Metal Manual.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC for submittal procedures.

Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

Project Record Documents: Record actual locations of air outlets and inlets.

QUALITY ASSURANCE

Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

Test and rate louver performance in accordance with AMCA 500-L.

Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

MANUFACTURERS

Carnes.

Krueger-HVAC.

Metalaire.

Greenheck.

Price Industries.

Titus.

Tuttle and Bailey.

Anemostat.

Nailor.

DIFFUSERS AND GRILLES

Ceiling Supply Diffuser (C-1):
Perforated face modular diffuser with adjustable modular core, steel panel, square or rectangular neck size as indicated, discharge pattern as indicated, lay-in tee bar ceiling, or surface mounted as required (coordinate with architectural reflected ceiling plan).
White baked enamel finish, Titus PMC.

Ceiling Return/Exhaust Grille (C-2):
Perforated face modular ceiling grille, steel panel, with duct adapters for round or rectangular as indicated, lay-in tee bar ceiling, or surface mounted as required (coordinate with architectural reflected ceiling plan).
White baked enamel finish, Titus PAR.

Sidewall Transfer Grilt Grille (H-1):
Aluminum perforated face, gasketed around face flange, white baked enamel finish, rectangular duct connection.
Titus 8F.

Sidewall Transfer Grille (L-1):
Aluminum perforated face, gasketed around face flange, white baked enamel finish, rectangular duct connection.
Titus 8F,

PART 3 EXECUTION

INSTALLATION

Install in accordance with manufacturer's instructions.

Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

Install diffusers to ductwork with air tight connection.

Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

Paint ductwork visible behind air outlets and inlets matte black.

Set pattern control for directions of throw as shown on Drawings prior to air balancer arriving on Project.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Manufactured units.

Casing.

Condenser coils.

Fan requirements.

Controls.

RELATED REQUIREMENTS

Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

Section 23 05 48 - Vibration and Seismic Controls for HVAC.

Section 23 23 00 - Refrigerant Piping.

REFERENCE STANDARDS

AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

ASHRAE Std 15 - Safety Standard for Refrigeration Systems.

ASHRAE Std 20 - Methods of Laboratory Testing Remote Mechanical-Draft Air-Cooled Refrigerant Condensers.

ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings.

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC for submittal procedures.

Product Data:
Rated capacities
Weights
Accessories
Electrical requirements
Wiring diagrams

Shop Drawings: Indicate components, assembly, dimensions, weights and loading, required clearances, and location and size of field connections. Include schematic layouts showing condenser, refrigeration compressors, cooling coils, refrigerant piping and accessories required for complete system.

Manufacturer's Instructions: Submit manufacturer's complete installation instructions, including wiring diagrams.

Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

Operation and Maintenance Data:
Start-up instructions
Maintenance instructions
Parts lists
Controls
Accessories

Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

Installer Qualifications: Company specializing in performing the work of this section with minimum five years of experience. and approved by manufacturer.

Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

DELIVERY, STORAGE, AND HANDLING

Comply with manufacturer's installation instruction for rigging, unloading and transporting units.

Protect units on site from physical damage. Protect coils.

PART 2 PRODUCTS

MANUFACTURERS

Daikin

Carrier.

Trane.

York International Corporation/Johnson Controls, Inc.

MANUFACTURED UNITS

Provide packaged, factory assembled and tested, pre-wired unit, suitable for outdoor use consisting of casing, condensing coil and fans, integral sub-cooling coil liquid accumulator and controls.

Construction and Ratings: In accordance with AHRI 210/240 and UL 207. Testing shall be in accordance with ASHRAE Std 20.

Performance Ratings: Energy Efficient Rating (EER)/Coefficient of Performance (COP) not less than prescribed by ASHRAE Std 90.1 I-P, in combination with compressor units.

Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

CASING

House components in welded steel frame with steel panels with weather resistant, baked enamel finish.

Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.

Provide removable access doors or panels with quick fasteners.

CONDENSER COILS

Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide sub-cooling circuits. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of nitrogen.

Coil Guard: Expanded metal with lint screens.

Configuration: Two refrigeration circuits each with receiver.

FAN REQUIREMENTS

Vertical discharge direct driven propeller type condenser fans with fan guard on discharge, equipped with roller or ball bearings with grease fittings extended to outside of casing.

Weatherproof motors suitable for outdoor use, with permanent lubricated ball bearings and built-incurrent and thermal overload protection.

Motors as indicated, in compliance with Section 23 05 13.

CONTROLS

Provide factory wired and mounted control panel, NEMA 250, containing fan motor starters, fan cycling thermostats or head pressure controls , compressor interlock, and control transformer.

Provide controls to permit operation down to 20 degrees F ambient temperature.

Provide solid state control to vary speed of one condenser fan motor in response to refrigerant condensing pressure.

PART 3 EXECUTION

INSTALLATION

Install in accordance with manufacturer's instructions.

Provide for connection to electrical service. See Section 26 05 83.

Install units on vibration isolation. See Section 23 05 48.

Provide connection to refrigeration piping system and charge system. Refer to Section 23 23 00. Comply with ASHRAE Std 15.

Provide cooling season start-up, winter season shut-down service, for first year of operation.

Shut-down system if initial start-up and testing takes place in winter and machines are to remain inoperative. Repeat start-up and testing operation at beginning of first cooling season.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Indoor air handling (fan and coil) units for ductless systems.

Controls.

RELATED REQUIREMENTS

Section 23 09 13 - Instrumentation and Control Devices for HVAC.

Section 23 31 00 - HVAC Ducts and Casings.

REFERENCE STANDARDS

AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

AHRI 520 - Performance Rating of Positive Displacement Condensing Units.

ASHRAE Std 15 - Safety Standard for Refrigeration Systems.

ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units.

NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical.

SUBMITTALS

See Section 23 05 00 - Common Work Results for HVAC for submittal procedures.

Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

Design Data: Indicate refrigerant pipe sizing.

Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

Project Record Documents: Record actual locations of components and connections.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience and approved by manufacturer.

WARRANTY

See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

MANUFACTURERS

Indoor Units for Ductless Systems
Daikin
Mitsubishi.
Carrier.

Trane.
LG.

SYSTEM DESIGN

Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
Heating: None.
Cooling: Outdoor electric condensing unit with evaporator coils in multiple ductless indoor units ("mini-split").
Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
Location: High-wall.
Fan: Cross-flow fan direct driven by a single motor.
Statically and dynamically balanced and run on a motor with permanently lubricated bearings.
Fan consists of two speeds:
High.
Low.
Filter return air with washable, antioxidant pre-filter and a pleated anti-allergy enzyme filter.

Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
Condensate Pump: Provide condensate pump when required; pipe drain to floor drain.

Electrical Characteristics:
Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26 05 83 - Wiring Connections.
Furnish magnetic contactors.
Arrange for single point electrical connection.

OUTDOOR UNITS

Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
Comply with AHRI 210/240.
Refrigerant: R-32.
Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.

Compressor: Hermetic, 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.
Manifold multiple compressors for single joint connection on liquid and suction lines.

Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
Condenser Fans: Direct-drive propeller type.
Condenser Fan Motor: Enclosed, 1-phase type, permanently lubricated.

Coil: Air-cooled, aluminum fins bonded to copper tubes.

Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
Provide thermostatic expansion valves.

Operating Controls:
Control by room thermostat to maintain room temperature setting.
Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.
Electrical:
Furnish magnetic contactors.
Arrange for single point electrical connection.
Provide field wiring.

Electrical Characteristics:
Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26 05 83 - Wiring Connections.
Furnish magnetic contactors.
Arrange for single point electrical connection.

PART 3 EXECUTION

EXAMINATION

Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

Verify that proper power supply is available and in correct location.

INSTALLATION

Install in accordance with NFPA 90A and NFPA 90B.

Install refrigeration systems in accordance with ASHRAE Std 15.

Pipe drain from cooling coils to nearest floor drain, floor sink, or sink tailpiece.

FAN COIL UNIT

Installation:
Install in location shown on the Drawings. Level unit and secure to structure.
Make piping connection and unit installation per manufacturer's recommendations and installation guides.
Pipe condensate pan to floor drain per manufacturer's installation guide. Provide minimum 2-inch trap seal on condensate drain connection.

Start-Up:
General: Comply with manufacturer's instructions.
Install filters before operating unit.
Ensure proper refrigerant and airflow before operating unit compressor.

SPLIT-SYSTEM AIR CONDITIONING UNIT

Installation:
Install in location shown on the Drawings. Level unit and secure to structure.
Make piping connections and unit installation per manufacturer's recommendations and installation guides.
Size and run refrigerant piping between fan coil unit(s) and air-cooled condensing unit(s) per manufacturer's recommendations. Provide traps and double suction and/or discharge risers if recommended by the manufacturer.
Insulate refrigerant piping as specified in Section 23 07 00 - Insulation for HVAC.
Pipe condensate pan to floor drain per manufacturer's installation guide.
Make refrigerant piping connections, install refrigeration accessories, and charge system. Provide additional refrigerant as required for proper operation at design capacities.

Start-Up:
General: Comply with manufacturer's instructions.
Install filters before operating unit.
Insure proper refrigerant and airflow before operating unit compressor.

Provide interconnecting power and control wiring, routed in conduit from the outdoor unit to the indoor unit, and control panel thermostat. Where unit provided requires separate power connections to the indoor and outdoor units provide at no additional cost. Include branch circuit conduit, wiring, circuit breaker, terminations, etc. as required for complete system. Branch circuit serving indoor unit originates in same panelboard serving outdoor unit.

Testing and Adjusting/Performance Test: Except where initial unit operation clearly shows the performance meets or exceeds the requirements, test to show compliance. The manufacturer's representative in the presence of the Engineer to perform tests.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Refrigerant coils.

RELATED REQUIREMENTS

Section 23 23 00 - Refrigerant Piping.

REFERENCE STANDARDS

AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

NFPA 70 - National Electrical Code.

SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

SUBMITTALS

See Section 01 30 00 - Administrative Requirements, for submittal procedures.

Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

Shop Drawings: Indicate coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

Certificates: Certify that coil capacities, pressure drops, and selection procedures meet or exceed specified requirements.

Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

DELIVERY, STORAGE, AND HANDLING

Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.

Protect coils from entry of dirt and debris with pipe caps or plugs.

WARRANTY

See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

Provide five year manufacturer warranty for _____.

PART 2 PRODUCTS

REFRIGERANT COILS

Manufacturers:
RAE Coils
Aerofin Corporation: www.aerofin.com/#sle.
Nortek Coil Solutions: www.nortekair.com/#sle.
Trane Technologies, PLC: www.trane.com/#sle.

Tubes: 5/8 inch OD seamless copper arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.

Fins: Aluminum continuous plate type with full fin collars. Solder coat copper fin coils.

Casing: Die formed channel frame of 16 gauge, 0.0598 inch galvanized steel with 3/8 inch mounting holes on 3 inch centers. Provide tube supports for coils longer than 36 inches.

Headers: Seamless copper or brass tubes with silver brazed joints.

Liquid Distributors: Brass or copper venturi type distributor with seamless copper distributor tubes, 5/16 inch outside diameter; maximum 12 circuits per distributor.

Testing: Air test under water at 300 psi for working pressure of 250 psi; clean, dehydrate, and seal with dry nitrogen charge.

Configuration: Down feed with bottom suction to prevent trapping of oil.

Fin Spacing: 8 fins per inch.

PART 3 EXECUTION

INSTALLATION

Install in accordance with manufacturer's written instructions.

Install in existing air handler in accordance with SMACNA (DCS).

Protect coils to prevent damage to fins and flanges. Comb out bent fins.

Install coils level. Install cleanable tube coils with 1:50 pitch.

Make connections to coils with unions and flanges.

Refrigerant Coils: Provide sight glass in liquid line within 12 inches of coil. Refer to Section 23 23 00.

END OF SECTION

PART 1 GENERAL

SUMMARY

Intent of this Division's Specifications and Drawings is to provide a complete and workable facility, with complete systems as required by applicable codes, as indicated, and as specified.

Provide complete and workable facility with complete systems that comply with the requirements of the state codes, local codes, and other authorities having jurisdiction. Include design, labor and materials required to install, test and place into operation the systems as called for in the Contract Documents and according to applicable codes and regulations.

Specifications and the accompanying Drawings are complementary and what is called for by one is as binding as if called for by both.

General and Supplemental Conditions apply to this Division, including but not limited to:
Drawings and Specifications.
Public ordinances and permits.
Payments and fees required by governing authorities for work of this Division.

Drawings that accompany this Division are diagrammatic. They do not show every offset, bend, tee, or elbow, which may be required to install work in the space provided and avoid conflicts with other construction.

Provide connections, raceway, wiring, breakers and installation required for systems specified, as required by the manufacturers installation documents, and for complete system functionality.

Offsets and transitions are to be assumed at a minimum at each crossing of services, structural penetrations through shear walls or beams, structural grids, where ceiling heights are restricted, and at piping and conduit mains.

Follow Drawings as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions, and without additional cost to the Owner. Significant deviations from the routing shown on the drawings is subject for approval prior to installation. The right is reserved by the design team to make reasonable changes in locations of system components prior to roughing-in, without cost impact.

Verify dimensions, field conditions, quantities, and measurements prior to installing work.

Work done under this Division of the specifications includes the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings or as specified herein.

Work installed contrary to Drawings and Specifications is subject to change as directed by the Owner and no extra compensation will be allowed for making those changes.

PRICE AND PAYMENT PROCEDURES

Allowances
Comply with Division 01, General Requirements.

Alternates
Comply with Division 01, General Requirements.
Refer to Drawings for detailed information relating to the appropriate alternates.

RELATED REQUIREMENTS

Division 00, Procurement and Contracting Requirements

Division 01, General Requirements

Division 07, Thermal and Moisture Protection

Division 08, Openings

Division 09, Finishes

Division 11, Equipment

Division 21, Fire Suppression

Division 22, Plumbing

Division 23, Heating, Ventilating, and Air Conditioning (HVAC)
Division 26, Electrical
Division 27, Communications
Division 28, Electronic Safety and Security
Division 33, Utilities

REFERENCES

References, Codes and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 27 Sections and those listed in this section.

Codes and Standards:
Comply with applicable sections of the most recent editions and addenda of following for interior and exterior installations.
Codes include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
IBC - International Building Code
NEC/NFPA 70 - National Electrical Code
ANSI/IEEE C2 - National Electrical Safety Code
ANSI - American National Standards Institute
NEMA - National Electrical Manufacturers Association
NFPA - National Fire Protection Association
NECA - National Electrical Contractor Association
NETA - National Electrical Testing Association
IEEE - Institute of Electrical and Electronic Engineers
UL - Underwriters Laboratories
[FED SPEC - Federal Specifications]
[FAR - Federal Acquisition Regulation]
State of Oregon:
OAR - Oregon Administrative Rules
OESC - Oregon Electrical Specialty Code
OFC - Oregon Fire Code
OSSC - Oregon Structural Specialty Code
OEESC - Oregon Energy Efficiency Specialty Code
Oregon Elevator Specialty Code

ADMINISTRATIVE REQUIREMENTS

Coordination
Review Drawings of other trades and Owner provided equipment to avoid conflicts.
Report potential conflicts to Architect, provide resolution prior to rough-in.
Architectural Drawings take precedence regarding exact placement of system components and equipment.
Verify physical dimensions and access requirements of equipment to fit the space available.
Coordinate access routes through the construction, equipment move-in planning, and provide required equipment, transport and services necessary to facilitate installation of equipment.
Where connections are required for equipment provided as Work of other Divisions, coordinate rough in and connection requirements for that equipment with its supplier and installer prior to commencing work.
Notify Architect of discrepancies between the actual rough in and connection requirements, and those identified on Drawings for resolution prior to installation.
Coordinate underground work with other trades working on the site.
Common trenches may be used with other trades, providing clearances required by codes and ordinances are maintained.
Coordinate installation of required supporting devices and set sleeves in architectural and structural components as they are constructed.
Coordinate location of access panels and doors for items concealed behind finished surfaces with Architect.

Coordinate sleeve selection and application with firestopping specified elsewhere.
Finishes: Coordinate with Architect, finish to match surrounding surfaces.
Layout Drawings:
Documents represent the design intent for the systems on the project. They do not indicate means and methods.
For projects with existing conditions and renovations, the documents do not represent the installed systems or installations.
Equipment arrangement shown on Drawings is diagrammatic to indicate general equipment sizing and spatial relationship. Include, as part of distribution equipment submittal, a scaled floor plan, which includes equipment shown with their submitted sizes. Include feeder conduit routing, both aboveground and underground, including termination points at equipment. Submit for Engineer's review prior to commencing work.
Provide additional wiring details at switchboards, motor control centers, and other areas where work is of sufficient complexity to warrant additional detailing for coordination.
Equipment layouts will comply with code required clearance and working areas and any additional required maintenance clearance and access areas.
Submit layout drawings for approval prior to commencing field installation.
Arrange raceways, wiring, and equipment to permit ready access to switches, motors, and control components.
Keep doors and access panels clear.
Coordinate electrical, telephone, and other utility services with the appropriate serving utility.
No additional compensation will be allowed to the Contractor for connection fees or additional work or equipment required by the serving utility, but not covered in the Drawings or Specifications.

Sequencing
Electrical work of this project is complex in nature and has an inherent sequence, which may not be readily discernable.
Implement construction sequences to be the least impactive possible to current facilities and services.
Where current services are required to be maintained, provide necessary equipment such temporary generators and connections to minimize downtime and cutovers.
Submit construction sequences for review and coordinate sequencing with other trades.
Construction sequences may be provided as part of the design documents. Where provided, review, provide comments and input. The sequences indicate the general natural of the work are provided as a guide. Provide further development of the construction sequences as required to perform the work.

Permits
Obtain permits and inspections for the installation of work and pay charges required. Deliver certificates of inspection issued by authorities to the Owner.

Change Orders
Supplemental cost proposals by the Contractor accompanied with a complete itemized breakdown of labor and materials. At the Architect's request, make available estimating sheets for the supplemental cost proposals. Separate and allocate labor for each item of work.

SUBMITTALS

General Submittal Requirements:
Refer to Division 00 and Division 01 for general submittal requirements.
Requirements set forth in this Section pertain to all specifications included in this Division of work.

Pre-Bid Submittal Requirements
Submit Questions and Substitution Requests before the Questions deadline, defined in Division 00 and Division 01.

Bid Submittal Requirements
Refer to individual Division sections for specific requirements due with Bid.

Contractor Responsibilities:
Provide submittals one time and organized in proper order.
Indicate deviations from Drawings and Specifications explicitly in the submittals. Failure to comply will void review automatically.

Submittal Schedule:
General:
Submit a schedule that is coordinated with the project construction schedule.
Allow for time required for review of submittals, making corrections/revisions to submittals, ordering, manufacturing, fabrication, and delivery.
Submittal Schedule to include the following for each submittal as a minimum:
Identify submittal by specification section number and title.
Date the item will be submitted. Arrange items in chronological order by scheduled date for first submittal.
Identify critical submittals and long lead items explicitly.
Submittal Category:
Product Data
Coordination Drawings
Shop Drawings
Samples
Construction Sequences
Certificates
Delegated Design Submittals
Test and Evaluation Reports
Manufacturers' Instructions
Source Quality Control
Site Quality Control
Manufacturer Reports
Sustainable Design
Qualification Statements
Closeout Submittal Category:
Maintenance Contracts
Operations and Maintenance Data
Bonds
Warranty Documentation
Final Test and Evaluation Reports
Record Documentation
Demonstration and Training
Sustainable Design Closeout
Software

Product Data:
General:
Assemble complete submittal package for this Division into a single submittal.
Partial submittals will not be accepted.
Submit product data on following equipment for review:
Equipment scheduled on Drawings.
Equipment requiring electrical connections or connections by other trades.
As required by each specification section or by notes on the Drawings.
Format:
Electronic: Submit electronic copies for Work of this Division in PDF format.
Include a complete index in the original submittal.
Incorporate links enabling navigation to each item.
Identify with each item filed under a folder and labeled with its respective specification section number, Article, and paragraph.
Provide cover sheet for each applicable section number.
Hard Copy: Submit copies for Work of this Division in a 3-ring loose leaf binder.
Include a complete index in the original submittal.
Identify with each item filed under a tab and labeled with its respective specification section number, Article, and paragraph
Provide cover sheet for each applicable section number.
Include for each item as a minimum:

Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified.
Manufacturer’s detailed shop drawings including clearances required.
Manufacturer’s detailed specifications.
Manufacturer’s data sheets including capacities, operating speeds, power requirements, design and operating conditions, performance curves, characteristics scheduled or described on the Drawings, and similar data.
List the name of the motor manufacturer and service factor for each piece of equipment.
Indicate equipment operating weights including bases and weight distribution at support points.
Wiring diagrams showing factory installed wiring.

Coordination Drawings:
General:
Assemble complete submittal package for the project into a minimum of two submittals.
Coordination Drawings - Below Grade
Coordination Drawings - Above Grade
Prepare project-specific information, drawn accurately to scale.
Submit coordination drawings for review prior to beginning fabrication.
Sheet Size: Match sheet size of Construction Drawings.
Prepare in two-dimensional format utilizing the same digital data software program, version, and operating system utilized to develop the Construction Drawings.
Format:
Electronic: Submit electronic copies in PDF format.
Include as a minimum:
Unique color code and overlay shop drawings with each trade listed below provided on a separte layer within the PDF, bookmark systems within PDF:
Structural
Ceiling Systems
HVAC Equipment
HVAC Ductwork
HVAC Piping
Plumbing Equipment
Plumbing Piping
Fire Suppression
Lighting
Electrical Power
Communications
Electronic Safety and Security
Complete floor plans to a minimum of 1/4-inch equals 1-foot scale.
Mechanical rooms to a minimum of 1/2-inch equals 1-foot scale.
Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.

Shop Drawings:
General:
Assemble complete submittal package for this Division into a single submittal.
Partial submittals will not be accepted.
Prepare project-specific information, drawn accurately to scale.
Prepare new Shop Drawings by Contractor and not reproductions or tracings of Engineer's Design Drawings.
Submit shop drawings for review prior to beginning fabrication.
Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.
Sheet Size: Match sheet size of Construction Drawings.
Prepare in three-dimensional format utilizing the same digital data software program, version, and operating system utilized to develop the Construction Drawings.
Format:

Electronic: Submit electronic copies for Work of this Division in PDF format.
Include a complete index in the original submittal.
Incorporate links enabling navigation to each item.
Identify with each item filed under a folder and labeled with its respective specification section number, Article and paragraph.
Include as a minimum:
Complete floor plans to a minimum of 1/4-inch equals 1-foot scale.
Mechanical, Electrical, and Technology rooms to a minimum of 1/2-inch equals 1-foot scale.
Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.
Fabricated equipment to a minimum of 1/4-inch equals 1-foot scale.

Samples
Refer to individual Division sections for Submittal requirements.

Certificates
Refer to individual Division sections for Submittal requirements.

Delegated Design Submittals
Refer to individual Division sections for Submittal requirements.

Test and Evaluation Reports
Refer to individual Division sections for Submittal requirements.

Manufacturers' Instructions
Refer to individual Division sections for Submittal requirements.

Source Quality Control Submittals
Refer to individual Division sections for Submittal requirements.

Site Quality Control Submittals
Refer to individual Division sections for Submittal requirements.

Manufacturer Reports
Refer to individual Division sections for Submittal requirements.

Sustainable Design Submittals
Refer to individual Division sections for Submittal requirements.

Qualification Statements
Refer to individual Division sections for Submittal requirements.

CLOSEOUT SUBMITTALS

Maintenance Contracts
Refer to individual Division sections for Submittal requirements.

Operations and Maintenance Data
General:
Assemble complete submittal package for this Division into a single submittal.
Partial submittals will not be accepted.
Submit when the work is substantially complete.
Submit manufacturer's operation and maintenance instruction manuals and parts lists for review on following equipment:
Equipment scheduled on Drawings.
Equipment requiring electrical connections or connections by other trades.
As required by each specification section or by notes on the Drawings.
Format:
Electronic: Submit electronic copies for Work of this Division in PDF format.
Include a complete index in the original submittal.
Incorporate links enabling navigation to each item.
Identify with each item filed under a folder and labeled with its respective specification section number, Article and paragraph.
Include for each item as a minimum:

Include name and contact information for location of source parts and service for each piece of equipment.
Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified.
Manufacturer’s operation and maintenance instruction manuals.
Manufacturer’s detailed shop drawings including clearances required.
Manufacturer’s detailed specifications.
Manufacturer’s data sheets including capacities, operating speeds, power requirements, design and operating conditions, performance curves, characteristics scheduled or described on the Drawings, and similar data.
List the name of the motor manufacturer and service factor for each piece of equipment.
Indicate equipment operating weights including bases and weight distribution at support points.
Wiring diagrams showing factory installed wiring.

Bonds
Refer to individual Division 00 and Division 01 sections for Submittal requirements.

Warranty Documentation
Refer to individual Division 00 and Division 01 sections for Submittal requirements.

Final Test and Evaluation Reports
Refer to individual Division sections for Submittal requirements.

Record Documentation
Shop Drawings
Shop drawings updated with as-built information and submitted as the record drawing set.
Record Drawings
General:
Provide drawings with notations reflecting the as-built conditions.
Notations to include any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.
Prepare project-specific information, drawn accurately to scale.
Provide project specific title block.
Sheet Size: Match sheet size of Construction Drawings.
Prepare in two-dimensional format utilizing the same digital data software program, version, and operating system utilized to develop the Construction Drawings.
Format:
Electronic: Submit electronic copies of record drawings for Work of this Division in PDF format.
Include a complete index in the original submittal.
Incorporate links enabling navigation to each item.
Identify with each item filed under a folder and labeled with its respective specification section number, Article and paragraph.

Demonstration and Training
Training Plan:
Submit outline of instructional program for demonstration and training.
Include the following:
List of training modules.
Schedule of proposed dates, times, length of instruction time.
Instructors' names for each training module.
Learning objective and outline for each training module.
Training Video Recordings:
Identification: On each copy, provide an applied label with the following information:
Name of Project.
Name and address of videographer.
Name of Architect.
Name of Contractor or Construction Manager.

Sustainable Design Closeout Documentation
Refer to individual Division sections for Submittal requirements.

Software
Refer to individual Division sections for Submittal requirements.

MAINTENANCE MATERIAL SUBMITTALS

Spare Parts
Refer to individual Division sections for Submittal requirements.

Extra Stock Materials
Refer to individual Division sections for Submittal requirements.

Tools
Refer to individual Division sections for Submittal requirements.

QUALITY ASSURANCE

Regulatory Requirements
Products and equipment are prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
General:
Conform Work and materials to requirements of the local, State, and Federal authorities having jurisdiction and other applicable laws and regulations.
Where codes or standards are referenced, the applicable portions apply.
Drawings, specifications, codes and standards are minimum requirements. Where requirements differ, apply the more stringent.
Should any change in drawings or specifications be required to comply with governing regulations, notify the Architect prior to submitting bid.
Execute work in strict accordance with the best practices of the trades in a thorough, substantial, skillful and well-executed manner by competent workers. Provide a competent, experienced full-time Superintendent who is authorized to make decisions on behalf of the Contractor.
The Architect or Architect's Representative may conduct unannounced field reviews of any work completed or in progress during the Contractor's working hours. A report will be issued to the Contractor if the field review of the systems construction has revealed elements of the work which are inconsistent with the Contract Documents. Items in the report are to be addressed in writing by the Contractor within two (2) weeks and corrections in the field made as directed.

Apparatus:
Build and install to deliver full rated capacity at the efficiency for which it was designed.
Provide entire system and apparatus that operate at full capacity without objectionable noise or vibration.

Alignment
Install panels, cabinets, and equipment level and true. Provide housekeeping pads and curbs accounting for floor or roof slope.
Install distribution equipment and electrical enclosures fitted neatly, without gaps, openings, or distortion.
Properly and neatly, close unused openings with approved devices.
Fit surface panels, devices, and outlets with neat, appropriate, trims, plates, or covers without overhanging edges, protruding corners, or raw edges.

Materials and Equipment:
Provide new work of good quality, free of faults and defects and in conformance with the Construction documents.
Each piece of equipment furnished will meet the detailed requirements of the Drawings and Specifications and will be suitable for the installation shown. Equipment not meeting the requirements will not be acceptable, even though specified by name along with other manufacturers.
Each piece of equipment furnished to be listed, classified, and labeled as suitable for the purpose intended.
Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
Furnish materials and equipment of size, make, type, and quality herein specified.

Equipment scheduled by performance or model number is considered as the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the Contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.

Workmanship:
General: Install materials in a neat and professional manner.
Manufacturer’s Instructions:
Follow manufacturer’s directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division Specifications, obtain clarification before starting work.

Noise Control
Do not install contactors, transformers, starters, and similar noise-producing devices on walls that are common to occupied spaces, unless otherwise indicated.
Where such devices are indicated to be mounted on walls common to occupied spaces, use shock mounts, or otherwise isolate them to prevent the transmission of noise to the occupied spaces.
Ballasts, contactors, starters, transformers, and like equipment which are found to be noticeably noisier than other similar equipment on the project will be deemed defective and be replaced.

Cutting and Patching:
Provide cutting, patching, and repairing for the proper installation and completion of the work specified in this Division by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work. This work includes but is not limited to plastering, masonry work, concrete work, carpentry work, and painting.
Make additional openings required in building construction by drilling or cutting. Use of jackhammer is specifically prohibited.
Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
Do not pierce beams, columns or structure members without approval from the Architect and structure engineer, and then only as directed.
New or existing work cut or damaged will be restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces will be repaired, refinished, and left in condition existing prior to commencement of work.

Visibly damaged goods are to be returned to the supplier and replaced at no additional cost to the Owner.

Contractor Responsibility:
Examination of building and site responsibility:
Examine site and building prior to installation to determine conditions affecting the scope of work.
Contact Owner representative for arrangements.
Respect and protect the privacy and confidentiality of Owner, its employees, processes, products, and intellectual property to the extent necessary, consistent with the legal responsibilities of the State and Owner policies.
Total responsibility for the coordination and installation of the work shown and described in the Drawings and Specifications.
Specified systems installed under the direction of a qualified Contractor. Qualification requirements include submittal by the Contractor to the Architect of the following:
Have experience with three or more installations of systems comparable in size, complexity, type, and design as specified herein.
Perform each of these installations satisfactorily for at least one year after final acceptance by the user.
Include the names, locations, and point of contact for these installations as a part of the initial submittal documentation.
List of previous projects of this scope, size, and nature, including names and sizes of projects, description of work, time of completion, and names of contact persons for reference.

Manufacturers
Equipment in these Sections are the standard products of a manufacturer regularly engaged in the manufacture of such products unless specified otherwise. Provide commercial grade components and products used in the system that comply with these Specifications.

Each component of equipment identifies the manufacturer's name, model, and applicable serial number. The Owner's authorized representative retains the right to reject products that reflect, in their opinion, sub-standard design practices, manufacturing procedures, support services, or warranty policies.

Certifications
Refer to individual Division sections for Submittal requirements.

Sustainability Standards Certifications
Refer to individual Division sections for Submittal requirements.

Preconstruction Testing
Refer to individual Division sections for Submittal requirements.

Site Samples
Refer to individual Division sections for Submittal requirements.

Mock-ups
Refer to individual Division sections for Submittal requirements.

DELIVERY, STORAGE, AND HANDLING

Assume custody and responsibility for the items upon delivery and determining that the contents are complete and in satisfactory condition for installation.

The Contractor is responsible for handling and control of equipment and liable for material loss due to delivery and storage problems.

Materials and equipment delivered and placed in storage will be stored with protection from the weather, humidity, and temperature variation, dirt, and dust or other contaminants.

Coordinate deliveries and submittals with the General Contractor/Owner to ensure a timely scheduled installation.

Equipment and materials are to be delivered to the site no more than three weeks prior to the commencement of its installation. Coordinate with General Contractor/Owner for the location of storage materials.

SITE CONDITIONS

Existing Conditions:
Prior to bidding, verify and become familiar with existing conditions by visiting the site.
Include related costs associated with site factors in the initial bid proposal.

Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

WARRANTY

Provide a written guarantee covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

Arrange to have the equipment factory representative present for those tests where the manufacturer's warranty could be impacted by the absence of a factory representative.

Correct warranty items promptly upon notification.

Apparatus:
Free of defects of material and workmanship and in accord with the Contract Documents.
Built and installed to deliver its full rated capacity at the efficiency for which it was designed.

UNINTERRUPTED SERVICE

Maintain electrical, signal and communication services to all functioning portions of the building throughout construction.

Pre-arrange with Owner outages necessary for new construction.
Comply with Division 01, General Requirements.
Apply for scheduled shutdowns a minimum of 4 weeks prior to time needed and reconfirm a minimum of 72 hours prior to time needed.
Contractor is liable for any damages resulting from unscheduled outages or for those not confined to the pre-arranged times. Damages include costs incurred by the Owner and by the Owner's tenants.

DEMOLITION AND SALVAGE

General:
Where affected by work, remove or relocate equipment, services, and systems encountered during the course of the remodel/construction work to a safe location that will be undisrupted by further construction.
Disconnect electrical service to hard-wired equipment scheduled for removal under other Divisions of Work.
Wiring which serves usable existing outlets restored and routed clear of the construction or demolition.
Safely cut off and terminate wiring abandoned and removed to leave site clean.

Reuse of Existing:
Existing concealed conduits in good condition may be reused for installation of new wiring where available.
Existing undamaged, properly supported surface conduits may be reused where surface conduits are called for, if the installation meets workmanship requirements of the Specifications.
Where new wiring is added or existing wiring disturbed in existing branch circuit raceways, existing wires replaced with new.

Salvage and Disposal:
Removed materials, not containing hazardous waste, not scheduled for reuse are the property of the Contractor for removal from the site, except for those items specifically indicated on the Drawings for salvage or reuse.
Identify materials containing, or possibly containing, hazardous waste for removal and disposal by the Hazardous Waste Contractor.
Neatly store salvaged items at one location at the site where directed by the Owner's Representative.
Salvage properly operating circuit breakers from panels scheduled for removal and use to replace faulty or inadequate breakers in existing panels scheduled to remain.

COMPLETION AND TESTING

General:
Comply with Division 01, General Requirements.

Upon completion, test systems to show that installed equipment operates as designed and specified, free of faults and unintentional grounds.
Schedule system tests so that several occur on the same day.
Coordinate testing schedule with construction phasing.
Conduct tests in the presence of the Architect or its representative.
Notify Architect of tests 48 hours in advance.

Engage a journeyman electrician with required tools to conduct equipment tests. Arrange to have the equipment factory representative present for those tests where the manufacturer's warranty could be impacted by the absence of a factory representative.

Perform tests per the requirements of each of the following systems:
Low Voltage Distribution System
Emergency Power System
Fire Alarm System
Security System
Public Address System
Lighting System

Lighting Control System
Power Metering and Monitoring System

Provide a written record of performance tests and submit with operation and maintenance data.

PART 2 PRODUCTS

PART 3 EXECUTION

INSTALLATION

Equipment Support
Minimum Support Capacity:
Provide fastening devices and supports for electrical equipment, luminaires, panels, outlets, and cabinets capable of supporting not less than four times the ultimate weight of the object or objects fastened to or suspended from the building structure.
Powder actuated or similar shot-in fastening devices will not be permitted for electrical work except by special permission from the Architect and Structural Engineer.

Equipment Connections
General:
Provide complete electrical connections for items of equipment requiring such connections, including incidental wiring, materials, devices, and labor necessary for a finished working installation.
Verify location and method for connecting to each item of equipment prior to roughing-in.
Check amperage, maximum overcurrent protection, voltage, phase, and similar attributes of each item of equipment before rough in and connection.
Motor Connections:
Make motor connections for the proper direction of rotation.
Minimum Size Flex for Mechanical Equipment: 1/2-inch; except at small control devices where 3/8-inch flex may be used.
Exposed Motor Wiring: Jacketed metallic flex with minimum 6-inches slack loop.
Do not test run pump motors until liquid is in the system.
Control devices and wiring relating to the HVAC systems are furnished and installed under Division 23, HVAC; except for provisions or items indicated in Division 26, Electrical Drawings and Specifications.

Special Techniques
Installation in Rated Construction
Install intumescent material around ducts, conduits, and other electrical elements penetrating rated construction.
Comply with firestop materials manufacturer written instructions to prevent spread of smoke or fire through sleeves or block-outs penetrating rated fire barriers.
Provide firestop materials specified in Division 07:
Wiring in Precast Construction
Coordinate installation of electrical conduit, boxes, fittings, anchors, and miscellaneous items concealed in precast concrete assemblies with the General Contractor.
Where electrical items are required to be installed in concrete assemblies precast off-site, it will be the Electrical Contractor's responsibility to place the electrical items necessary in the concrete at the off-site locations or pay for the General Contractor to make arrangements for the installation of these items in the precast assemblies. Electrical Contractor held responsible for the proper placement and locations of electrical items at the off-site location.

Interface with Other Work
Existing concrete, block, or brick walls are considered not accessible and may require use of Surface Mounted Raceway (SMR) if existing concealed raceway and device boxes are not available for reuse or do not meet the intent of the design (i.e., proximity to egress path, point of use, etc.). Coordinate route and installation where SMR is required with the Architect/Engineer prior to rough-in. Responsible for reinstalling SMR routed without such prior approval to the Architect's satisfaction.

Existing stud walls (wood or metal) with or without blocking with plaster, plasterboard, or paneling finish are considered accessible with accessible ceiling, attic, tunnel, or crawl space above, below, or adjacent. Remove, patch, and repair finished surface as required to conceal rough in for new device locations. If it is determined that a specific instance will not permit concealment of rough-in due to obstructions such as beams, headers, and other structural elements, prior approval before rough-in from the Architect is required.

Systems Integration

Tolerances

SITE QUALITY CONTROL

Site Tests and Inspections

Non-Conforming Work

Manufacturer Services

CLEANING

Waste Management

General

Painted Surfaces:
Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

PROTECTION

Protect electrical work and equipment installed under this Division against damage by other trades, weather conditions, or any other causes.
Equipment found damaged or in other than new condition will be rejected as defective.

Keep switchgear, transformers, panels, luminaires, and electrical equipment covered or closed to exclude dust, dirt, and splashes of plaster, cement, paint, or other construction material spray.
Equipment not free of contamination is not acceptable.

Provide enclosures and trims in new condition, free of rust, scratches, and other finish defects.
If damaged, properly refinish in a manner acceptable to the Architect.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Electrical demolition.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical for submittal procedures.

PART 2 PRODUCTS

MATERIALS AND EQUIPMENT

Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

EXAMINATION

Verify field measurements and circuiting arrangements are as indicated.

Verify abandoned wiring and equipment serve only abandoned facilities.

Demolition drawings are based on casual field observation.

Report discrepancies to Owner before disturbing existing installation.

Report discrepancies to Architect before disturbing existing installation.

Beginning of demolition means installer accepts existing conditions.

PREPARATION

Disconnect electrical systems in walls, floors, and ceilings to be removed.

Coordinate utility service outages with utility company.

Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
Obtain permission from Owner at least 240 hours before partially or completely disabling system.
Make temporary connections to maintain service in areas adjacent to work area.

Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
Notify Owner before partially or completely disabling system.
Notify monitoring facility of prior to any system/wiring/device changes.
Make notifications at least 240 hours in advance.
Make temporary connections to maintain service in areas adjacent to work area.

Existing Telecom System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
Obtain permission from Owner at least 240 hours before partially or completely disabling system.
Obtain permission from Architect at least 240 hours before partially or completely disabling system.
Make temporary connections to maintain service in areas adjacent to work area.

DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
PCB-containing electrical equipment, including transformers, capacitors, and switches.
PCB- and DEHP-containing lighting ballasts.
Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

Remove, relocate, and extend existing installations to accommodate new construction.

Remove abandoned wiring to source of supply.

Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

Disconnect and remove abandoned panelboards and distribution equipment.

Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

Repair adjacent construction and finishes damaged during demolition and extension work.

Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

CLEANING AND REPAIR

See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

Clean and repair existing materials and equipment that remain or that are to be reused.

Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Single conductor building wire.

Underground feeder and branch-circuit cable.

Metal-clad cable.

Wiring connectors.

Oxide inhibiting compound.

Wire pulling lubricant.

Cable ties.

RELATED REQUIREMENTS

Section 07 84 00 - Firestopping.

Section 26 05 05 - Selective Demolition for Electrical.

Section 26 05 26 - Grounding and Bonding for Electrical Systems.

Section 26 05 53 - Identification for Electrical Systems.

Section 28 46 00 - Fire Detection and Alarm.

REFERENCE STANDARDS

ASTM B3 - Standard Specification for Soft or Annealed Copper Wire.

ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes.

ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation.

ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape.

NECA 1 - Standard for Good Workmanship in Electrical Construction.

NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable.

NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF).

NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.

NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.

NFPA 70 - National Electrical Code.

UL 44 - Thermoset-Insulated Wires and Cables.

UL 83 - Thermoplastic-Insulated Wires and Cables.

UL 267 - Outline of Investigation for Wire-Pulling Compounds.

UL 486A-486B - Wire Connectors.

UL 486C - Splicing Wire Connectors.

UL 486D - Sealed Wire Connector Systems.

UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables.

UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.

UL 1277 - Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

UL 1569 - Metal-Clad Cables.

ADMINISTRATIVE REQUIREMENTS

Coordination:
Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical, for submittal procedures.

Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

DELIVERY, STORAGE, AND HANDLING

Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

FIELD CONDITIONS

Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

CONDUCTOR AND CABLE APPLICATIONS

Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

Metal-clad cable is permitted only as follows:
Where not otherwise restricted, may be used:
Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
Maximum Length: 6 feet.
Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard or terminate MC cabling within a local junction box and transition to conduit and building wire homerun back to panelboard within the room or as soon as possible.

CONDUCTOR AND CABLE GENERAL REQUIREMENTS

Provide products that comply with requirements of NFPA 70.

Provide products listed, classified, and labeled as suitable for the purpose intended.

Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

Comply with NEMA WC 70.

Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

Conductor Material:

Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
Conductors designated with the abbreviation "CU" indicate copper.
Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
Tinned Copper Conductors: Comply with ASTM B33.

Minimum Conductor Size:
Branch Circuits: 12 AWG, unless noted otherwise.
Exceptions:
20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.

Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

CONDUCTOR STRANDING:

Feeders and Branch Circuits:[<>]
Size 10 AWG and Smaller: Solid, unless noted otherwise.

Size 8 AWG and Larger: Stranded.Control Circuits: Stranded.

Conductor Color Coding:
Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
Color Coding Method: Integrally colored insulation.
Color Code:
480Y/277 V, 3 Phase, 4 Wire System:
Phase A: Brown.
Phase B: Orange.
Phase C: Yellow.
Neutral/Grounded: Gray.
208Y/120 V, 3 Phase, 4 Wire System:
Phase A: Black.
Phase B: Red.
Phase C: Blue.
Neutral/Grounded: White.
Equipment Ground, All Systems: Green.

SINGLE CONDUCTOR BUILDING WIRE

Manufacturers:
Copper Building Wire:
General
Essex
Okonite
Cerro Wire LLC.
Encore Wire Corporation.
General Cable Technologies Corporation; _____.
Southwire Company.

Description: Single conductor insulated wire.

Conductor Stranding:
Feeders and Branch Circuits:
Size 10 AWG and Smaller: Solid.
Size 8 AWG and Larger: Stranded.
Control Circuits: Stranded.

Insulation Voltage Rating: 600 V.

Insulation:
Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
Size 4 AWG and Larger: Type XHHW-2.
Installed Underground: Type XHHW-2.

UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

Manufacturers:
Cerro Wire LLC.
Encore Wire Corporation.
Southwire Company.
Okonite

Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.

Provide equipment grounding conductor unless otherwise indicated.

Conductor Stranding:
Size 10 AWG and Smaller: Solid.
Size 8 AWG and Larger: Stranded.

Insulation Voltage Rating: 600 V.

METAL-CLAD CABLE

Manufacturers:
AFC Cable Systems Inc.
Encore Wire Corporation.
Southwire Company.
The Okonite Company.

Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

Insulation Voltage Rating: 600 V.

Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

Grounding: Full-size integral equipment grounding conductor [sheath is not to be used as an equipment grounding conductor].

Armor:
Branch Circuits: Steel, interlocked tape
Feeders: Aluminum or steel, interlocked tape.

POWER AND CONTROL TRAY CABLE

Manufacturers:
Encore Wire Corporation.
General Cable Technologies Corporation; _____.
The Okonite Company.
Southwire Company.

Description: NFPA 70, Type TC cable listed and labeled as complying with UL 1277.

Conductor Stranding: Stranded.

Insulation Voltage Rating: 600 V.

Insulation: Type XHHW or XHHW-2.

Jacket: PVC or Chlorinated Polyethylene (CPE).

WIRING CONNECTORS

Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

Connectors for Grounding and Bonding: Comply with Section 26 05 26.

Wiring Connectors for Splices and Taps:
Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

Wiring Connectors for Terminations:
Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
Conductors for Control Circuits: Use crimped terminals for all connections.

Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
Manufacturers:
3M.
Ideal Industries, Inc.
NSI Industries LLC.

Mechanical Connectors: Provide bolted type or set-screw type.
Manufacturers:
Burndy LLC; _____.
Ilsco.
Thomas & Betts Corporation.

Compression Connectors: Provide circumferential type or hex type crimp configuration.
Manufacturers:
Burndy LLC; _____.
Ilsco.
Thomas & Betts Corporation.

Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
Manufacturers:
Burndy LLC; _____.
Ilsco.
Thomas & Betts Corporation.

ACCESSORIES

Electrical Tape:
Manufacturers:
3M.
Plymouth Rubber Europa.
Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
Manufacturers:
Burndy LLC; _____.
Ideal Industries, Inc.
Ilsco.

Wire Pulling Lubricant:
Manufacturers:
3M.
American Polywater Corporation.
Ideal Industries, Inc.
Listed and labeled as complying with UL 267.
Suitable for use with conductors/cables and associated insulation/jackets to be installed.
Suitable for use at installation temperature.

Cable Ties: Material and tensile strength rating suitable for application.
Manufacturers:
Burndy LLC; _____.

PART 3 EXECUTION

EXAMINATION

Verify interior of building has been protected from weather.

Verify work likely to damage wire and cable has been completed.

Verify raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

Verify field measurements are as indicated.

Verify conditions are satisfactory for installation prior to starting work.

PREPARATION

Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

INSTALLATION

Circuiting Requirements:
Unless dimensioned, circuit routing indicated is diagrammatic.
When circuit destination is indicated without specific routing, determine exact routing required.
Arrange circuiting to minimize splices.
Include circuit lengths required to install connected devices within 10 ft of location indicated.
Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
Maintain separation of wiring for emergency systems in accordance with NFPA 70.
Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
Increase size of conductors as required to account for ampacity derating.
Size raceways, boxes, etc. to accommodate conductors.
Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

Install products in accordance with manufacturer's instructions.

Perform work in accordance with NECA 1 (general workmanship).

Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.

Install metal-clad cable (Type MC) in accordance with NECA 120.

Installation in Raceway:
Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
Pull conductors and cables together into raceway at same time.
Pulleys or Blocks: Use for alignment of the conductors when pulling.
Make up and insulate wiring promptly after installation of conductors.
Do not pull wire in until bushings are installed and raceways terminations are completed.
Do not pull wire into conduit embedded in concrete until after the concrete poured and forms stripped
Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

Terminate cables using suitable fittings.
Metal-Clad Cable (Type MC):
Use listed fittings.
Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
Do not use direct-bearing set-screw type fittings for cables with aluminum armor.

Install conductors with a minimum of 12 inches of slack at each outlet.

Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

Make wiring connections using specified wiring connectors.
Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
Do not remove conductor strands to facilitate insertion into connector.
Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

Insulate ends of spare conductors using vinyl insulating electrical tape.

Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

FIELD QUALITY CONTROL

See Section 01 40 00 - Quality Requirements, for additional requirements.

Inspect and test in accordance with NETA ATS, except Section 4.

Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

Perform insulation resistance test for conductors 100A and larger, after installation and prior to termination.

Tests to be performed, record and maintain the results in tabular form, clearly identify each conductor tested,

Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Grounding and bonding requirements.

Conductors for grounding and bonding.

Connectors for grounding and bonding.

Ground bars.

RELATED REQUIREMENTS

Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
Includes oxide inhibiting compound.

Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

REFERENCE STANDARDS

IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.

NECA 1 - Standard for Good Workmanship in Electrical Construction.

NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.

NFPA 70 - National Electrical Code.

UL 467 - Grounding and Bonding Equipment.

ADMINISTRATIVE REQUIREMENTS

Coordination:
Verify exact locations of underground metal water service pipe entrances to building.
Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical, for submittals procedures.

Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

Shop Drawings:
Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.

Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

Field quality control test reports.

Project Record Documents: Record actual locations of grounding electrode system components and connections.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

Maintain at the project site a copy of each referenced document that prescribes execution requirements.

Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.

Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

DELIVERY, STORAGE, AND HANDLING

Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

GROUNDING AND BONDING REQUIREMENTS

Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

Do not use products for applications other than as permitted by NFPA 70 and product listing.

Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

Grounding System Resistance:
Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

Grounding Electrode System:
Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
Provide continuous grounding electrode conductors without splice or joint.
Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
Metal Underground Water Pipe(s):
Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
Metal In-Ground Support Structure:
Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

Bonding and Equipment Grounding:

Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
Metal gas piping.
Metal process piping.
Provide bonding for interior metal air ducts.

Communications Systems Grounding and Bonding:
Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for additional buildings or structures in accordance with NFPA 70.
Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

GROUNDING AND BONDING COMPONENTS

General Requirements:
Provide products listed, classified, and labeled as suitable for the purpose intended.
Provide products listed and labeled as complying with UL 467 where applicable.

Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
Use insulated copper conductors unless otherwise indicated.
Exceptions:
Use bare copper conductors where installed underground in direct contact with earth.
Use bare copper conductors where directly encased in concrete (not in raceway).
Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gauge of specified conductors.

Connectors for Grounding and Bonding:
Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
Exceptions:
Use mechanical connectors for connections to electrodes at ground access wells.
Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
Exceptions:
Use exothermic welded connections for connections to metal building frame.
Manufacturers - Mechanical and Compression Connectors:
Advanced Lightning Technology (ALT).

Burndy LLC.
UltraWeld, by Harger Lightning & Grounding.
Thomas & Betts Corporation.
_____.
Substitutions: See Section 01 60 00 - Product Requirements.
Manufacturers - Exothermic Welded Connections:
Burndy LLC.
Cadweld, a brand of Erico International Corporation.
thermOweld, subsidiary of Continental Industries; division of Burndy LLC.
Substitutions: See Section 01 60 00 - Product Requirements.

Ground Bars:
Description: Copper rectangular ground bars with mounting brackets and insulators.
Size: As indicated.
Holes for Connections: As indicated or as required for connections to be made.
Manufacturers:
Advanced Lightning Technology (ALT).
Erico International Corporation.
Harger Lightning & Grounding.
thermOweld, subsidiary of Continental Industries; division of Burndy LLC.
Substitutions: See Section 01 60 00 - Product Requirements.

Oxide Inhibiting Compound: Comply with Section 26 05 19.

PART 3 EXECUTION

EXAMINATION

Verify work likely to damage grounding and bonding system components has been completed.

Verify field measurements are as indicated.

Verify conditions are satisfactory for installation prior to starting work.

INSTALLATION

Install products in accordance with manufacturer's instructions.

Perform work in accordance with NECA 1 (general workmanship).

Make grounding and bonding connections using specified connectors.
Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

Identify grounding and bonding system components in accordance with Section 26 05 53.

Ufer Ground: Provide a concrete encased building grounding electrode where shown on the Drawings. Grounding electrode to consist of a minimum of 20 feet of #4 AWG copper conductor cast into the bottom 6 inches of an exterior concrete foundation or footing.

FIELD QUALITY CONTROL

See Section 01 40 00 - Quality Requirements, for additional requirements.

Inspect and test in accordance with NETA ATS except Section 4.

Perform inspections and tests listed in NETA ATS, Section 7.13.

Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

RELATED REQUIREMENTS

Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

Section 26 50 00 - Lighting: Additional support and attachment requirements for interior luminaires.

REFERENCE STANDARDS

ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

MFMA-4 - Metal Framing Standards Publication.

NECA 1 - Standard for Good Workmanship in Electrical Construction.

NFPA 70 - National Electrical Code.

UL 5B - Strut-Type Channel Raceways and Fittings.

ADMINISTRATIVE REQUIREMENTS

Coordination:
Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
Coordinate work to provide additional framing and materials required for installation.
Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

Sequencing:
Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

SUBMITTALS

Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

Installer's qualification statement.

Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

QUALITY ASSURANCE

Maintain at project site one copy of each referenced document that prescribes execution requirements.

Installer Qualifications for Powder-Actuated Fasteners: Certified by fastener system manufacturer with current operator's license.

Installer Qualifications for Field Welding: See Section 05 50 00.

Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

DELIVERY, STORAGE, AND HANDLING

Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

SUPPORT AND ATTACHMENT COMPONENTS

General Requirements:
Comply with the following. Where requirements differ, comply with most stringent.
NFPA 70.
Requirements of authorities having jurisdiction.
Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of 1.
Include consideration for vibration, equipment operation, and shock loads where applicable.
Do not use products for applications other than as permitted by NFPA 70 and product listing.
Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
Steel Components: Use corrosion-resistant materials suitable for environment where installed.
Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

Materials for Metal Fabricated Supports: See Section 05 50 00.

Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
Conduit Straps: One-hole or two-hole type; steel or malleable iron.
Conduit Clamps: Bolted type unless otherwise indicated.

Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
Manufacturers:
Eaton Corporation.
Emerson Electric Co; O-Z/Gedney.
HoldRite, a brand of Reliance Worldwide Corporation.
Erico International Corporation.
Thomas & Betts Corporation.
Substitutions: See Section 01 60 00 - Product Requirements.

Metal Channel/Strut Framing Systems:
Manufacturers:
Atkore International Inc; Unistrut.
Thomas & Betts Corporation.
Eaton Corporation.
Source Limitations: Furnish channel/strut and associated fittings, accessories, and hardware produced by single manufacturer.
Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
Comply with MFMA-4.
Channel/Strut Used as Raceway, Where Indicated: Listed and labeled as complying with UL 5B.

Channel Material:
Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
Minimum Channel Dimensions: 1-5/8 inch wide by 13/16 inch high.

Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
Minimum Size, Unless Otherwise Indicated or Required:
Equipment Supports: 1/2-inch diameter.
Busway Supports: 1/2-inch diameter.
Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
Trapeze Support for Multiple Conduits: 3/8-inch diameter.
Outlet Boxes: 1/4-inch diameter.
Luminaires: 1/4-inch diameter.

Nonpenetrating Rooftop Supports for Low-Slope Roofs:
Manufacturers:
Atkore International Inc; Unistrut.
Eaton Corporation.
Erico International Corporation.
PHP Systems/Design
Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

Anchors and Fasteners:
Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
Hollow Masonry: Use toggle bolts.
Hollow Stud Walls: Use toggle bolts.
Steel: Use beam clamps, machine bolts, or welded threaded studs.
Sheet Metal: Use sheet metal screws.
Wood: Use wood screws.
Plastic and lead anchors are not permitted.
Powder-actuated fasteners are not permitted.
Where approved by Architect.
Use only threaded studs; do not use pins.
Hammer-driven anchors and fasteners are not permitted.
Nails are permitted for attachment of nonmetallic boxes to wood frame construction.
Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction.
Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
Manufacturer: Same as manufacturer of metal channel/strut framing system.
Comply with MFMA-4.
Channel Material: Use galvanized steel.
Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.
Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

EXAMINATION

Verify that field measurements are as indicated.

Verify that mounting surfaces are ready to receive support and attachment components.

Verify that conditions are satisfactory for installation prior to starting work.

INSTALLATION

Install products in accordance with manufacturer's instructions.

Install hangers and supports in accordance with NECA 1.

Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

Unless specifically indicated or approved by Architect, do not provide support from roof deck.

Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

Field Welding, Where Approved by Architect: See Section 05 50 00.

Equipment Support and Attachment:
Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 3 inches in height; see Section 03 30 00.
Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

Conduit Support and Attachment: See Section 26 05 33.13 for additional requirements.

Box Support and Attachment: See Section 26 05 33.16 for additional requirements.

Interior Luminaire Support and Attachment: See Section 26 51 00 for additional requirements.

Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

Secure fasteners in accordance with manufacturer's recommended torque settings.

Remove temporary supports.

Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

FIELD QUALITY CONTROL

See Section 01 40 00 - Quality Requirements for additional requirements.

Inspect support and attachment components for damage and defects.

Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Galvanized steel rigid metal conduit (RMC).

Aluminum rigid metal conduit (RMC).

Intermediate metal conduit (IMC).

PVC-coated galvanized steel rigid metal conduit (RMC).

Flexible metal conduit (FMC).

Liquidtight flexible metal conduit (LFMC).

Galvanized steel electrical metallic tubing (EMT).

Rigid polyvinyl chloride (PVC) conduit.

RELATED REQUIREMENTS

Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.

Section 07 84 00 - Firestopping.

Section 26 05 26 - Grounding and Bonding for Electrical Systems.
Includes additional requirements for fittings for grounding and bonding.

Section 26 05 29 - Hangers and Supports for Electrical Systems.

Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

Section 31 23 16 - Excavation.

Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

Section 31 23 23 - Fill: Bedding and backfilling.

REFERENCE STANDARDS

ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC).

ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S).

ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A).

NECA 1 - Standard for Good Workmanship in Electrical Construction.

NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT).

NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit.

NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC).

NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.

NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit.

NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.

NFPA 70 - National Electrical Code.

UL 1 - Flexible Metal Conduit.

UL 6 - Electrical Rigid Metal Conduit-Steel.

UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel.

UL 360 - Liquid-Tight Flexible Metal Conduit.

UL 514A - Metallic Outlet Boxes.

UL 514B - Conduit, Tubing, and Cable Fittings.

UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.

UL 797 - Electrical Metallic Tubing-Steel.

ADMINISTRATIVE REQUIREMENTS

Coordination:
Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
Verify exact conduit termination locations required for boxes, enclosures, and equipment.
Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

Sequencing:
Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical, for submittals procedures.

Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

Shop Drawings:
Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
Include proposed locations of roof penetrations and proposed methods for sealing.

Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

QUALITY ASSURANCE

Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

DELIVERY, STORAGE, AND HANDLING

Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

CONDUIT APPLICATIONS

Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

Underground:
Under Slab on Grade: Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
Where rigid polyvinyl (PVC) conduitlarger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.

Embedded Within Concrete:

Within Slab on Grade(within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
Within Slab Above Ground: Not permitted.
Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.
Where galvanized steel electrical metallic tubing (EMT) emerges from concrete into salt air, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.

Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
Locations subject to physical damage include, but are not limited to:
Where exposed below 8 feet, except within electrical communications rooms or closets.
Where exposed below 20 feet in warehouse areas.

Exposed, Exterior: Use galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit.

Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit or MC cable whip.
Maximum Length: 6 feet.

Flexible Connections to Vibrating Equipment:
Dry Locations: Use flexible metal conduit or liquidtight flexible metal conduit.
Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
Maximum Length: 6 feet unless otherwise indicated.
Vibrating equipment includes, but is not limited to:
Transformers.
Motors.

Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC) or galvanized steel electrical metallic tubing (EMT).

CONDUIT - GENERAL REQUIREMENTS

Comply with NFPA 70.

Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.

Fittings for Grounding and Bonding: See Section 26 05 26 for additional requirements.

Provide conduit, fittings, supports, and accessories required for a complete raceway system.

Provide products listed, classified, and labeled as suitable for purpose intended.

Minimum Conduit Size, Unless Otherwise Indicated:
Branch Circuits: 3/4 inch (21 mm) trade size.
Branch Circuit Homeruns: 3/4-inch trade size.
Control Circuits: 3/4 inch (21 mm) trade size.
Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
Underground, Interior: 3/4-inch trade size.
Underground, Exterior: 3/4 inch (21 mm) trade size.

Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

Manufacturers:
Allied Tube & Conduit.
Republic Conduit.
Wheatland Tube Company.

Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

Fittings:
Manufacturers:
ABB; T&B.
Bridgeport Fittings Inc.
O-Z/Gedney, a brand of Emerson Electric Co.
Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

ALUMINUM RIGID METAL CONDUIT (RMC)

Manufacturers:
Allied Tube & Conduit.
Republic Conduit.
Wheatland Tube Company.

Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.

Fittings:
Manufacturers:
ABB; T&B.
Bridgeport Fittings Inc.
O-Z/Gedney, a brand of Emerson Electric Co.
Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
Material: Use aluminum.
Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

Manufacturers:
Robroy Industries.

Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

PVC-Coated Boxes and Fittings:
Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.

Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
Material: Use steel or malleable iron.
Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.

FLEXIBLE METAL CONDUIT (FMC)

Manufacturers:
AFC Cable Systems, Inc.
Electri-Flex Company.
International Metal Hose.

Fittings:
Manufacturers:
Bridgeport Fittings Inc.
O-Z/Gedney, a brand of Emerson Electric Co.
Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

Manufacturers:
AFC Cable Systems, Inc; _____.
Electri-Flex Company; _____.
International Metal Hose; _____.

Fittings:
Manufacturers:
ABB; T&B.
Bridgeport Fittings Inc.
O-Z/Gedney, a brand of Emerson Electric Co.
Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

ELECTRICAL METALLIC TUBING (EMT)

Manufacturers:
Allied Tube & Conduit.
Republic Conduit.
Wheatland Tube Company.

Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

Fittings:
Manufacturers:
Bridgeport Fittings Inc.
O-Z/Gedney, a brand of Emerson Electric Co.
Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
Connectors and Couplings: Use compression/gland or set-screw type.
Do not use indenter type connectors and couplings.
Use in dry protected locations for circuits rated 600V and less. Exceptions:
EMT is acceptable for outdoor use in photovoltaic roof applications.
EMT is acceptable for other outdoor applications in covered locations.
For outdoor applications, raintight fittings must be used.

RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

Manufacturers:
Cantex Inc.
JM Eagle.

Fittings:
Manufacturer: Same as manufacturer of conduit to be connected.

Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

ACCESSORIES

Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

PART 3 EXECUTION

EXAMINATION

Verify that field measurements are as indicated.

Verify that mounting surfaces are ready to receive conduits.

Verify that conditions are satisfactory for installation prior to starting work.

INSTALLATION

Install products in accordance with manufacturer's instructions.

Install conduit in accordance with NECA 1.

Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

Aluminum Rigid Metal Conduit (RMC): Install in accordance with NECA 102.

Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.

PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.

Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

Conduit Routing:
Unless dimensioned, conduit routing indicated is diagrammatic.
When conduit destination is indicated without specific routing, determine exact routing required.
Conceal conduits unless specifically indicated to be exposed.
Conduits in the following areas may be exposed, unless otherwise indicated:
Electrical rooms.
Mechanical equipment rooms.
Within joists in areas with no ceiling.
Unless otherwise approved, do not route exposed conduits:
Across floors.
Across roofs.
Across top of parapet walls.
Across building exterior surfaces.
Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
Arrange conduit to maintain adequate headroom, clearances, and access.
Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
Arrange conduit to provide no more than 150 feet between pull points.
Route conduits above water and drain piping where possible.
Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
Maintain minimum clearance of 6 inches between conduits and piping for other systems.
Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
Heaters.

Hot water piping.
Flues.
Group parallel conduits in same area on common rack.
Pull lines: Install nylon pull lines in empty conduits larger than 1-inch where routing includes 25-feet or more in length or includes 180 degrees or more in bends. Where conduits requiring pull lines are stubbed out and capped, coil a minimum of 36-inches of pull line and tape at termination of conduit for easy future access. Label pull lines as to conduit starting or terminations point and intended future use.

Conduit Support:
Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.
Provide required vibration isolation and/or seismic controls; see Section 26 05 48.
Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
Use conduit strap to support single surface-mounted conduit.
Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
Use conduit clamp to support single conduit from beam clamp or threaded rod.
Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
Use of spring steel conduit clips for support of conduits is permitted only as follows:
Support of electrical metallic tubing (EMT)up to 1 inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.
Use of wire for support of conduits is permitted only as follows:
For securing conduits to studs in hollow stud walls.
For suspending conduits supported by spring steel conduit clips, where specifically indicated or permitted.
Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

Connections and Terminations:
Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings. Do not use running threads.
Use suitable adapters where required to transition from one type of conduit to another.
Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
Secure joints and connections to provide mechanical strength and electrical continuity.

Penetrations:
Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
Make penetrations perpendicular to surfaces unless otherwise indicated.
Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
Conceal bends for conduit risers emerging above ground.
Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.

Underground Installation:
Provide trenching and backfilling; see Section 31 23 16.13.
Provide trenching and backfilling; see Section 31 23 16 and Section 31 23 23.
Minimum Cover, Unless Otherwise Indicated or Required:
Underground, Exterior: 24 inches.
Under Slab on Grade: 12 inches to bottom of slab.
Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length for service entrance where not concrete-encased.

Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 03 30 00.

Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
Where conduits cross structural joints intended for expansion, contraction, or deflection.
Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
Where conduits are subject to earth movement by settlement or frost.

Conduit Sealing:
Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
Where conduits enter building from outside.
Where service conduits enter building from underground distribution system.
Where conduits enter building from underground.
Where conduits may transport moisture to contact live parts.
Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
Where conduits pass from outdoors into conditioned interior spaces.
Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

Provide grounding and bonding; see Section 26 05 26.

Identify conduits; see Section 26 05 53.

FIELD QUALITY CONTROL

See Section 01 40 00 - Quality Requirements for additional requirements.

Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

Correct deficiencies and replace damaged or defective conduits.

CLEANING

Clean interior of conduits to remove moisture and foreign matter.

PROTECTION

Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

Boxes and enclosures for integrated power, data, and audio/video.

Floor boxes.

Underground boxes/enclosures.

Accessories.

RELATED REQUIREMENTS

Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

Section 26 05 26 - Grounding and Bonding for Electrical Systems.

Section 26 05 29 - Hangers and Supports for Electrical Systems.

Section 26 05 33.13 - Conduit for Electrical Systems:
Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

Section 26 27 26 - Wiring Devices:
Wall plates.
Floor box service fittings.
Additional requirements for locating boxes for wiring devices.

Section 27 10 00 - Structured Cabling: Additional requirements for communications systems outlet boxes.

REFERENCE STANDARDS

NECA 1 - Standard for Good Workmanship in Electrical Construction.

NECA 130 - Standard for Installing and Maintaining Wiring Devices.

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.

NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

NFPA 70 - National Electrical Code.

SCTE 77 - Specifications for Underground Enclosure Integrity.

UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

UL 508A - Industrial Control Panels.

UL 514A - Metallic Outlet Boxes.

UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.

ADMINISTRATIVE REQUIREMENTS

Coordination:
Coordinate work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
Coordinate arrangement of electrical equipment with dimensions and clearance requirements of the actual equipment to be installed.

Coordinate minimum sizes of boxes with actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
Coordinate minimum sizes of pull boxes with actual installed arrangement of connected conduits, calculated according to NFPA 70.
Coordinate placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
Coordinate work with other trades to preserve insulation integrity.
Coordinate work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical, for submittal procedures.

Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.

Samples:
Floor Boxes: Provide one sample(s) of each floor box proposed for substitution upon request.

Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
See Section 01 60 00 - Product Requirements, for additional provisions.
Keys for Lockable Enclosures: Two of each different key.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

Maintain at the project site a copy of each referenced document that prescribes execution requirements.

Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

DELIVERY, STORAGE, AND HANDLING

Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

BOXES

General Requirements:
Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
Provide boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
Provide products listed, classified, and labeled as suitable for the purpose intended.
Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
Provide grounding terminals within boxes where equipment grounding conductors terminate.

Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
Use sheet-steel boxes for dry locations unless otherwise indicated or required.
Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
Use cast aluminum boxes where aluminum rigid metal conduit is used.
Use nonmetallic boxes where exposed rigid PVC conduit is used.
Use suitable concrete type boxes where flush-mounted in concrete.
Use suitable masonry type boxes where flush-mounted in masonry walls.
Use raised covers suitable for the type of wall construction and device configuration where required.
Use shallow boxes where required by the type of wall construction.
Do not use "through-wall" boxes designed for access from both sides of wall.
Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
Minimum Box Size, Unless Otherwise Indicated:
Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
Wall Plates: Comply with Section 26 27 26.
Manufacturers:
Cooper Crouse-Hinds, a division of Eaton Corporation.
Hubbell Incorporated; Bell Products.
Hubbell Incorporated; RACO Products.
O-Z/Gedney, a brand of Emerson Electric Co.
Thomas & Betts Corporation.
Substitutions: See Section 01 60 00 - Product Requirements.

Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
NEMA 250 Environment Type, Unless Otherwise Indicated:
Indoor Clean, Dry Locations: Type 1, painted steel.
Outdoor Locations: Type 3R, painted steel.
Junction and Pull Boxes Larger Than 100 cubic inches:
Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
Back Panels: Painted steel, removable.
Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
Manufacturers:
Cooper B-Line, a division of Eaton Corporation.
Hoffman, a brand of Pentair Technical Products.
Hubbell Incorporated; Wiegmann Products.
Substitutions: See Section 01 60 00 - Product Requirements.

Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
Manufacturers:
Hubbell Incorporated.
Substitutions: See Section 01 60 00 - Product Requirements.

Floor Boxes:

Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with components, adapters, and trims required for complete installation.
Use cast iron or nonmetallic floor boxes within slab on grade.
Use sheet-steel or cast iron floor boxes within slab above grade.
Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
Manufacturer: Same as manufacturer of floor box service fittings.

Underground Boxes/Enclosures:
Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
Size: As indicated on drawings.
Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
Provide logo on cover to indicate type of service.
Applications:
Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.
Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
Manufacturers:
Hubbell Incorporated; Quazite Products.
MacLean Highline.
Oldcastle Precast, Inc.
Substitutions: See Section 01 60 00 - Product Requirements.
Combination fiberglass/polymer concrete boxes/enclosures are acceptable.
Product(s):
MacLean Highline PHA Series: Straight wall, all-polymer concrete splice box/pull box; available Tier 8, Tier 15, and Tier 22 load ratings.
11 by 18 by 12 inches nominal; Model PHA111812 (stackable).
MacLean Highline CHA Series: Fiberglass/polymer concrete splice box/pull box; available Tier 8 and Tier 15 load ratings.
11 by 18 by 12 inches nominal; Model CHA111812.
MacLean Highline CVA Series: Fiberglass/polymer concrete splice vault; available Tier 8, Tier 15, and Tier 22 load ratings.
30 by 48 by 18 inches nominal; Model CVA304818.
_____.

ACCESSORIES

Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.
Manufacturers:
Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.
Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

EXAMINATION

Verify field measurements are as indicated.

Verify mounting surfaces are ready to receive boxes.

Verify conditions are satisfactory for installation prior to starting work.

INSTALLATION

Install products in accordance with manufacturer's instructions.

Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

Provide separate boxes for emergency power and normal power systems.

Provide multi-gang boxes as required to accept devices installed with no more than one device per gang, unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

Box Locations:
Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
Unless dimensioned, box locations indicated are approximate.
Locate boxes as required for devices installed under other sections or by others.
Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
Communications Systems Outlets: Comply with Section 27 10 00.
Locate boxes so wall plates do not span different building finishes.
Locate boxes so wall plates do not cross masonry joints.
Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
Junction boxes installed in accessible ceiling or wall cavities or exposed in utility areas minimum of 4-inches square, 1-1/2 inches deep with appropriately marked blank cover.
Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
Concealed above accessible suspended ceilings.
Within joists in areas with no ceiling.
Electrical rooms.
Mechanical equipment rooms.

Box Supports:
Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls.
Repair or replace supports for boxes that permit excessive movement.

Install boxes plumb and level.

Flush-Mounted Boxes:

Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

Floor-Mounted Cabinets: Mount on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

Install boxes as required to preserve insulation integrity.

Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.

Underground Boxes/Enclosures:

Install enclosure on gravel base, minimum 6 inches deep.

Flush-mount enclosures located in concrete or paved areas.

Mount enclosures located in landscaped areas with top at 1 inch above finished grade.

Provide cast-in-place concrete collar constructed in accordance with Section 03 30 00, minimum 10 inches wide by 12 inches deep, around enclosures that are not located in concrete areas.

Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

Close unused box openings.

Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

Provide grounding and bonding in accordance with Section 26 05 26.

Identify boxes in accordance with Section 26 05 53.

CLEANING

Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

PROTECTION

Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Vibration isolation requirements.

Seismic control requirements.

Vibration isolators.

External seismic snubber assemblies.

Seismic restraint systems.

RELATED REQUIREMENTS

Section 01 45 33 - Code-Required Special Inspections and Procedures.

Section 03 30 00 - Cast-in-Place Concrete.

Section 26 05 29 - Hangers and Supports for Electrical Systems.

DEFINITIONS

Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).

Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

REFERENCE STANDARDS

ASCE 19 - Structural Applications of Steel Cables for Buildings.

ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications.

FEMA 413 - Installing Seismic Restraints for Electrical Equipment.

FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage.

NECA 1 - Standard for Good Workmanship in Electrical Construction.

NFPA 70 - National Electrical Code.

SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems.

GENERAL REQUIREMENTS:

Provide seismic restraints for equipment, both supported and suspended, conduits, and cable tray systems.

Bracing of conduits and cable trays in accordance with the provisions set forth in the SMACNA seismic restraint manual and the requirements set in ASCE 7-10 Section 13.2.

Review and approve structural requirements for restraints, including their attachment to the building structure by a registered structural engineer in the same state as the project.

Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

Seismic restraints, including anchors to building structure, designed by a registered professional structural engineer licensed in the state of Oregon. Design includes:

Number, size, capacity, and location of anchors for floor- or roof-mounted equipment. For curb-mounted equipment, provide design of attachment of both the unit to the curb and the curb to the structure. For units weighing greater than 2500 pounds, or curbs more than 10 feet long, provide substantiating calculations the curb can accept the prescribed seismic forces.

Number, size, capacity, and location of seismic restraint devices and anchors for vibration-isolation and suspended equipment. Provide calculations, test data, or California OSHPD approval number verifying the horizontal and vertical ratings of the seismic restraint devices.

Number, size, capacity, and location of braces and anchors for suspended raceways, bus ducts, and cable trays on as-built plan drawings.

ADMINISTRATIVE REQUIREMENTS

Coordination:
Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
Coordinate work with other trades to provide additional framing and materials required for installation.
Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
Seismic Controls:
Coordinate arrangement of seismic restraints with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
Coordinate work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

Sequencing:
Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical, for submittal procedures.

Design Documents: Prepare and submit information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
Seismic Controls: Include seismic load capacities.

Shop Drawings - Vibration Isolation Systems:
Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.

Shop Drawings - Seismic Controls:
Include dimensioned plan views and sections indicating proposed electrical component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
Indicate proposed arrangement of distributed system trapeze support groupings.
Indicate proposed locations for distributed system flexible fittings and/or connections.
Indicate locations of seismic separations where applicable.

QUALITY ASSURANCE

Comply with NFPA 70.

Comply with applicable building code.

Supports, Hangers, and Anchors: Comply with the requirements of Section 26 05 29 - Hangers and Supports for Electrical Systems meet the requirements of ASCE 7-10 Section 13.2 based on the Seismic Design Criteria located on the structural drawings.

DELIVERY, STORAGE, AND HANDLING

Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

VIBRATION ISOLATION REQUIREMENTS

Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.

Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

General Requirements:
Select vibration isolators to provide required static deflection.
Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
Select vibration isolators for outdoor equipment to comply with wind design requirements.
Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

Equipment Isolation:

Conduit Isolation:
Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.

SEISMIC CONTROL REQUIREMENTS

Design and provide electrical component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor electrical components.

Seismic Restraints:
Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
ASHRAE (HVACA).
FEMA 413.
FEMA E-74.
SMACNA (SRM).
Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
External Seismic Snubber Assemblies:
Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.
Seismic Restraint Systems:
Except where otherwise restricted, use of either cable or rigid restraints is permitted.
Use only cable restraints to restrain vibration-isolated electrical components, including distributed systems.
Use only one restraint system type for a given electrical component or distributed system (e.g., conduit, cable tray) run; mixing of cable and rigid restraints on a given component/run is not permitted.
Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain electrical component in all lateral directions; consider bracket geometry in anchor load calculations.
Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported electrical component weight.

Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported electrical component weight.
Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

Seismic Attachments:
Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
Do not use power-actuated fasteners.
Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
Concrete Housekeeping Pads:
Increase size of pad as required to comply with anchor requirements.
Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

Seismic Interactions:
Include provisions to prevent seismic impact between electrical components and other structural or nonstructural components.
Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

Seismic Relative Displacement Provisions:
Use suitable fittings or flexible connections to accommodate:
Relative displacements at connections between components, including distributed systems (e.g., conduit, cable tray); do not exceed load limits for equipment utility connections.
Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
Design displacements at seismic separations.
Anticipated drifts between floors.

VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

VIBRATION ISOLATORS

Manufacturers:
Vibration Isolators:
Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.
Mason Industries; _____: www.mason-ind.com/#sle.
Vibration Eliminator Company, Inc; _____: www.veco-nyc.com/#sle.
Substitutions: See Section 01 60 00 - Product Requirements.
Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.

General Requirements:
Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.

EXTERNAL SEISMIC SNUBBER ASSEMBLIES

Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.

Seismic Snubbing Elements:
Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

SEISMIC RESTRAINT SYSTEMS

Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

Cable Restraints:
Comply with ASCE 19.
Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
Use protective thimbles for cable loops where potential for cable damage exists.

Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

EXAMINATION

Verify field measurements are as shown on the drawings.

Verify mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

Verify conditions are satisfactory for installation prior to starting work.

CODE-REQUIRED SPECIAL INSPECTIONS

Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.

Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

INSTALLATION

Install products in accordance with manufacturer's instructions.

Install products in accordance with applicable requirements of NECA 1 (general workmanship).

Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

Secure fasteners according to manufacturer's recommended torque settings.

Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

Vibration Isolation Systems:
Vibration-Isolated Equipment Support Bases:
Provide specified minimum clearance beneath base.
Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
Adjust isolators to be free of isolation short circuits during normal operation.
Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

Seismic Controls:
Provide specified snubbing element air gap; remove any factory-installed spacers, debris or other obstructions.
Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
Equipment with Sheet Metal Housings:
Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
Attach additional steel as approved by manufacturer where required to transfer loads to structure.
Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
Concrete Housekeeping Pads:
Size in accordance with seismic design to meet anchor requirements.
Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
Seismic Restraint Systems:
Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
Install restraints within permissible angles in accordance with seismic design.
Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

FIELD QUALITY CONTROL

See Section 01 40 00 - Quality Requirements, for additional requirements.

Inspect vibration isolation and/or seismic control components for damage and defects.

Vibration Isolation Systems:
Verify isolator static deflections.
Verify required clearance beneath vibration-isolated equipment support bases.
Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

Seismic Controls:
Verify snubbing element air gaps.

Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Electrical identification requirements.

Identification nameplates and labels.

Wire and cable markers.

Voltage markers.

Floor marking tape.

Warning signs and labels.

RELATED REQUIREMENTS

Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

Section 26 05 73 - Power System Studies: Arc flash hazard warning labels.

Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

REFERENCE STANDARDS

ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs.

ANSI Z535.4 - American National Standard for Product Safety Signs and Labels.

NFPA 70 - National Electrical Code.

NFPA 70E - Standard for Electrical Safety in the Workplace.

UL 969 - Marking and Labeling Systems.

ADMINISTRATIVE REQUIREMENTS

Coordination:
Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

Sequencing:
Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
Do not install identification products until final surface finishes and painting are complete.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical, for submittals procedures.

Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

Samples:
Identification Nameplates: One of each type and color specified.
Warning Signs and Labels: One of each type and legend specified.

Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

FIELD CONDITIONS

Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

IDENTIFICATION REQUIREMENTS

Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.

Identification for Equipment:
Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
Panelboards:
Identify ampere rating.
Identify voltage and phase.
Identify power source and circuit number. Include location when not within sight of equipment.
Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
Use typewritten circuit directory to identify load(s) served for panelboards with a door.Identify spares and spaces.
For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device.Identify spares and spaces.
Enclosed switches, circuit breakers, and motor controllers:
Identify voltage and phase.
Identify power source and circuit number. Include location when not within sight of equipment.
Identify load(s) served. Include location when not within sight of equipment.
Enclosed Contactors:
Identify ampere rating.
Identify voltage and phase.
Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
Identify coil voltage.
Identify load(s) and associated circuits controlled. Include location.
Uninterruptable Power Supplies:
Identify voltage and phase.
Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
Identify load(s) served. Include location when not within sight of equipment.
Electricity Meters:
Identify load(s) metered.
Use voltage marker to identify highest voltage present for each piece of electrical equipment.
Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
Use identification labelon inside of door at each fused switch to identify required NEMA fuse class and size.
Use identification labelon inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 91 23 and 09 91 13.
Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

Service equipment.
Industrial control panels.
Motor control centers.
Elevator control panels.
Industrial machinery.
Arc Flash Hazard Warning Labels: Comply with Section 26 05 73.
Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
Minimum Size: 3.5 by 5 inches.
Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
Service Equipment: Include the following information in accordance with NFPA 70.
Nominal system voltage.
Available fault current.
Clearing time of service overcurrent protective device(s).
Date label applied.
Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

Identification for Conductors and Cables:
Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
Identification for Communications Conductors and Cables: Comply with Section 27 10 00.
Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
At each source and load connection.
Within boxes when more than one circuit is present.
Within equipment enclosures when conductors and cables enter or leave the enclosure.
In cable tray, at maximum intervals of 20 feet.
Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
Use underground warning tape to identify direct buried cables.

Identification for Raceways:
Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.
Maximum Intervals: 20 feet.
Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.

Field-Painting: Comply with Section 09 91 23 and 09 91 13.
Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.
Color Code:
Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
Use underground warning tape to identify underground raceways.
Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.

Identification for Cable Tray: Comply with Section 26 05 36.

Identification for Boxes:
Use voltage markers to identify highest voltage present.
Use voltage markers or color coded boxes to identify systems other than normal power system.
Color-Coded Boxes: Field-painted in accordance with Section 09 91 23 and 09 91 13 per the same color code used for raceways.
Emergency Power System: Red.
Life Safety Branch: _____.
Fire Alarm System: Red.
_____ System: _____.
For exposed boxes in public areas, do not color code.
Use handwritten text using indelible marker to identify circuits enclosed.
For exposed boxesin public areas, provide identification on inside face of cover.
Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

Identification for Devices:
Identification for Communications Devices: Comply with Section 27 10 00.
Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
Factory Pre-Marked Wallplates: Comply with Section 26 27 26.
Use identification label to identify fire alarm system devices.
For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
Use identification label to identify serving branch circuitfor all receptacles.
For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

Identification for Luminaires:
Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

Identification for Photovoltaic Systems: Comply with Section 26 31 00

IDENTIFICATION NAMEPLATES AND LABELS

Identification Nameplates:
Manufacturers:
Brady.
3M.
Brimar Industries, Inc.
Kolbi Pipe Marker Co.
Seton Identification Products.
Substitutions: See Section 01 60 00 - Product Requirements.
Materials:

Indoor Clean, Dry Locations: Use plastic nameplates.
Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

Identification Labels:
Manufacturers:
3M.
Brady Corporation.
Brother International Corporation.
Panduit Corp.
Substitutions: See Section 01 60 00 - Product Requirements.
Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant. Use only for indoor locations.
Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

Format for Equipment Identification:
Minimum Size: 1 inch by 2.5 inches.
Legend:
System designation where applicable:
Emergency Power System: Identify with text "EMERGENCY".
Fire Alarm System: Identify with text "FIRE ALARM".
_____ System: Identify _____.
Equipment designation or other approved description.
Other information as indicated.
Text: All capitalized unless otherwise indicated.
Minimum Text Height:
System Designation: 1 inch.
Equipment Designation: 1/2 inch.
Other Information: 1/4 inch.
Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
Color:
Normal Power System: White text on black background.
480Y/277 V, 3 Phase Equipment: White text on red background.
208Y/120 V, 3 Phase Equipment: White text on red background.
_____ Equipment: White text on red background.
Emergency Power System: Black text on orange background.
Life Safety Branch: White text on _____ background.
Fire Alarm System: White text on red background.
Standby Power System: black text on yellow background.

Format for General Information and Operating Instructions:
Minimum Size: 1 inch by 2.5 inches.
Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
Text: All capitalized unless otherwise indicated.
Minimum Text Height: 1/4 inch.
Color: Black text on white background unless otherwise indicated.
Exceptions:
Provide white text on red background for general information or operational instructions for emergency systems.

Provide white text on red background for general information or operational instructions for fire alarm systems.
Provide white text on _____ background for _____.

Format for Caution and Warning Messages:
Minimum Size: 2 inches by 4 inches.
Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
Text: All capitalized unless otherwise indicated.
Minimum Text Height: 1/2 inch.
Color: Black text on yellow background unless otherwise indicated.

Format for Receptacle Identification:
Minimum Size: 3/8 inch by 1.5 inches.
Legend: Power source and circuit number or other designation indicated.
Include voltage and phase for other than 120 V, single phase circuits.
Text: All capitalized unless otherwise indicated.
Minimum Text Height: 3/16 inch.
Color: Black text on clear background.

Format for Control Device Identification:
Minimum Size: 3/8 inch by 1.5 inches.
Legend: Load controlled or other designation indicated.
Text: All capitalized unless otherwise indicated.
Minimum Text Height: 3/16 inch.
Color: Black text on clear background.

Format for Fire Alarm Device Identification:
Minimum Size: 3/8 inch by 1.5 inches.
Legend: Designation indicated and device zone or address.
Text: All capitalized unless otherwise indicated.
Minimum Text Height: 3/16 inch.
Color: Red text on white background.

WIRE AND CABLE MARKERS

Manufacturers:
3M.
Brady Corporation.
HellermannTyton.
Panduit Corp.
Substitutions: See Section 01 60 00 - Product Requirements.

Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
Do not use self-adhesive type markers.

Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

Legend: Power source and circuit number or other designation indicated.

Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
Do not use handwritten text.

Minimum Text Height: 1/8 inch.

Color: Black text on white background unless otherwise indicated.

VOLTAGE MARKERS

Manufacturers:
3M.
Brady Corporation.

Brimar Industries, Inc.
Seton Identification Products.
Substitutions: See Section 01 60 00 - Product Requirements.

Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

Minimum Size:
Markers for Equipment: 1 1/8 by 4 1/2 inches.
Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
Markers for Junction Boxes: 1/2 by 2 1/4 inches.

Legend:
Markers for Voltage Identification: Highest voltage present.
Markers for System Identification:
Other Systems: Type of service.

Color: Black text on orange background unless otherwise indicated.

UNDERGROUND WARNING TAPE

Manufacturers:
Brady Corporation.
Brimar Industries, Inc.
Seton Identification Products.
Substitutions: See Section 01 60 00 - Product Requirements.

Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
Exception: Use foil-backed detectable type tape where required by serving utility or where directed by Owner.

Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

Legend: Type of service, continuously repeated over full length of tape.

Color:
Tape for Buried Power Lines: Black text on red background.
Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

FLOOR MARKING TAPE

Manufacturers:
3M.
Brady Corporation.
Brimar Industries, Inc.
Seton Identification Products.
Substitutions: See Section 01 60 00 - Product Requirements.

Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

WARNING SIGNS AND LABELS

Manufacturers:
Brimar Industries, Inc.
Clarion Safety Systems, LLC.
Seton Identification Products.
Substitutions: See Section 01 60 00 - Product Requirements.

Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

Warning Signs:

Materials:
Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
Outdoor Locations: Use factory pre-printed rigid aluminum signs.
Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
Minimum Size: 7 by 10 inches unless otherwise indicated.

Warning Labels:
Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
Do not use labels designed to be completed using handwritten text.
Provide polyester overlaminate to protect handwritten text.
Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

PREPARATION

Clean surfaces to receive adhesive products according to manufacturer's instructions.

INSTALLATION

Install products in accordance with manufacturer's instructions.

Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
Surface-Mounted Equipment: Enclosure front.
Flush-Mounted Equipment: Inside of equipment door.
Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
Elevated Equipment: Legible from the floor or working platform.
Branch Devices: Adjacent to device.
Interior Components: Legible from the point of access.
Conduits: Legible from the floor.
Boxes: Outside face of cover.
Conductors and Cables: Legible from the point of access.
Devices: Outside face of cover.

Install identification products centered, level, and parallel with lines of item being identified.

Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.

Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

Secure rigid signs using stainless steel screws.

Mark handwritten text, where permitted, to be neat and legible.

FIELD QUALITY CONTROL

See Section 01 40 00 - Quality Requirements, for additional requirements.

Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Short-circuit study.

Arc flash and shock risk assessment.
Includes arc flash hazard warning labels.

Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

RELATED REQUIREMENTS

Section 26 05 53 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

REFERENCE STANDARDS

ANSI Z535.4 - American National Standard for Product Safety Signs and Labels.

IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants.

IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis.

IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems.

IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations.

NEMA MG 1 - Motors and Generators.

NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.

NFPA 70 - National Electrical Code.

NFPA 70E - Standard for Electrical Safety in the Workplace.

ADMINISTRATIVE REQUIREMENTS

Coordination:
Existing Installations: Coordinate with equipment manufacturer(s) to obtain data necessary for completion of studies.
Coordinate work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

Sequencing:
Submit study reports prior to or concurrent with product submittals.
Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.
Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

Scheduling:
Arrange access to existing facility for data collection with Owner.
Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical, for submittal procedures.

Study preparer's qualifications.

Field testing agency's qualifications.

Study reports, stamped or sealed and signed by study preparer.

Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.
Include characteristic time-current trip curves for protective devices.
Include impedance data for busway.
Include impedance data for engine generators.
Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
Include documentation of listed series ratings upon request.
Identify modifications made in accordance with studies that:
Can be made at no additional cost to Owner.
As submitted will involve a change to the contract sum.

Arc Flash Hazard Warning Label Samples: One of each type and legend specified.

Site-specific arc flash hazard warning labels.

Field quality control reports.

Certification that field adjustable protective devices have been set in accordance with requirements of studies.

Project Record Documents: Revise studies as required to reflect as-built conditions.
Include hard copies with operation and maintenance data submittals.
Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

POWER SYSTEM STUDIES

Scope of Studies:
Perform analysis ofboth new and directly affected existing portions of electrical distribution systemas indicated on drawings.
Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.
Known Operating Modes:
Utility as source.
Maintenance settings.

General Study Requirements:
Comply with NFPA 70.
Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

Data Collection:
Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
Obtain up-to-date information from Utility Company.
Utility Company: McMinnville Water and Light.
Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.
Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
Protective Devices:

Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.
Existing Installations:
Provide the services of field testing agency or equipment manufacturer's representative to perform field data collection.
Collect data on existing electrical distribution system necessary for completion of studies, including field verification of available existing data (e.g. construction documents, previous studies). Include actual settings for field-adjustable devices.

Short-Circuit Study:
Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
Maximum utility fault currents.
Maximum motor contribution.
Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

Arc Flash and Shock Risk Assessment:
Comply with NFPA 70E.
Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
Where reasonable, study preparer may assume a maximum clearing time of two seconds in accordance with IEEE 1584, provided that the conditions are such that a worker's egress from an arc flash event would not be inhibited.
For single-phase systems, study preparer to perform calculations assuming three-phase system in accordance with IEEE 1584 using single phase bolted fault current, yielding conservative results.
For equipment with main devices mounted in separate compartmentalized sections, perform calculations on both the line and load side of the main device.
Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
Maximum and minimum utility fault currents.
Maximum and minimum motor contribution.
Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

Study Reports:
General Requirements:
Identify date of study and study preparer.
Identify study methodology and software product(s) used.
Identify scope of studies, assumptions made, implications of possible alternate scenarios, and exclusions from studies.
Identify base used for per unit values.
Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
Include conclusions and recommendations.
Short-Circuit Study:
For each scenario, identify at each bus location:

Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
Fault point X/R ratio.
Associated equipment short circuit current ratings.
Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
Arc Flash and Shock Risk Assessment:
For the worst case for each scenario, identify at each bus location:
Calculated incident energy and associated working distance.
Calculated arc flash boundary.
Bolted fault current.
Arcing fault current.
Clearing time.
Arc gap distance.
For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.
Include recommendations for reducing the incident energy at locations where the calculated maximum incident energy exceeds 8 calories per sq cm.

QUALITY ASSURANCE

Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.
Study preparer may be employed by manufacturer of electrical distribution equipment.
Study preparer may be employed by field testing agency.

Field Testing Agency Qualifications: Independent testing organization specializing in testing, analysis, and maintenance of electrical systems with minimum five years experience; NETA Accredited Company.
Field Supervisor: Certified electrical testing technician; NETA ETT Level III.

Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.
Products:
EasyPower LLC.
ETAP/Operation Technology, Inc.
Power Analytics Corporation.
SKM Systems Analysis, Inc.
Substitutions: See Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

ACCEPTABLE MANUFACTURERS

Emerson

Electrical Systems Analysis

Qualified engineers of the switchgear manufacturer

ARC FLASH HAZARD WARNING LABELS

Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
Materials: Comply with Section 26 05 53.
Minimum Size: 4 by 6 inches.
Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
Include orange header that reads "WARNING" unless otherwise indicated.
Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.
Include the following information:
Arc flash boundary.

Available incident energy and corresponding working distance.
Site-specific PPE (personnel protective equipment) requirements.
Nominal system voltage.
Limited approach boundary.
Restricted approach boundary.
Equipment identification.
Study preparer, report reference, and date calculations were performed.

PART 3 EXECUTION

INSTALLATION

Install arc flash warning labels in accordance with Section 26 05 53.

FIELD QUALITY CONTROL

See Section 01 40 00 - Quality Requirements, for additional requirements.

Provide the services of field testing agency or equipment manufacturer's representative to perform inspection, testing, and adjusting.

Inspect and test in accordance with NETA ATS, except Section 4.

Adjust equipment and protective devices for compliance with studies and recommended settings.

Notify Architect of conflicts with or deviations from studies. Obtain direction before proceeding.

Submit detailed reports indicating inspection and testing results, and final adjusted settings.

ARC FLASH TRAINING

Train the Owner's qualified electrical personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Training certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET) or equivalent.

CLOSEOUT ACTIVITIES

See Section 01 78 00 - Closeout Submittals, for closeout submittals.

See Section 01 79 00 - Demonstration and Training, for additional requirements.

Training: Include as part of the base bid training for Owner's personnel on electrical safety pertaining to arc flash and shock hazards.
Use site-specific arc flash and shock risk assessment report as training reference, supplemented with additional training materials as required.
Provide minimum of eight hours of training.
Instructor: Representative of entity performing study.
Location: At project site.

ATTACHMENTS

Previous studies.

Existing drawings.

END OF SECTION

PART 1 GENERAL

SUMMARY

This Section includes:
Testing Equipment

RELATED SECTIONS

Division 01, General Requirements

Division 26, Electrical

Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables

Section 26 05 26 - Grounding and Bonding for Electrical Systems

Section 26 09 43 - Network Lighting Controls

Section 26 27 13 - Electricity Metering

Section 26 24 16 - Panelboards

Section 26 33 23 - Central Battery Equipment

Section 28 46 00 - Fire Detection and Alarm

TESTING CRITERIA

General:
Perform field tests and operational checks to assure that electrical equipment, both contractor and Owner supplied, is operational within industry and manufacturer's tolerances, and is installed in accordance with design specifications.
Provide tests and operational checks to determine the suitability for energization.
Schedule tests and give a minimum of one week's advance notice of time and date to the Architect and Owner for any major systems tests specified in this Section.
Provide testing company equipment and technical personnel to perform tests and inspections. At Contractors expense, furnish personnel necessary to assist in the testing and inspection.
When tests and inspections are complete, attach a label to the devices tested. Provide on the label, the name of the testing company, date of tests, and initials of the Engineer who performed the tests.

Responsibilities:
Clean the equipment, torque down accessible bolts according to the equipment manufacturer's instructions; perform routine insulation resistance tests on branch and feeder circuits, continuity checks on branch and control wiring, and rotation tests for distribution and utilization equipment.
Furnish a complete set of current plans and specifications to the testing company prior to commencement of testing. At each test site, provide test control power necessary to perform the tests specified. Consult the test organization as to the specific power requirements. Notify the testing organization when the equipment and systems are ready for their inspections and testing. After review by the testing engineer, correct deficiencies noted by the testing company.
Provide manufacturer factory trained representatives(s) of each equipment and/or system that will perform required functional testing, checkout, and repairs in order to pronounce the equipment and/or systems meet the requirements of these specifications and Drawings and it is ready for startup testing and commissioning by the testing organization as specified hereafter.
Furnish settings of protective devices by the Engineer, in conjunction with Utility.
Testing organization to notify Engineer prior to the commencement of testing. The testing organization, set, and adjust the protective devices and associated auxiliary timing devices in accordance with the values furnished by the Engineer. The testing organization maintains a written record of tests and, upon completion of the test, include them in a final report. Detail deficiencies in the system material, workmanship, or design.

Implementation:
Safety practices comply with applicable state and local safety orders, as well as with the Occupational Safety and Health Act (OSHA). Compliance with the National Fire Protection Association (NFPA) standard NFPA 70E, and the Accident Prevention Manual for Industrial Operations of the National Safety Council.

Tests, other than phase rotation and operational tests, only performed on apparatus that is deenergized. The testing company's lead test engineer for the project designated safety representative and supervise testing observations and safety requirements. Do not proceed with Word until determined that it is safe to do so.
Power Circuits: Conductors shorted to ground by a hotline grounding device approved for the purpose. Provide warning signs and protective barriers as necessary to conduct the tests safely.

Reports:
General: Provide full documentation of tests in the form of a report.
Test report includes the following sections:
Scope of Testing
Equipment Tested
Description of Test
Test Results
Conclusions and Recommendations
Appendix, including Test Forms
Record each piece of equipment on a data sheet listing the condition of the equipment as found and as left. Include recommendations for necessary repair and/or replacement parts. Indicate on data sheets the name of the engineer who tested the equipment and the date of the test completion.
Submit record copies of the completed test report no more than 30 days after completion of the testing and inspection.

REFERENCES

The testing and inspection comply with applicable sections of the applicable codes and standards listed in Section 26 05 00 - Common Work Results for Electrical of the project specifications.

The inspection and testing comply with the project plans and specifications, as well as with the manufacturer's drawings, instruction manuals, and other applicable data that may be provided by the Engineer, for the apparatus tested.

QUALIFICATIONS

Testing Organization:
Independent division of the manufacturer of the assembled products being tested. If an outside testing organization is utilized, a representative of the manufacturer under contract by the testing company. Be present during testing to ensure the testing is performed properly and deficiencies discovered are promptly corrected.
Full Service Company that employs factory trained test engineers capable of troubleshooting, as well as identifying power equipment problems.
Perform Work outlined under the full time, onsite supervision of a graduate engineer with a minimum of 5 years of field testing experience.
Upon request, submit proof of its qualifications.

PART 2 PRODUCTS

TESTING EQUIPMENT

Testing agency to have calibration program, which maintains applicable test instrumentation within rated accuracy. Traceable accuracy to the National Bureau of Standards in an unbroken chain. Calibrate instruments calibrated in accordance with the following frequency schedule:
Field Instruments: 6 month maximum.
Laboratory Instruments:12 months.
Leased Specialty Equipment: 12 months (where accuracy is guaranteed by lessor). Dated calibration labels visible on test equipment.

PART 3 EXECUTION

EQUIPMENT TO BE TESTED

Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables:
For circuits rated 400A or higher perform tests listed in the NETA 2017 Acceptance Testing Specifications for Low-Voltage Cables, Section 7.3.2.

Section 26 05 26 - Grounding and Bonding for Electrical Systems :
Perform tests listed in the NETA 2017 Acceptance Testing Specifications for Grounding Systems, Section 7.13.

Section 26 24 16 - Panelboards:
Panelboards: Perform tests listed in the NETA 2017 Acceptance Testing Specifications for Switchgear and Switchboard Assemblies, Section 7.1. Only those tests applicable to panelboards need be performed, no electrical tests of the circuit breakers need to be performed.

Section 26 27 13 - Electricity Metering:
Instrument Transformers: Perform tests listed in the NETA 2017 Acceptance Testing Specifications for Instrument Transformers, Section 7.10.
Metering Functions: Perform tests listed in the NETA 2017 Acceptance Testing Specifications for Metering, Section 7.11.

Section 28 46 00 - Fire Detection and Alarm:
Fire Alarm System: Perform tests listed in Section 28 46 00 - Fire Detection and Alarm .

END OF SECTION

GENERAL

SECTION INCLUDES

General requirements that apply to implementation of commissioning of electrical systems and components. It will assist operating staff training and familiarization with new systems. It will serve as a tool to reduce post-occupancy critical systems operational difficulty or failure. It will, also, be used to develop test protocol and record the associated test data in an effort to advance the building systems from a state of substantial completion to operation.

All electrical systems in the project shall perform in accordance with the design intent and the Owner's operational needs.

Commissioning Process Overview, applying to the electrical systems and electrical commissioning team members, can be found in specifications section 019113, General Commissioning Requirements.

Systems to be commissioned
Electrical systems and all integral equipment controls. All electrical systems shall be commissioned, including, but not limited to:

Lighting and daylighting controls (interior and exterior)

RELATED SECTIONS

Commissioning requirements and related issues are given in the following Sections of the Specifications.

Division 01 Section "General Requirements", Closeout Procedures: Lists some tasks required for substantial completion and final acceptance.

Division 01 Section "General Requirements", Execution and Closeout Requirements: Lists some tasks required for substantial completion, final acceptance, and training.

Division 01 Section "General Requirements", Closeout Submittals: Lists some tasks required for O&M requirements.

Division 01 Section "General Requirements", General Commissioning Requirements: Alerts Trade Subcontractor to commissioning in other sections.

RESPONSIBILITIES

Overview
The responsibilities of the electrical commissioning team members in the commissioning process are summarized in specifications section 019113, General Commissioning Requirements.

SUBMITTALS

Other Equipment and System Information
When not included with the standard submittals, the Trade Subcontractors shall provide to the Commissioning Provider requested shop drawings, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures and control drawings. In addition, the manufacturer installation and checkout materials that are shipped inside the equipment and the field checkout forms to be used by the factory or field technicians shall be submitted to the Commissioning Provider. This documentation may be required prior to the normal O&M manual submittals.

All equipment and system documentation requested by the Commissioning Provider shall be included by the Trade Subcontractors later in the O&M manuals.
The Trade Subcontractors shall submit startup forms and procedures. If manufacturer startup forms are unavailable, Trade Subcontractors are responsible to document baseline operation of their equipment including but not limited to:

Operational electrical data

Photos of installation conditions
Deficiencies found and resolved during startup

QUALITY ASSURANCE

Test Equipment
All standard testing equipment required for the Trade Subcontractors to perform installation, start-up and initial checkout and required functional testing shall be provided by the Trade Subcontractors.

Special tools and instruments, only available from vendor, specific to a piece of equipment, required for testing equipment according to these Contract Documents shall be provided.

The Trade Subcontractors shall provide datalogging equipment for setting up and testing of specialized spaces if required and equipment required to perform specified electrical equipment testing.

Datalogging equipment required for contractor testing of electrical equipment shall be provided by the Trade Subcontractors and free to be used by the Commissioning Provider.

COORDINATION

Commissioning Team
The members of the commissioning team consist of the Commissioning Provider, the Owner/Owner Representative, the GC, the Architect and Design Engineers, the mechanical contractor, the electrical contractor, the plumbing contractor, the testing adjusting and balancing contractor, the controls contractor, any other installing subcontractors or suppliers of commissioned equipment or systems and the facility or plant operator/engineer.

PRODUCTS NOT USED

EXECUTION

MEETINGS

Kick-off Meeting
The Commissioning Provider will schedule, plan and conduct a commissioning kick-off meeting with the entire commissioning team in attendance, including the controls, electrical, plumbing, mechanical, adjusting and balancing and other appropriate Trade Subcontractors and the facility operator or Owner Representative in attendance. Prior to this meeting, the commissioning plan will be distributed to all members. The commissioning plan, the overall commissioning process and general responsibilities of each team member, reporting and communication protocols and next steps will be discussed. Meeting minutes will be distributed to all parties by the Commissioning Provider.

Miscellaneous Meetings
Deficiencies identified through the commissioning process shall be discussed, as needed, in portions of regular construction meetings. Meetings dedicated to deficiencies or commissioning: status, coordination and planning shall also be conducted, if needed. The Commissioning Provider will plan, conduct and take minutes at commissioning meetings. When practical, commissioning meetings will be an appendage to regular construction meetings. All commissioning meetings shall be attended by the GC, the mechanical and the controls subcontractor. Selected meetings shall require the attendance of the electrical, plumbing, fire alarm, TAB or other trades of commissioned systems.

Controls Integration Meeting
The Commissioning Provider coordinates the meeting to go over the control drawings, sequences of operation included in the controls submittal. This meeting is held prior to the approval of the controls submittal. The intent is to clarify control related issues for the controls contractor, mechanical, fire alarm, plumbing and electrical contractor, facility staff and Commissioning Provider prior to startup, testing and balancing and functional testing.

The controls contractor shall attend the meeting. The mechanical, electrical and general contractor shall attend when issues regarding equipment they are responsible for are discussed. The control technicians attending the meetings must be the same technicians that are/will install and program the DDC system.

Primary issues discussed and clarified are:

- Control drawing content
- Point database (monitored points, software points, naming conventions, alarms, report format)
- Sequences of operation and setpoints
- Interlocks to packaged controls and other systems including lighting controls
- Operator workstation graphics
- Field sensor and panel locations

The Commissioning Provider takes minutes at these meetings.

COMMISSIONING CHECKLISTS, START-UP, AND INITIAL CHECKOUT

The following procedures apply to all equipment and systems to be commissioned:

Commissioning Checklists:

The Commissioning Provider develops and completes the commissioning checklists and procedures for commissioned equipment and systems.

Execute pre-functional system checks using the Commissioning Provider's created forms on the web based commissioning software PlanRadar (or project Cx app).

<u>Calibrations</u>

The construction checklists will contain requirements for calibrations when applicable. The Trade Subcontractors is responsible to calibrate all field-installed sensors and actuators using checkout documentation methods approved by the Commissioning Provider.

<u>Manufacturer Installation and Startup Procedures</u>

A start-up plan shall be developed and submitted by the installing Subcontractor. Start-up plan to include the following:

- Manufacturer’s tests.
- Lighting level verification
- Lighting room checkout and testing
- Exterior lighting checkout and testing

The Trade Subcontractors shall complete the pre-start procedures in the manufacturer startup forms prior to starting equipment, including but not limited to verification of completion of wiring, safeties, drive rotation and proper electrical test readings. Startup shall be conducted under supervision of responsible manufacturer representatives for major pieces of equipment. The GC shall notify the Commissioning Provider at least 5 days in advance of any equipment start-up, providing the Commissioning Provider a copy of the start-up plan at that time.

The Commissioning Provider shall observe startup and checkout of selected systems.

The Trade Subcontractors and manufacturer representatives shall execute start-up and provide the Commissioning Provider with a signed and dated copy of the completed start-up documentation. The Trade Subcontractors shall clearly note any items that have not been completed and the plan for their completion.

The Trade Subcontractors shall operate each commissioned device or system to the full extent of its capability, from minimum to maximum, under automatic and manual control and verify that the equipment, system and assembly is functioning according to the specifications, manufacturer recommendations and good operating practice.

The manufacturer startup reports and procedures for a given system shall be successfully completed and submitted prior to testing, adjusting and balancing of the equipment.

The Commissioning Provider will review startup documentation and identify incomplete areas.

The Trade Subcontractors shall correct all areas that are deficient or incomplete in the startup documentation in a timely manner.

Designated systems requiring test and balance work shall have this activity commence after systems have successfully completed start-up. System and equipment deficiencies observed during this activity is to be noted and corrected.

FUNCTIONAL TESTING

Functional tests for a given system shall not be conducted until they are fully operational under normal and reliable control with control calibrations, programming and control system graphics complete and checked out and the Trade Subcontractors have submitted completed, applicable startup reports, satisfactory to the Commissioning Provider.

The objective of the Functional Performance Testing is to advance the building systems from a state of substantial completion to full dynamic operation in accordance with the specified design requirements and design intent.

Any lighting test equipment needed to accomplish the functional performance tests shall be provided by Subcontractors.

Subcontractors shall provide to the Commissioning Team documentation of calibration of controls. Documentation shall include dates, setpoints, calibration coefficients, control loop verification, and other data required to verify system check-out. Documentation shall be dated and initialed by field engineer or technician performing the work.

Development of Functional and Performance Test Procedures
Test procedures and documentation forms are not finalized until after equipment and control system submittals and shop drawings are approved.

DEFICIENCIES AND NON-CONFORMANCE

Deficiency Management
The Commissioning Provider will record the results of document reviews, field observations, tests conducted or reviewed and trend logs or monitoring. All deficiencies will be recorded on a Deficiency Log kept by the Commissioning Provider. The Deficiency Log will be kept updated by the Commissioning Provider.

Participate and respond to commissioning related issues by using the Commissioning Provider's web based commissioning software PlanRadar (or project Cx app).

A current copy of the Deficiency Log will be provided to the GC and Owner/Owner Representative on a regular basis, as requested. New deficiencies will be identified.

Items that are incomplete or are requiring Designer input will be sent to the Designer and Owner/Owner Representative by the Commissioning Provider via appropriate channels.

When completion of a deficiency has been identified by the Commissioning Provider as holding up or is likely to delay any commissioning process, particularly functional testing, the GC, shall be required to notify the Commissioning Provider providing the planned actions and an expected date of completion. The GC shall notify the Commissioning Provider listing the actions taken to resolve the issue. It is not the responsibility of the Commissioning Provider to obtain this status information through meeting attendance, asking questions or field observation.

The Commissioning Provider documents resolutions in the Deficiency Log and schedules retesting and back-checking as needed.

Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Provider will not be pressured into

overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so.

The time for the Commissioning Provider to direct, document and evaluate any retesting required because a specific construction checklist or start-up test item, reported to have been successfully completed, but determined during testing to be faulty, will be charged to the GC.

The GC shall reimburse the Commissioning Provider for costs when a scheduled test cannot be completed due to:

Failure of the GC to schedule the test with all parties required to perform the test or with regulatory authorities required to witness the test.
Failure of the GC to provide required notice for tests that have been cancelled or rescheduled.
Failure of the GC or Trade Subcontractors to have in place test equipment, support equipment, instrumentation, permits, or other ancillary equipment or systems required for successful execution of the test.
Failure of the Trade Subcontractors to complete pre-start or start-up procedures or other work required as a prerequisite for execution of the test.

The GC shall respond in writing to the Commissioning Provider at least as often as commissioning meetings are being scheduled concerning the status of each outstanding deficiency identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

Approval and Acceptance: The Commissioning Provider will note each satisfactorily demonstrated function on the test form. Functional testing or acceptance of a system is indicated after all testing and monitoring is complete and there are no outstanding deficiencies for that equipment or system in the Commissioning Provider's Deficiency Log.

DEFERRED TESTING

Unforeseen Deferred Tests

If any functional test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of functional testing may be delayed.

ADDITIONAL DOCUMENTATION

Documentation required of the Trade Subcontractors shall consist of the following:

Submitted completed documented, equipment startup reports, satisfactory to the Commissioning Provider
Submitted completed documented, lighting controls point to point device checkout noting that all controlled points and devices are functional, calibrated and confirmed by the lighting trade subcontractor to be pulled into the network.

Record of deficiencies and incomplete items for tests they are responsible to document.

Training record (see Division 01 section for contractual training requirements).

TRAINING FACILITY PERSONNEL

The Trade Subcontractors are responsible to provide training for facility personnel per the Contract Documents.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Control Stations.

Standalone Room Controllers.

Occupancy/Vacancy Sensors.

Photosensor.

Relays, Switchpacks, and Room Controllers.

Power Supplies and Transformers.

Emergency Lighting Control Relays.

Low Voltage Control Wiring.

Test Equipment.

Responsibilities and participation under Division 26, Electrical in the automatic dimming system installation and commissioning process.

Installation, connection, adjustment, and testing of the equipment including labor, materials, tools, appliances,

RELATED REQUIREMENTS

Division 01, General Requirements.

Division 26, Electrical.

Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables

Section 26 05 33.16 - Boxes for Electrical Systems.

Section 26 09 43 - Network Lighting Controls.

Section 26 09 93 - Sequence of Operations for Lighting Controls.

Section 26 27 26 - Wiring Devices.

Section 26 51 00 - Interior Lighting.

Section 26 56 00 - Exterior Lighting

REFERENCE STANDARDS

NECA 1 - Standard for Good Workmanship in Electrical Construction.

NECA 130 - Standard for Installing and Maintaining Wiring Devices.

NFPA 70 - National Electrical Code.

UL 1008 - Transfer Switch Equipment.

UL 924 - Emergency Lighting and Power Equipment.

GENERAL REQUIREMENTS

Provide qualified personnel for participation in commissioning tests, including seasonal testing required after the initial commissioning.

Providing equipment, materials, and labor necessary to correct deficiencies found during the commission process which fulfill contract and warranty requirements.

Provide Operating and Maintenance Data and Record Drawings to the Test Engineer for verification, organization, and distribution.

Provide assistance to the Test Engineer to develop and edit descriptions of system operation.

Providing training for the systems specified in this Division with coordination by the Test Engineer and Commissioning Agent.

SUBMITTALS

Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, installed features, system wiring schematics, and user interface components.

Shop Drawings:
Submittal drawings with a complete system diagram to show quantity of devices, location in the building, dimensions and required wiring.
Occupancy sensors, show the required quantity to cover the space controlled (note: this may be more than the quantity shown on the drawings).
The locations shown on the drawings are for reference only and coordinated with the manufacturer and Architect for final quantity and location during the bid process to allow for allowance of proper quantity, wiring lengths and installation coordination.

Samples:
Provide physical samples of user interface devices and visually exposed control devices for approval by Owner and Architect.

Operation and Maintenance Manuals:
Include product data of system components, one line diagrams of installed components and their locations throughout the building, a final floor plan noting the locations of devices installed above ceilings, behind access panels or in concealed but accessible spaces and the lighting zones or devices they control.
Final relay schedule with the zone of control, location of control zone, voltage, power feed, time clock setting, photocell set point, switch, or dimmer stations controlling the relay, and sweep function set points will be provided by the Contractor.

Project Record Documents: Record actual installed locations and settings for lighting control devices.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

Maintain at the project site a copy of each referenced document that prescribes execution requirements.

Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

DELIVERY, STORAGE, AND PROTECTION

Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

FIELD CONDITIONS

Maintain field conditions within manufacturer's required service conditions during and after installation.

SYSTEM DESCRIPTION

Control Stations:
Control Station Types:
Provide control stations for occupant lighting control as scheduled on the drawings and may include and/or combine the following type of individual control type within a single station:
Scene Selection
On/Off Switching
Dimming Raise/Lower
Occupancy/Vacancy Sensor

Relays, Switchpacks, and Room Controllers:
Analog and Digital: Room controller devices to accept line voltage input as well as input from any combination of control stations, occupancy/vacancy sensors and/or daylight sensors and produce the required effect (switching or dimming) on up to four zones of connected lighting.

Occupancy/Vacancy Sensing:

Reduce electric energy consumption by reducing or eliminating lighting energy use in unoccupied spaces by switching lighting off with occupancy and/or vacancy sensors.

Photoelectric Daylight Harvesting:
Daylit Areas:
Reduce electric energy consumption during daylight hours by reducing the light output of the electric lighting system via switching in response to measured lighting levels provided by daylight within the building interior.
Dimming zones will correlate with the distribution of daylight within the space as noted on plans.

Emergence Override: Provide automatic load control relay devices for controlling egress lighting circuiting.

PART 2 PRODUCTS

LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

Basis of Design Manufacturer:
Lutron Vive

Approved Basis of Design Alternate Manufacturers:
Or Approved Equal

Products described in this section are to be provided by the single BOD (basis of design) or approved alternate manufacturer listed above, or by a compatible, BOD approved third party alternate manufacturer.
Manufacturer series numbers are identified herein to establish the minimum level of quality for each product.
Comparable products that meet the requirements of the specification by other acceptable manufacturers identified herein are acceptable with prior approval.

CONTROL STATIONS

Control Station Types:
Scene Select: Provide four scene selection control station including discrete, engraveable pushbuttons allowing on/off and raise/lower control of entire space and means for occupants to select from indicated on drawings.
On/Off:
Provide individual pushbuttons.
Controls lighting in entire space if no zones indicated on plans.
Dimming/Raise Lower:
Provide individual pushbuttons for on and off control of zones indicated on plans.
Controls lighting in entire space if no zones indicated on plans.
Dimming accomplished by press and hold the ON and OFF buttons for dimming up and down respectively.
Integral Occupancy:
Automatically switches lighting on when occupant enters space.
Switches lights off after predetermined period of vacancy.
Controls lighting in entire space.
Integral Vacancy:
Includes pushbuttons for occupant manual on/off and dimming control of lighting in space.
Automatically switches lights off after predetermined period of vacancy.
Includes provision to revert to occupancy control in absence of configurable amount of daylight.
Controls lighting in entire space.

Line Voltage Dimming Switches:
Architectural grade, line voltage, 20A rated, single pole, preset style, slide up to brighten and down to dim, with on/off rocker style switch, decora style, wattage rating and lamp/power supply compatibility as required.
Forward Phase, Reverse Phase, 0-10V.
Provide 3-way type where shown on plan.
Lutron Diva Series

Wallbox Occupancy Sensor Switches:
180 degree coverage, type as shown on plan (PIR, ultrasonic or dual-technology), configurable automatic-on or manual on operation, 3-wire type, daylight override, adjustable time-out, selectable walk-through mode and override off switch. Single or dual relay type as required or as shown on Drawings. Provide 3-way type where shown on plan.
WattStopper PW series.

Digital Control Stations:
Provide control stations with configuration as indicated or as required to control the loads as indicated.
General Requirements:
Power: Class 2 (low voltage).
UL listed.
Provide faceplates with concealed mounting hardware, with matching finish.
Borders, logos, and graduations to use laser engraving or silk-screened graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning. Self-Adhesive labels not permitted.
Finish: As specified for wall controls in this Section.
Single-Zone or Single-Group:
Turn an individual fixture or group of fixtures as shown on plans on and off via button press.
Raise and lower light levels via press and hold button.
Separate buttons for dimming and on/off functions not allowed.
Multi-Scene or Multi-Group:
General Requirements:
Allows control of any devices part of the lighting control system as indicated on plans.
Controls can be programmed with different functionality through system software without any hardware changes. Allows contextual functions based upon button press and press and hold input.
Allows for easy reprogramming without hardware replacement.
System will automatically update programming without direct human interaction upon replacement of any component.
Communications: Utilize RS485 or similar wiring for low-voltage communication.
To help occupants understand how to use the lighting control system, engraving requirements should be included for controls. Engraving details should include text size and style.
Engrave keypads with button, zone, and scene descriptions as indicated on the drawings.
Software Configuration:
Single defined action.
Buttons can be programmed to perform defined action on press and defined action on release.
Buttons can be programmed using conditional logic off of a state variable such as time of day or partition status.
Buttons can be programmed to perform automatic sequence of defined actions.
Capable of deactivating select keypads to prevent accidental and/or unwanted changes to light levels and other settings.
Buttons can be programmed for raise/lower of defined loads.
Buttons can be programmed to toggle defined set of loads on/off.
Status LEDs:
Upon button press, LEDs to immediately illuminate.
Time delays inherent in large systems can cause short delays between button press and system confirmation. To avoid any confusion and prevent multiple button presses, keypads should immediately show that the button has been pressed for visual confirmation.
LEDs to reflect the true system status. LEDs to remain illuminated if the button press was properly processed or LEDs to turn off if the button press was not processed.
Support logic that defines when LED is illuminated:
Scene logic (logic is true when zones are at defined levels).
Room logic (logic is true when at least one zone is on).
Pathway logic (logic is true when at least one zone is on).
Last scene (logic is true when spaces are in defined scenes).

STANDALONE ROOM CONTROLLERS

General:
Provides a common, standalone interface via dimming and/or switching to a group of 0-10V Dimming or Fixed Output Ballasts and/or 0-10V LED Drivers.
Direct conduit connection or provision for mounting to junction box.
Physical barriers provided between Class 1 and Class 2 wiring as well as between normal power and emergency power wiring.
Dual voltage 120/277V, 60HZ operation, 20A rating for each relay Relays utilize zero crossing technology for increased life.
Plenum Rated.

Digital Room Controllers and Switchpacks:
Replacement of any component requires no reconfiguration or reprogramming.
Low voltage connections via CAT5/6 and RJ-45 connectors.
On board power supply for a minimum of six accessory devices including, but not limited to occupancy sensors and control stations.
Up to four on-board relays and accompanying 0-10V dimming channels.
Provision for IR or RF remote for configuration and editing of connected device settings.
Provide means to copy settings from on system to another.
Field configurable to support, occupancy (automatic on) and vacancy (manual on) control protocol. Daylight harvesting feature for any number of zones.
Timeclock Functionality:
Provide functionality to directly trigger relay and dimmer settings by timeclock event and:
Mask or lock out sensor and/or control station inputs by timeclock event.
Room Controller: WattStopper LMRC Series
Switchpack: WattStopper LMZC Series

Analog Room Controllers and Power Packs:
On board power supply for a minimum of six accessory devices including, but not limited to occupancy sensors.
Up to four on-board relays and accompanying 0-10V dimming channels.
Provision for IR or RF remote for configuration and editing of connected device settings.
Provide means to copy settings from on system to another.
Field configurable to support, occupancy (automatic on) and vacancy (manual on) control protocol with optional daylight harvesting feature.

OCCUPANCY/VACANCY SENSORS

General Requirements:
Power Failure Memory: Settings and learned parameters to be saved in non-volatile memory and not lost should power be interrupted and subsequently restored.
Furnished with necessary mounting hardware and instructions.
NEC Class 1 or 2 devices, refer to plans.
Ceiling-Mounted Sensors: Indicate viewing directions on mounting bracket.
Wall-Mounted Sensors: Provide swivel-mount base.
Ceiling-Mounted Sensors: Provide customizable mask to block off unwanted viewing areas.
Isolated Relay: Provide ceiling mounted sensors with an internal isolated relay with Normally Open, Normally Closed, and Common outputs rated at 1A at 30VDC/VAC for use with HVAC control, Data Logging and other control options.
Line Voltage sensors accept line voltage input and output switched line voltage directly to controlled luminaires.
Line voltage sensors must be capable of occupancy or vacancy control. Operation is to be determined by onboard device settings.
Sensor configuration to be made by integral pushbutton or dial controls.
Types:
PIR: utilize invisible light to determine occupancy.
Ultrasonic/Microphonic: utilize audible or subaudible sound to determine occupancy.
Dual-Tech: utilize a combination of the above technologies to determine occupancy.

Detection of vacancy by both ultrasonic and PIR sensors required to turn lights off.
Low Voltage sensors are paired with a switch pack or room controller. Provide digital sensors compatible with room controller/switchpack and balance of system.
Low voltage sensors must be capable of occupancy or vacancy control. Operation is to be determined by overall system configuration and/or device settings.

Ceiling Mounted: 360 degree coverage:
Automatic-on operation, light-level sensing, adjustable time-out, automatic sensing/adjustment for optimal time-out delay setting, selectable walk-through mode.
Low- or line-voltage as shown on Drawings or described in Section 26 09 93 - Sequence of Operations for Lighting Controls,
Surface mounted, provide power packs as required.
Dual Technology Type:
Low Voltage: WattStopper DT-300 Series.
Line Voltage: WattStopper DT-355 Series
Passive infrared type:
Low Voltage: WattStopper CI-300 Series
Line Voltage: WattStopper CI-355 Series
Ultrasonic type:
Low Voltage: WattStopper UT-300 Series
Line Voltage: WattStopper UT-355 Series

Ceiling/Wall Mounted/Corner: 180 degree coverage:
Automatic-on operation, light-level sensing, adjustable time-out, automatic sensing/adjustment for optimal time-out delay setting, selectable walk-through mode,
Low-voltage with power pack, surface mounted as required.
Dual Technology type: WattStopper DT-200 series.
Passive infrared type: WattStopper CX-100 series.

Provide multiple contacts and/or power packs for Low Voltage occupancy sensors that:
Control both normal and emergency lighting and require separation of branch circuit wiring systems. In case of occupancy sensor failure, emergency lighting fail to the on state.
Control separate lighting control zones. Unless otherwise noted, occupancy sensors are intended to control light in a designated zone or room. Contractor is responsible for providing the required power packs to insure functionality of the system.
Provide UL924 listed relay or power pack for to bypass occupancy sensors in event of power failure. During normal operation, relay to operate lighting in conjunction with adjacent normal power lighting.

PHOTOSENSOR

General Requirements:
Use NEC Class 2 wiring for low voltage communication.
Can be replaced without reprogramming.
Photopically corrected to approximate human vision.
Daylight sensing equipment will be digital, full range type, self or manually calibrated.
Provide proper photocell type(s) as required to:
Measure lighting levels on an affected interior surface. Illumination contribution to this measured surface will include both daylighting and electric lighting (closed-loop system).
Measure light levels entering space through glazing. Illumination contribution to this measured surface will include daylighting only (open-loop system).
Measure light levels on affected interior surface and entering space through glazing. Illumination contribution to these measured surfaces will include both daylight and electric lighting (combination open and closed loop/dual loop system).
Independently control single zone of luminaires for maximum energy savings while maintaining even task illumination across the entire area between zones. Refer to drawings for control groupings.
Incorporate time delay logic to prevent cycling due to clouds and other short-term influences to lighting levels.

Accept indoor, skylight, and outdoor photo sensing heads. Photo sensing control permit the user to specify the actual footcandle level where desired switching occurs.

Indoor:
Stable output over temperature from 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C).
Open Loop:
Adjustable aiming angle to accommodate various glazing configurations
Provide linear response from 0 to minimum 1000 foot-candles.
Mountable on lighting fixtures or recessed acoustical ceiling tiles.
Wattstopper LMLS-500 Series.
Closed Loop:
Indoor sensors have a Fresnel lens, with a minimum 60 degree cone of response.
Provide linear response from 0 to minimum 500 foot-candles.
Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
Mountable on lighting fixtures or recessed acoustical ceiling tiles.
Wattstopper LMLS-400 Series.
Dual Loop (Skylight/Atrium):
Indoor sensors have a Fresnel lens, with a minimum 60 degree cone of response.
Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
Atrium:
Translucent dome with a 180 degree field of view.
Sensor range from 2 to 2,500 FC.
Skylight:
Sensors have a translucent dome with a 180 degree field of view.
Range between 10 and 7,500 FC.
Wattstopper LMLS-600 Series.

Outdoor / Rooftop:
Outdoor models have a hood over the aperture to shield the sensor from direct sunlight.
The outdoor sensor circuitry completely encased in an optically clear epoxy resin.
Range between 0 and 750 FC.

Analog: Interior/Exterior: PLC CES Series

RELAYS, SWITCHPACKS AND ROOM CONTROLLERS

Analog:
Devices interconnected via low voltage cabling.
Configurable to produce the following sequences of operation by handheld IR or RF remote.
Occupancy control: Automatically turns lights on when occupant is detected in space. Automatically turns lights off after a configurable period of vacancy.
Vacancy Control: Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.
Timeclock
Daylight Harvesting:
Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.
Accepts input from analog daylight sensing equipment and adjusts light level settings accordingly.

Digital:
Devices interconnected by contractor terminated cabling.
Configurable to produce the following sequences of operation by handheld IR or RF remote.
Occupancy Control:
Automatically turns lights on when occupant is detected in space.
Automatically turns lights off after a configurable period of vacancy.
Vacancy Control: Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.

Timeclock
Daylight Harvesting
Occupant must manually turn lights in space on, automatically turns lights off after a set period of vacancy.
Accepts input from daylight sensing equipment and adjusts light level settings accordingly.
Provides additional capability or accessories to integrate with AV, BAS, HVAC, and/or shade control systems.

POWER SUPPLIES AND TRANSFORMERS

Provide from same manufacturer of equipment served.

Compatible with specified photocells and dimming control station protocols.

Refer to Section 26 50 00 - Lighting for product specification on luminaire power supplies and transformers.

EMERGENCY LIGHTING CONTROL RELAYS

Manufacturers:
Bodine
Nine 24
Wattstopper
Or approved equivalent.

General Requirements
Comply with UL 924 requirements:
If controlled off, must turn on automatically.
Provide required egress illuminance along entire egress path.
Must not be able to be overridden by building occupants.
Unless shown otherwise on drawings, load control relay provided is to control egress lighting along with adjacent normal power lighting except in event of power failureor fire alarm system alarm status.
Device can be integral to other components listed above or operate in conjunction with other lighting control components as a discrete component, but must be fed via UL 1008 compliant power source, such that in event of a power failure, control and dimming signals are bypassed and lighting operates at full power. Fed via the UL 1008 source.

Description:
Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts.
UL 924 listed for connected load of 10A at 277V or 120V.
UL rated N.C. contacts, minimum 10A rating.
Integral surge protection.
Two separate status emergency lighting indicators for troubleshooting:
Amber LED indicates presence of normal utility power.
Red LED indicates presence of unswitched emergency power.
Manual and/or automatic diagnostic testing feature.
Self-contained enclosure UL listed for installation in indoor or damp locations.

LOW VOLTAGE CONTROL WIRING

18 gauge shielded cable or as recommended by the manufacturer.

TEST EQUIPMENT

Provide multi-function digital illuminance meter with detachable receptor head with the following characteristics:
Receptor: Silicon photocell type
Illuminance Units: Lux or footcandles (switchable)
Measuring range: 0.1 to 19,990 lux, 0.01 to 1,999 footcandles
Accuracy: ±4 percent ±1 digit of displayed value
Cosine Correction Characteristics: Within ±1 percent at 10 degrees; within ±5 percent at 60 degrees.

Measuring functions: Illuminance, integrated illuminance, average illuminance.
Temperature/humidity drift: Within ±3 percent ±1 digit (of value displayed at 68 degrees F) within operating temperature/humidity range.
Operating conditions: 32 degrees F to 104 degrees F at less than 85 percent humidity.

Provide proof of calibration within 12 months of use. Calibration performed by an independent calibration lab approved by the manufacturer of the meter.

PART 3 EXECUTION

EXAMINATION

Verify that field measurements are as indicated.

Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

Verify that final surface finishes are complete, including painting.

Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

Verify that conditions are satisfactory for installation prior to starting work.

INSTALLATION

Submittal data required prior to ordering and installation.

General Testing:
Functionally test control devices to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with approved drawings, specifications, and manufacturers' installation instructions.
Prepare and complete report of test procedures and results and file with the Owner.

Install lighting control devices in accordance with manufacturer's instructions.

Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

Install lighting control devices plumb and level, and held securely in place.

Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.

Provide required supports in accordance with Section 26 05 29.

Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

Identify lighting control devices in accordance with Section 26 05 53.

Low Voltage Wiring:
Install in conduit where running through inaccessible areas. Provide plenum rated wiring in accessible ceiling spaces.
Test CAT5/6 cables terminated on site prior to wiring of digital lighting control systems. Provide evidence of successful testing to Engineer and Owner. Factory pre-terminated cabling is not subject to this requirement.
Coordinate low voltage wiring connection and location with luminaires to be controlled.

Occupancy Sensors:
For installation of low voltage occupancy sensors in inaccessible ceiling systems, coordinate power pack locations with Architect prior to installation and coordinate access panel locations with Architect.

Sensor locations identified on Drawings are diagrammatic and are meant to indicate only that occupancy sensing within a given space is required. Locate sensors as required by the manufacturer to provide maximum coverage of the room, to operate as someone enters the room, and to avoid false operation due to persons outside the room passing an open door.
Provide additional sensing heads as necessary or per manufacturer's recommendation to achieve complete coverage of each room.
Set sensitivity as required to provide small movement coverage throughout the room without extending coverage beyond the room.
System performance testing done with the sensor timing set to the time delay indicated by space type in Section 26 09 93 - Sequence of Operations for Lighting Controls.
Upon Completion of installation and prior to turning space over to Owner, Contractor reset occupancy sensor automatic self-adjustment settings to insure proper time delay self-adjustment for Owner occupant schedule and room use.
Allow for up to 24 hours of callback sensor adjustments to be made by the Contractor or occupancy sensor manufacturer qualified installer for up to six months after the Owner has taken occupancy of the space.

Emergency Lighting Control Relays:
Provide unswitched emergency circuit, and unswitched and switched normal circuit to UL 924 relay for control of emergency luminaires with remaining room luminaires on normal power.
Install each relay within dedicated 4-11/16-inch junction box with double-gang plaster ring for wall or ceiling flush-mount or in a self-contained enclosure from the manufacturer, as indicated on Drawings.
Where location in ceiling would interfere with removal of ceiling tiles, install relay flush-mounted in nearest wall at ceiling level.
Do not locate behind wall switch.

WORK PRIOR TO COMMISSIONING

Complete phases of work so the system can be powered, tested, adjusted, and otherwise commissioned. Under Division 26, Electrical, complete systems, including subsystems, so they are fully functional. This includes the complete installation of equipment, materials, wire, controls, etc., in accordance with the contract documents and related directives, clarifications, change orders, etc.

A commissioning plan will be developed by the Test Engineer and approved by the Commissioning Agent. Under Division 26, Electrical, assist the Test Engineer and Commissioning Agent in preparing the commissioning plan by providing necessary information pertaining to the actual equipment and installation. If system modifications and clarifications are in the contractual requirements of this and related sections of work, they will be made at no additional cost to the Owner. If Contractor initiated system changes have been made that alter the commissioning process, the Commissioning Agent will notify the Owner.

Specific pre-commissioning responsibilities under Division 26, Electrical are as follows:
Factory startup services for the following items of equipment:
Lighting Control System
Normal startup services required to bring each system into a fully operational state. This includes complete installation and cleaning. The Test Engineer will not begin the commissioning process until each system is documented as being installed complete.

Begin commissioning after installation of interior and exterior finishes including but not limited to adjacent roofing, finished floor, wall, and ceiling systems including final painting, furniture and book stacks in place, and other building systems which have direct or indirect influence on the performance and distribution of the daylight and electric lighting systems.

Start of commissioning before such items are complete will not relieve Contractor from completing those systems in accordance with the Construction Schedule.

SEQUENCE OF COMMISSIONING

Provide to Architect prior to start of commissioning layout drawings indicating proposed location of measurement points. Proceed with commissioning after review and acceptance by Architect.

Illuminance measurements oriented horizontal, facing up, at 30-inches above finished floor. Measurements for a control group occurs at the same location. Ensure constancy of local surface reflectance conditions throughout commissioning of each control group.

Ensure no personnel or outside influence affects the amount of flux striking the receptor head during the recording session.

Document measurements in clearly understandable format for review by the Architect. Include time of measurement, temperature, and relative humidity.

Measure illuminance at least two hours after local sunset with full output of electric lighting. Record integrated illuminance and average illuminance for a 2 hour period.

During daylight hours, measure illuminance with electric lighting off, including emergency and nightlight circuits. Record integrated illuminance and average illuminance for a two hour period. Document in clearly understandable format for review by the Architect.

Set each photocell to 150 percent of electric-only lighting contribution.

After initial setpoint has been set, measure illuminance in 10 minute increments from 1 hour before to 1 hour after local sunset.

Submit recorded data to Architect for review.

TESTING FOR SEASONAL VARIATIONS

Timing of Commissioning:
Initial Commissioning:
Perform to best suit the current time-of-year and cloud cover conditions.
Conduct as done as soon as contract work is completed regardless of season.
Seasonal Commissioning: Test under full sunlight and full overcast conditions during summer and winter solstice, as well as similar conditions at the spring or fall equinox.
Subsequent Commissioning: Ascertain adequate performance during the four seasons.

PARTICIPATION IN COMMISSIONING

Provide skilled technicians to start up systems within Division 26, Electrical. The same technicians made available to assist the Test Engineer and Commissioning Agent in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested, and coordinated by the Test Engineer. Under Division 26, Electrical, ensure that the qualified technician(s) are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments, and problem resolutions at no additional cost to the Owner.

System problems and discrepancies may require additional technician time, Test Engineer time, Commissioning Agent time, redesign, and reconstruction of systems and system components. The additional technician time made available for the subsequent commissioning periods until the required system performance is obtained at no additional cost to the Owner.

Commissioning Agent reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service the commission the equipment, and a willingness to work with the Test Engineer and Commissioning Agent to get the job done. Remove technicians from the project at the request of either the Test Engineer or Commissioning Agent.

RESOLUTION OF DEFICIENCIES

In some systems, misadjustments, misapplied equipment, and deficient performance will result in additional work required to commission the systems.

Complete work under the direction of the Architect, with input from the Contractor, equipment supplier, Test Engineer, and Commissioning Agent.

Whereas members will have input and the opportunity to discuss the work and resolve problems, the Architect will have final jurisdiction on the necessary work to be done to achieve performance.

Complete corrective work in a timely fashion to permit timely completion of the commissioning process.

Experimentation to render system performance is permitted. If the Commissioning Agent deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Agent will notify the Owner, indicating the nature of the problem, expected steps to be taken, and the deadline for completion of activities.

If deadlines pass without resolution of the problem, the Owner reserves the right to obtain supplementary services, equipment, or both, to resolve the problem.

Costs incurred to solve the problems in an expeditious manner will be the Contractor's responsibility.

TRAINING

Participate in the training of Owner's engineering and maintenance staff, as required in Divisions 01 through 28, on each system and related components.

Conduct training in a classroom setting, with system and component documentation, and suitable classroom training aids.

Training classroom sessions and file demonstrations will be videotaped and copies of this material will be provided as part of closeout requirements.

Training will be conducted jointly by the test engineer, commissioning agent, the Contractor, and the equipment suppliers.

Test engineer responsible for highlighting system peculiarities specific to this project.

SYSTEMS DOCUMENTATION

In addition to the requirements of Division 01, General Requirements, update contract documents to incorporate field changes and revisions to system designs to account for actual constructed configurations.

Division 26, Electrical, record drawings include architectural floor plans and the individual daylight control systems in relation to actual building layout.

Provide in AutoCAD .dwg format for transmittal to the test engineer.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Software Interfaces

Backbone and System Integration Equipment Lighting Control Equipment

Low Voltage Control Wiring

Wireless Network Architecture

Network Security

Responsibilities and participation under Division 26, Electrical in the automatic dimming system installation and commissioning process.

Installation, connection, adjustment and testing of the equipment including labor, materials, tools, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a complete operational lighting control system.

RELATED SECTIONS

Division 01, General Requirements

Division 26, Electrical

Division 23, Heating, Ventilation, and Air Conditioning

Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables

Section 26 09 23 - Lighting Control Devices

Section 26 09 93 - Sequence of operation for Lighting Controls

Section 26 27 26 - Wiring Devices

Section 26 50 00 - Lighting

Section 26 51 00 - Interior Lighting

Section 26 56 00 - Exterior Lighting

REFERENCE STANDARDS

FCC emission standards

NEMA - National Electrical Manufacturers Association

NFPA 70 - National Electrical Code

UL - Underwriters Laboratories Inc

UL 20 - General-Use Snap Switches

UL 924 - Standard for Emergency Lighting and Power Equipment

UL 1008 - Standard for Transfer Switches

QUALITY CONTROL

Provide installation of lighting control systems by an experienced contractor. Provide a factory technician to supervise the installation and installation and make final adjustment and tests of the system.

Furnish evidence of an experienced service organization which stocks system parts and is capable of providing repair service within 24 hours.

Manufacturers

Company specializing in the manufacturing of centralized and distributed lighting control systems with a minimum of 10 years documented experience.

Installers

Company certified by the manufacture and specializing in installation of networked lighting control products with a minimum three years documented experience and capable of providing repair and service within 24 hours.

System Components

Demonstrate that individual components have undergone quality control and testing prior to shipping.
Compliant with the requirements of NFPA 70.
Power components UL listed for require loads.

WARRANTY

Manufacturer is to provide a minimum five year warranty on hardware devices supplied and installed.
Warranty coverage is to begin on the date of shipment.

Hardware warranty is to cover repair or replacement of any defective products within the warranty period.

MAINTENANCE AND SUSTAINABILITY

Manufacturer is to make available to the owner, new parts, upgrades, and/or replacements available for a minimum of 5 years following installation.

SUBMITTALS

Shop Drawings: wiring diagrams for the various components of the system specified including:
Composite wiring and/or schematic diagrams of each control circuit as proposed to be installed.
Show location of devices, including at minimum sensors, load controllers, and switches/dimmers for each on reflective ceiling plans.
Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topology.
Network riser diagram including floor and building level details. Include network cable specifications.
Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.
Provide physical samples of user interface devices and visually exposed control devices for approval by Owner and Architect.

Product Data: Manufacturers data sheets of each product to be used, including:
Catalog sheets and specifications.
Rating, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
Storage and handling requirements and recommendations.
Installation instructions.

Closeout Submittals:
Project Record Documents: Record actual installed locations and settings for lighting control devices.
Operation and Maintenance Manual:
Include approved Shop drawings and Product data.
Include final relay schedule with the zone of control, location of control zone, voltage, power feed, time clock setting, photocell set point, switch, or dimmer stations controlling relay, and sweep function set points will be provided by contractor.
Include Sequence of Operation, identifying operation for each room or space.
Include manufacturers maintenance information.
Include startup and test reports.

Information Technology (IT) connection information pertaining to interconnection with facility IT networking equipment and third party systems.

Service Specification sheet indicating general service descriptions, including startup, training, post startup support, and contract terms.

SYSTEM OPERATION

Use a modular component approach, utilizing a central processor, transceivers which activate relays and relay cabinets.

Incorporate the following criteria:
Control information from the controller to the transceiver multiplexed over a single pair of wires.
Conform control wiring to NEC Article 725, Class 2.
Components: Standard catalog items available through electrical distributors.
Expandable to control up to 4,000 relays. Relays operable from 2 or 3-wire control systems.

Programmable on site to achieve control functions and be readily update able to reflect changes without requiring rewiring.

Installed system capable of the following control functions:
Automatic Control: Areas to be activated in user dictated patterns (ON-OFF array of relays) according to either a weekly schedule broken into one-minute increments or alternate daily schedules pre-programmed for holidays.
Manual Controls: Control relay or group of relays with either a maintained or momentary switch; activate group of relays to one of ten user determined patterns via a touchstone or pushbutton phone or the controller keyboard.

Select, activate, and lock-in lighting pattern from the central controller with provisions to lock out manual and automatic commands.

Indicate to the operator transceiver failure.

Internal battery backup of ten hours for memory protection. Store program information on a disc and automatically reload the controller after a power outage longer than the battery backup.

Capable of turning on circuits for continued operation should control component fail.

A self-diagnostic routine to indicate a malfunction.

Systems devices to support remote firmware update, such that physical access to each device is not necessary, for purposes of upgrading functionality at a later date.

System Integration Capabilities
The system is to be able to interface with third party building management systems (BMS) to support two way communication using the industry standard BACnet/IP or BACnet/MSTP protocols.

CONNECTION TO EXISTING NETWORK

General: Communication between peer-to-peer network lighting control panels via TCP/IP over existing Ethernet, RS-485, RS-232, or other previously established panel system communication protocol.

Provide software and system integration to seamlessly integrate to the existing server for common system graphics, alarming, paging out of alarms via existing system.

PRE-INSTALLATION MEETINGS

General convene minimum two weeks prior to commencing work of this section. Meeting to be attended by contractor, member of the design team, system installer, factory authorized manufacturers representative, and representative of trades related to the system installation.

Review installation procedures and coordination required with related work and the following:
Confirm the location and mounting of devices, with special attention to placement of switch, dimmers, and sensors.
Review the specifications for low voltage control wiring and terminations.
Discuss the functionality and configuration of products, including sequences of operation, per design requirements.
Discuss requirements for integration with other trades.

Inspect and make note of job conditions prior to installation:
Record minuts of meeting and provide copies to parties present.
Identify outstanding issues in writing designating the responsible partly for follow up action and the timetable for competition.
Installation is not to begin until outstanding issues are resolved to the satisfaction of the Architect.

PART 2 PRODUCTS

MANUFACTURERS

Source limitations: furnish Section 26 09 43 - Network Lighting Controls and associated components produced by the same manufacturer as Section 26 09 23 - Lighting Control Devices used for this project and obtained from a single supplier.

Basis of design manufacturer:
Lutron Vive

Approved Basis of Design Alternate Manufacturers:
Approved Equal

Products described in this section are to be provided by the single BOD (basis of design) or pre-approved alternate, manufacturer, listed above.

SOFTWARE INTERFACES

Management Interface
System to provide web based management interface that provides remote system control, live status monitoring, and configuration capabilities of lighting control settings and schedules.
Management interface must be compatible with industry standard web browser client, including, but not limited to: Microsoft Bing, Apple Safari, Google Chrome, Mozilla Firefox.

Historical Database and Analytics Interface
System to provide a browser based trending and monitoring interface that stores historical data for occupancy/daylight sensors and lighting loads.

Visualization Interface
System to provide an optional web based visualization interface that displays a graphical floor plan.
System data, to include status of occupancy sensors, daylight sensors and light output to be overlaid to the floor plan to provide a graphical status page.

BACKBONE AND SYSTEM INTEGRATION EQUIPMENT

System Controller:
System Controller to be a multitasking, real time digital control processor consisting of modular hardware with plug-in enclosed processors, communication controllers and power supplies.
Sytem controller to preform the following functions:
Facilitation of global network communications between different areas and control zones;
Time based control of downstream wired and wireless network devices.
Linking into an Ethernet network.
Integration with building Management System (BMS) and Heating, Ventilation and Air Conditioning (HVAC) equipment. Provide BACnet communications from Lutron VIve Hub to Building Management System.
Connection to various software interfaces, including management interface, historical database and analytics interface, visualization interface, and personal control applications.
System controller to not require a dedicated PC or a dedicated cloud connection.
Device to automatically detect networked devices connected to it, including those connected to wired and wireless communication bridges.
Device to have a standard and astronomical internal time clock.
To be capable of connecting to the customers Local Area Network (LAN) via IEEE 802.11 x wireless and IEEE 802.3 wired connection
To be capable of operating independent of the buildings existing network infrastructure if desired and to not rely on tenant supplied PC for operation. Network infrastructure to only be utilized for Personal Control Software.
System controller to support BACnet/IP and BACnet/MSTP protocols to directly interface with BMS and HVAC equipment with out the need for additional protocol translation gateways.

LOW VOLTAGE CONTROL WIRING

Wiring System to support operation on the following types of cabling:
ANSI/TIA/EIA-568-B.2-10 standard for Category 5e UTP cable.
Meet applicable requirements of ANSI/ICEA S-80-576.
Four 24 AWG twisted pairs.
Overall diameter of the cable less then 0.28 inches.
Ultimate breaking strength measured in accordance with ASTM D 4565 400 N minimum.
Lead free cable jackets and rated for its installed environment.
Withstanding a bend radius of 1 inch at -20 degrees C without jacket or insulation cracking.
Provide cabling compatible with other parts of the system components and carry the full 20 year warranty.
In order to qualify for the warranty the structured cabling system must be installed per the following:

Meet TIA/EIA commercial building wiring standards.
Use products purchased from authorized distributors.
Installed in accordance with the manufacturers warranty guidelines.
Size conductors according to lighting control device manufacturers written instructions, unless otherwise indicated.
18-24 AWG minimum, stranded copper, color coded, 300V minimum insulation. Multiconductor cable assembly may be used at contractors option.

WIRELESS NETWORK ARCHITECTURE

Wireless network to be capable of self healing, such that the loss of backbone or local communication between devices does not result in the loss of control of the luminaires in the space.

Wireless network communication to support uniform and instant response such that luminaires in a lighting control zone respond immediately and synchronously in response to a sensor or wall station signal.

Wireless communications to support a latency of less than 400mS for response of control after control station, schedule, or integration trigger.

Sufficient wireless coverage to be coordinated with structural and architectural plans by lighting control manufacturer to ensure adequate antenna transmission and repeaters are supplied where concrete or metal construction is of concern to system communications.

NETWORK SECURITY

For IP based networks the following performance requirements are to be met and coordinated with the owners information system department.
A Local Area Network (LAN) wholly independent of the owners/in house communications systems, with no established connections that would allow lighting devices on the IP network to communicate with devices on other networks unless explicit permission from the owner is given.
Where a wholly independent LAN is not available, the lighting control network will separate tenants from the lighting control network via a dedicated VLAN (IEEE 802.1q).
The systems LAN network and sub-network assignments included on the shop drawings and updated in the record drawings/O&M submittal at project closeout.
Devices IP addresses statically assigned.
Minimum network requirements.
Final network requirements comply with the manufacturers primary communication protocol.
Confirm final requirements with manufacturers for deviations to the requirements listed herein, prior to making configurations to network switching equipment.

System to support a minimum of Advanced Encryption Standard (AES) 128 bit encryption.

Utilize public and private key authentication.

Provisioning
Devices with a default password to be provided with a new password during installation. Coordinate with Owners for creation of login passwords.
Upon completion of provisioning, disable radios not dedicated to standard operation of the system.

PART 3 EXECUTION

DRAWINGS

Installing contractor responsible for documenting installed locations of networked devices, including networked luminaries. Includes responsibility to provide as-built plan drawing showing device addresses corresponding to locations of installed equipment.

Submit drawings when approved and form the basis for installation.

Incorporate at the completion of the work deviations from the installation drawings on the shop drawings/contract documents to indicate as built conditions. Submit drawings as the record drawings for the system.

INSTALLATION

Install systems for each section of each floor and connect lighting circuits per relay schedule on drawings.

Area control switches able to manually provide at least two levels of control of luminaries per area.

Wiring (power and control) will comply with Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables. Wiring to be installed to be concealed wherever possible. Notify the Architect and Owner if conduit or wire will be visibly exposed in any way and coordinate installation approach with the Architect and Owner prior to installation.

Provide conduit for wiring, 1/2 inch minimum size.

Components for cabinets factory installed.

Install cabinets plumb, adjacent to serving lighting panel in electrical rooms as shown on the Drawings.

Coordination with Owners IT network infrastructure
The successful bidder is required to coordinate with the owner representative to secure required network connections to the owners IT network infrastructure.
The bidder to provide to the owners representative network infrastructure requirements of the networked lighting control system.
The bidder to provide, to the manufacturers representative, necessary contacts pertaining to the owners IT infrastructure, to ensure that the system is properly connected and started up.

Coordination with Mechanical division
Successful bidder to provide integration equipment detailed in Section 26 09 43 - Network Lighting Controls.
Successful bidder to verify integration scope with the Mechanical contractor prior to submittal phase and provide necessary schedule to the Lighting Control manufacturer.

SYSTEM STARTUP

Upon completion of the installation by the installer, including completion of required verification and documentation required by the manufacturer, the system to be started up and programmed by an authorized representative of the manufacturer.
Low voltage network cable testing to be preformed prior to system startup at the discretion of the manufacturer.

System start-up and programming to include:
Verifying operational communications to system devices.
Programming the network devices into functional control zones to meet the required sequence of operation.
Programming and verification sequence of operations.
Customization of owners software interfaces and applications.
Each device to be labeled with room name, zone of control, and luminaire type in device tree of software management system for ease of programming, verification and maintenance.

Initial start up and programming to occur on site. Additional programming may occur on site or remotely over the Internet as necessary.

PROJECT TURNOVER

Demonstration and Training:
Without additional expense to the Owner, competent authorized representative personal to give instructions for the care, adjustment, and operation of all parts of the system to the Owners representative who is to have charge of the equipment.
Each instructor to be thoroughly familiar with parts of the installation and trained in operating theory as well as in practical operation and system maintenance.
Furnish system instruction to the Owner after the final acceptance of the system at the dates and times selected by the Owner.

Installation, start up, and maintenance assistance available from the manufacturer on an as needed basis.

Submit a software database file with desired labels and notes completed.

PRODUCT SUPPORT AND SERVICE

Factory telephone support to be available at no cost to the Owner following acceptance. Factory assistance to consist of assistance in solving application issues pertaining to the control equipment.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Power distribution panelboards.

Lighting and appliance panelboards.

Overcurrent protective devices for panelboards.

RELATED REQUIREMENTS

Section 26 05 26 - Grounding and Bonding for Electrical Systems.

Section 26 05 29 - Hangers and Supports for Electrical Systems.

Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

Section 26 27 13 - Electricity Metering: For interface with equipment specified in this section.

REFERENCE STANDARDS

FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service.

NECA 1 - Standard for Good Workmanship in Electrical Construction.

NECA 407 - Standard for Installing and Maintaining Panelboards.

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.

NEMA PB 1 - Panelboards.

NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.

NFPA 70 - National Electrical Code.

UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

UL 67 - Panelboards.

UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.

UL 869A - Reference Standard for Service Equipment.

UL 943 - Ground-Fault Circuit-Interrupters.

UL 1053 - Ground-Fault Sensing and Relaying Equipment.

UL 1699 - Arc-Fault Circuit-Interrupters.

ADMINISTRATIVE REQUIREMENTS

Coordination:

Coordinate work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

Coordinate arrangement of electrical equipment with dimensions and clearance requirements of actual equipment to be installed.

Coordinate work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical, for submittal procedures.

Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
Include wiring diagrams showing factory and field connections.
Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
Include documentation of listed series ratings upon request.

Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

Field Quality Control Test Reports.

Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
See Section 01 60 00 - Product Requirements, for additional provisions.
Panelboard Keys: Two of each different key.
See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

Maintain at the project site a copy of each referenced document that prescribes execution requirements.

Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

DELIVERY, STORAGE, AND HANDLING

Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

FIELD CONDITIONS

Maintain ambient temperature within the following limits during and after installation of panelboards:
Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

PART 2 PRODUCTS

MANUFACTURERS

Schneider Electric; Square D Products

ABB/GE

Substitutions: See Section 01 60 00 - Product Requirements.

Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

PANELBOARDS - GENERAL REQUIREMENTS

Provide products listed, classified, and labeled as suitable for the purpose intended.

Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
Altitude: Less than 6,600 feet.
Ambient Temperature:
Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

Short Circuit Current Rating:
Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
Listed series ratings are acceptable only where specifically indicated.
Label equipment utilizing series ratings as required by NFPA 70.

Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

Selectivity: Where requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

Mains: Configure for top or bottom incoming feed as indicated or as required for installation.

Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

Bussing: Sized in accordance with UL 67 temperature rise requirements.
Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.

Conductor Terminations: Suitable for use with the conductors to be installed.

Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
Indoor Clean, Dry Locations: Type 1.
Outdoor Locations: Type 3R.
Boxes: Galvanized steel unless otherwise indicated.
Provide wiring gutters sized to accommodate the conductors to be installed.
Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
Provide removable end walls for NEMA Type 1 enclosures.
Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
Fronts:
Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.

Lockable Doors: Locks keyed alike unless otherwise indicated.

Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.

Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.
Ampere Rating: Not less than ampere rating of panelboard bus.
Short Circuit Current Rating: Not less than the panelboard short circuit current rating.
Coil Voltage: As required for connection to control system indicated.

Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
Use zero sequence ground fault detection method unless otherwise indicated.
Provide test panel and field-adjustable ground fault pick-up and delay settings.
Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control ground fault delay functions for system coordination purposes.

Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

Load centers are not acceptable.

Provide the following features and accessories where indicated or where required to complete installation:
Feed-through lugs.
Sub-feed lugs.

Metering:
Where indicated on Design Drawings, provide microprocessor-based digital electrical metering system including instrument transformers, wiring, and connections necessary for measurements specified.
Metering type to be as indicated on Design Drawings
See Section 26 27 13 for metering equipment requirements.

POWER DISTRIBUTION PANELBOARDS

Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

Products:
Substitutions: See Section 01 60 00 - Product Requirements.

Conductor Terminations:
Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
Main and Neutral Lug Type: Mechanical.

Bussing:
Phase and Neutral Bus Material: Copper.
Ground Bus Material: Copper.

Circuit Breakers:
Provide bolt-on type or plug-in type secured with locking mechanical restraints.
Provide thermal magnetic circuit breakers for circuit breaker frame sizes less than 250 amperes.
Provide electronic trip circuit breakers for circuit breaker frame sizes 250 amperes and above.

Enclosures:
Provide flush-mounted enclosures unless otherwise indicated.
Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.
Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
Provide clear plastic circuit directory holder mounted on inside of door.

Metering:
Where indicated on Design Drawings, provide microprocessor-based digital electrical metering system including instrument transformers, wiring, and connections necessary for measurements specified.
Metering type to be as indicated on Design Drawings
See Section 26 27 13 for metering equipment requirements.

LIGHTING AND APPLIANCE PANELBOARDS

Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

Products:
Substitutions: See Section 01 60 00 - Product Requirements.

Conductor Terminations:
Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
Main and Neutral Lug Type: Mechanical.

Bussing:
Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
Phase and Neutral Bus Material: Copper.
Ground Bus Material: Copper.

Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

Enclosures:
Provide flush-mounted enclosures as indicated.
Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
Provide clear plastic circuit directory holder mounted on inside of door.

Provide column-width panelboards with accessory column-width cable trough and pullbox where indicated.

Metering:
Where indicated on Design Drawings, provide microprocessor-based digital electrical metering system including instrument transformers, wiring, and connections necessary for measurements specified.
Metering type to be as indicated on Design Drawings
See Section 26 27 13 for metering equipment requirements.

OVERCURRENT PROTECTIVE DEVICES

Molded Case Circuit Breakers:
Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
Interrupting Capacity:
Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
14,000 rms symmetrical amperes at 480 VAC.
Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
Conductor Terminations:
Provide mechanical lugs unless otherwise indicated.
Provide compression lugs where indicated.
Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
Provide interchangeable trip units where indicated.
Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
Provide the following field-adjustable trip response settings:
Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
Long time delay.
Short time pickup and delay.
Instantaneous pickup.
Ground fault pickup and delay where ground fault protection is indicated.
Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
Provide communication capability where indicated: Compatible with system indicated.
Provide 100 percent Rated Circuit Breakers for circuit breaker frame sizes 250 amperes and larger.
Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
Provide the following circuit breaker types where indicated:
Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
Circuit Breaker Selection for Transformer Primary Protection: Provide circuit breakers with time-current characteristics to clear transformer inrush currents while still providing protection for the ANSI through-fault protection curve. Provide circuit breakers with adjustable magnetic trip or electronic trip units as necessary to provide time-current curve shaping to achieve long time trip indicated on drawings, inrush coordination and damage protection.
Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
Provide the following features and accessories where indicated or where required to complete installation:
Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.

Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

SOURCE QUALITY CONTROL

See Section 01 40 00 - Quality Requirements, for additional requirements.

Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

EXAMINATION

Verify field measurements are as indicated.

Verify the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

Verify that mounting surfaces are ready to receive panelboards.

Verify conditions are satisfactory for installation prior to starting work.

INSTALLATION

Perform work in accordance with NECA 1 (general workmanship).

Install products in accordance with manufacturer's instructions.

Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

Provide required support and attachment in accordance with Section 26 05 29.

Install panelboards plumb.

Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

Provide grounding and bonding in accordance with Section 26 05 26.
Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.

Install field-installed branch devices, components, and accessories.

Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

Set field-adjustable circuit breaker tripping function settings as indicated.

Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.

Set field-adjustable ground fault protection pickup and time delay settings as indicated.

Provide filler plates to cover unused spaces in panelboards.

Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
Emergency and night lighting circuits.
Fire detection and alarm circuits.
Communications equipment circuits.
Intrusion detection and access control system circuits.
Video surveillance system circuits.

Identify panelboards in accordance with Section 26 05 53.

FIELD QUALITY CONTROL

See Section 01 40 00 - Quality Requirements, for additional requirements.

Inspect and test in accordance with NETA ATS, except Section 4.

Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required, except for the following:
Perform insulation-resistance tests on control wiring with respect to ground.
Test functions of the trip unit by means of secondary injection.

Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

Test GFCI circuit breakers to verify proper operation.

Test AFCI circuit breakers to verify proper operation.

Test shunt trips to verify proper operation.

Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

Correct deficiencies and replace damaged or defective panelboards or associated components.

ADJUSTING

Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

Adjust alignment of panelboard fronts.

Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

CLEANING

Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Equipment for Owner Electricity Metering.

Basic Electricity Metering:
Single circuit electricity meters.
Multi-circuit electricity meters.

Ethernet Gateway for Electricity Meters.

Data Acquisition Servers.

RELATED REQUIREMENTS

Section 26 05 26 - Grounding and Bonding for Electrical Systems.

Section 26 05 29 - Hangers and Supports for Electrical Systems.

Section 26 05 33.16 - Boxes for Electrical Systems: Cabinets and enclosures for metering system components.

Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

Section 26 24 16 - Panelboards: For interface with meters specified in this section.

Section 26 28 13 - Fuses.
Includes requirements for spare fuses and spare fuse cabinets.

REFERENCE STANDARDS

IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers.

NECA 1 - Standard for Good Workmanship in Electrical Construction.

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.

NFPA 70 - National Electrical Code.

ADMINISTRATIVE REQUIREMENTS

Coordination:
Coordinate work to provide equipment suitable for interface with electricity metering systems to be provided.
Coordinate the work with other installers to provide communication lines required for electricity metering system interface.
Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

Preinstallation Meeting: Conduct meeting with facility representative and other related equipment manufacturers to discuss electricity metering system interface requirements.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical, for submittal procedures.

Product Data:
Provide manufacturer's standard catalog pages and data sheets for electricity metering systems and associated components and accessories.
Include ratings, configurations, standard wiring diagrams, dimensions, service condition requirements, and installed features.
Include manufacturer’s published data tables with complete listing of metering device Modbus registers and/or BacNet Object IDs with associated data descriptions, formats, units, scale factors.

Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

Field Quality Control Test Reports.

Project Record Documents:
Final as built system interconnection schematic diagrams.
Final equipment settings:
Device usernames and passwords updated from factory defaults.
TCP/IPv4 network settings for all Ethernet enabled meters configured for Modbus/TCP or BacNet/TCP
TCP/IPv4 network settings for all Ethernet enabled electrical metering equipment gateways and/or protocol converters.
Modbus slave IDs for all RS485 enabled meters.
Meter device configuration reports.
Meter device setting file exports.

Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
See Section 01 60 00 - Product Requirements, for additional provisions.
Enclosure Keys: Two of each different key.
See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

Maintain at the project site a copy of each referenced document that prescribes execution requirements.

Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

DELIVERY, STORAGE, AND HANDLING

Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

FIELD CONDITIONS

Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

MANUFACTURERS

Electricity Meters:
Substitutions: See Section 01 60 00 - Product Requirements.
Source Limitations: Provide electricity meters produced by single manufacturer and obtained from single supplier.

EQUIPMENT FOR OWNER ELECTRICITY METERING

Provide microprocessor-based digital electricity metering systems including instrument transformers, wiring, and connections necessary for measurements specified.

Provide products listed, classified, and labeled as suitable for the purpose intended.

Provide electricity metering systems and associated components compatible with the equipment and associated circuits to be metered.

Meters
Designed for multifunction electrical measurement on 3 phase power systems. Meter to perform to spec in harsh electrical applications in high and low voltage power systems.
Support 3 element Wye, 2.5 element Wye, 2 element Delta, 4 wire Delta systems.
Surge Withstand: conform to IEEE C37.90.1

Fault Current Withstand: 100 Amps for 10 seconds, 300 Amps for 3 seconds, and 500 Amps for 1 second.
Inputs and outputs: galvanically isolated to 2500 VAC.

Enclosures:
Where not furnished by manufacturer, provide required cabinets and enclosures in accordance with Section 26 05 33.16 - Boxes for Electrical Systems.
Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
Indoor Clean, Dry Locations: Type 1.
Outdoor Locations: Type 3R or Type 4.
Provide lockable door(s) for outdoor locations.
Finish: Manufacturer's standard unless otherwise indicated.

Instrument Transformers:
Comply with IEEE C57.13, where applicable.
Select suitable ratio, burden, and accuracy as required for connected devices, including protective relay equipment that may be present in the design.
Select suitable insulation/voltage class for the circuit to be metered.
Current Transformers:
Solid Core CTs for less than or equal to 400A primary metering applications unless otherwise noted in Design.
Split Core CTs for 600A and greater primary metering applications unless otherwise noted in Design.
Rogowski CTs permitted only with pre-bid approval or as indicated in the Design.
Compatible with connected meters; replace meters damaged by connection of incompatible current transformers.
Provide shorting terminal blocks for connection of secondaries where applicable.
CT line voltage terminals to be finger safe.
Potential Transformers:
Include primary and secondary fuses with disconnecting means.
CT line voltage terminals to be finger safe.

Interface with Other Work:

BASIC ELECTRICITY METERS

Electricity meters with “M|B” annotations as indicated on Design Documents are subject to the requirements of this Part. Basic electricity meters can be Single Circuit, Multi-Circuit or Branch Circuit type electricity meters as indicated on Design Documents.

Basic Electricity Meter equipment to be connected to Facility Building Management System (BMS)
Basic meters to communicate with Facility BMS via BACnet-IP communication protocol.
See Section 23 09 13 - Instrumentation and Control Devices for HVAC.
See Design Documentation for additional requirements.

Single Circuit Electricity Meter
Basis of Design:
Dent Instrutments Power Scout 3HD
Display:
Integral LED to present user scrollable display of measured readings.
Enclosure:
Integrated into switchgear or switchboard assembly or into dedicated cabinet. If switchgear/switchboard integrated, the metering section or cubicle will include dielectric barriers to separate the meter equipment space from live electrical components, shock hazards and Arc Flash hazards.
Include terminal blocks, fuses, power supplies and other accessories as required to satisfy the Design.

Multi-Circuit Electricity Meter
Basis of Design:
Dent Instrutments Power Scout 12HD
Number of metering points:

Capable of metering 4 or more three phase circuits via a single multi-point meter assembly and associated enclosure.
Capable of metering 12 or more single phase circuits via a single multi-point meter assembly and associated enclosure.
Display:
Optional integral or remote color LED touch screen display to display real time data for each metered point.
See Design Documents for inclusion and desired location.
Enclosure:
Integrate into switchgear or switchboard assembly or into dedicated cabinet. If switchgear/switchboard integrated, the metering section or cubicle will include dielectric barriers to separate the meter equipment space from live electrical components, shock hazards and Arc Flash hazards.
Include terminal blocks, fuses, power supplies and other accessories as required to satisfy the Design.

Basic Electricity Metering Product Requirements:
Accuracy:
Real Power/Energy: Plus/minus 0.5 percent, complying with ANSI C12.20 accuracy and IEC 62053-21, Class 0.5, or IEC 60253-22, Class 0.5S.
Reactive Power/Energy: Plus/minus 1.0 percent, complying with IEC 62053-24, Class 1, or better.
Line to Neutral Voltage: Plus/minus 0.2 percent.
Line to Line Voltage: Plus/minus 0.4 percent.
Current: Plus/minus 0.2 percent.
Power Factor: Plus/minus 1.0 percent.
Frequency: Plus/minus 0.01 Hz.
Sampling Frequency, Update Rate and Harmonics:
Sampling frequency: 400 per cycle (24,000Hz)
Update rate: 2 seconds (maximum)
Harmonics Resolution: N/A.
Measured Parameters:
Real energy (kWh); per phase and total of phases.
Reactive energy (kVARh); per phase and total of phases.
Apparent energy (kVAh); per phase and total of phases.
Real power (kW); Average and maximum over a user-specified interval of one hour or less.
Reactive power (kVAR); Average and maximum over a user-specified interval of one hour or less.
Apparent power (kVA); Average and maximum over a user-specified interval of one hour or less.
Bi-directional Energy Measurements:
Real/active energy (kWh) and apparent energy (kVAh); imported (from the grid), exported (to the grid), and signed net total.
Reactive energy (kVARh); imported (from the grid) and exported (to the grid), per quadrant as defined by IEEE 1459.
Maximum demand; real/active power (kW), reactive power (kVAR), and apparent power (kVA); imported (from the grid) and exported (to the grid).
Current; per phase and average of phases.
Voltage; line-to-line and line-to-neutral; per phase and average of phases.
Power factor; per phase and average of phases.
Frequency.
Non-Volatile Memory:
N/A
Data Logging
N/A
Waveform Recording
N/A
Alarm
N/A
Meter Inputs/Outputs (I/O):
NA

Communications:
Compatible with connected systems. Provide accessories necessary for proper interface.
Protocol converters not permitted unless otherwise noted in Design Documentation or this Section.
Serial Communications (at least one of the following):
RS-485, 2-wire: support for Modbus RTU
RS-485, 2-wire; support for BACnet MS/TP
Ethernet Communications (at least one of the following):
Modbus TCP/IP
BacNet IP

PART 3 EXECUTION

EXAMINATION

Verify field measurements are as indicated.

Verify the ratings and configurations of metering systems and associated components are consistent with the indicated requirements.

Verify mounting surfaces are ready to receive meters.

Verify conditions are satisfactory for installation prior to starting work.

INSTALLATION

Perform work in accordance with NECA 1 (general workmanship).

Install products in accordance with manufacturer's instructions.

Provide required support and attachment components in accordance with Section 26 05 29.

Provide grounding and bonding in accordance with Section 26 05 26.

Provide fuses complying with Section 26 28 13 as required.

Identify meters and associated wiring in accordance with Section 26 05 53.

FIELD QUALITY CONTROL

See Section 01 40 00 - Quality Requirements, for additional requirements.

Inspect and test in accordance with NETA ATS, except Section 4.

Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.

Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.

Correct deficiencies and replace damaged or defective metering system components.

Submit detailed reports indicating inspection and testing results and corrective actions taken.
Testing results report to include meter CT polarity and CT/PT phase relationship verification with respect to the metered circuit and associated directionality of current and power flows.

ADJUSTING

Program system parameters according to requirements of Owner.

CLEANING

Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

CLOSEOUT ACTIVITIES

See Section 01 78 00 - Closeout Submittals, for closeout submittals.

See Section 01 79 00 - Demonstration and Training, for additional requirements.

Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

Provide minimum of two hours of training.
Instructor: Manufacturer's authorized representative.
Location: At project site.

PROTECTION

Protect installed system components from subsequent construction operations.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Wall switches.

Wall dimmers.

Receptacles.

Wall plates and covers.

Floor box service fittings.

Poke-through assemblies.

Access floor boxes.

RELATED REQUIREMENTS

Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

Section 26 05 26 - Grounding and Bonding for Electrical Systems.

Section 26 05 33.16 - Boxes for Electrical Systems.

Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

Section 26 09 23 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

REFERENCE STANDARDS

FS W-C-596 - Connector, Electrical, Power, General Specification for.

FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification).

NECA 1 - Standard for Good Workmanship in Electrical Construction.

NECA 130 - Standard for Installing and Maintaining Wiring Devices.

NEMA WD 1 - General Color Requirements for Wiring Devices.

NEMA WD 6 - Wiring Devices - Dimensional Specifications.

NFPA 70 - National Electrical Code.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical for submittal procedures.

Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

Operation and Maintenance Data:

QUALITY ASSURANCE

Comply with requirements of NFPA 70.

Products: Listed, classified, and labeled as suitable for the purpose intended.

DELIVERY, STORAGE, AND PROTECTION

Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

WIRING DEVICES - GENERAL REQUIREMENTS

Provide wiring devices suitable for intended use with ratings adequate for load served.

Wiring Device Applications:

Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.

Provide GFCI protection for:

Receptacles installed within 6 feet of sinks.
Receptacles serving electric drinking fountains.

WALL SWITCHES

Manufacturers:
Substitutions: See Section 01 60 00 - Product Requirements.

Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

Locking Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed switch actuator and maintained contacts; switches keyed alike; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

WALL DIMMERS

Manufacturers:
Lutron

Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

RECEPTACLES

Manufacturers:
Hubbell Incorporated.
Leviton Manufacturing Company, Inc.
Lutron Electronics Company, Inc; Designer Style.
Pass & Seymour, a brand of Legrand North America, Inc.

Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
NEMA configurations specified are according to NEMA WD 6.

Convenience Receptacles:
Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

GFCI Receptacles:
GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.

Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

USB Charging Devices:
USB Charging Devices - General Requirements: Listed as complying with UL 1310.
USB Type A Port Charging Capacity: 1.5 A, minimum per port.
USB Type C Port Charging Capacity: 5 A (PD), minimum per port.
USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

Exposed Device Color, unless otherwise noted, is as follows:
Normal power: Gray or as selected by Architect.
Emergency power: Red.
Standby power: Red.
UPS: Blue.
Isolated ground: Orange.
Surge suppression: Blue.

WALL PLATES AND COVERS

Manufacturers:
Hubbell Incorporated.
Leviton Manufacturing Company, Inc.
Lutron Electronics Company, Inc.
Pass & Seymour, a brand of Legrand North America, Inc.

Wall Plates: Comply with UL 514D.
Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
Size: Standard; _____.
Screws: Metal with slotted heads finished to match wall plate finish.

Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

FLOOR BOX SERVICE FITTINGS

Manufacturers:
Hubbell Incorporated.
Thomas & Betts Corporation.
Wiremold, a brand of Legrand North America, Inc.

Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.

Above-Floor Service Fittings:
Single Service Pedestal Convenience Receptacles:
Configuration: One standard convenience duplex receptacle.

Single Service Pedestal Communications Outlets:
Configuration: One 1 inch bushed opening.

POKE-THROUGH ASSEMBLIES

Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

ACCESS FLOOR BOXES

Description: Metallic multi-service box suitable for mounting in access floor system specified in Section 09 69 00.

Configuration:

PART 3 EXECUTION

EXAMINATION

Verify field measurements are as indicated.

Verify outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

Verify wall openings are neatly cut and will be completely covered by wall plates.

Verify final surface finishes are complete, including painting.

Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

Verify conditions are satisfactory for installation prior to starting work.

PREPARATION

Provide extension rings to bring outlet boxes flush with finished surface.

Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

INSTALLATION

Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
ocate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Owner to obtain direction prior to proceeding with work.

Install wiring devices in accordance with manufacturer's instructions.

Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.

Install wiring devices plumb and level with mounting yoke held rigidly in place.

Install wall switches with OFF position down.

Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

Do not share neutral conductor on branch circuits utilizing wall dimmers.

Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

FIELD QUALITY CONTROL

See Section 01 40 00 - Quality Requirements, for additional requirements.

Inspect each wiring device for damage and defects.

Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

Test each receptacle to verify operation and proper polarity. Receptacle testing report form example is as follows:

Receptacle Testing and Acceptance Report Form						Date	
Room/Area	Receptacle Test			Ground System Voltage/Impedance		Grounding	Exceptions/Remarks
	Physical Integrity	Polarity	Tension >4oz	New <20mV	Impedance <0.1 Ohms		

Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

Correct wiring deficiencies and replace damaged or defective wiring devices.

ADJUSTING

Adjust devices and wall plates to be flush and level.

CLEANING

Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

CORD CAPS

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Uninterruptible power supply (UPS) centralized emergency lighting inverters.

Controls.

Battery charger.

Storage batteries.

Cabinet.

RELATED REQUIREMENTS

Section 26 05 26 - Grounding and Bonding for Electrical Systems.

Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

Section 26 05 73 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.

Section 26 51 00 - Interior Lighting:

REFERENCE STANDARDS

NFPA 70 - National Electrical Code.

NFPA 101 - Life Safety Code.

NFPA 111 - Standard on Stored Electrical Energy Emergency and Standby Power Systems.

UL 924 - Emergency Lighting and Power Equipment.

SUBMITTALS

See Section 26 05 00 - Common Work Results for Electrical, for submittal procedures.

Shop Drawings.

Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.

Shop Drawings: Indicate dimensions, input/output voltages, power ratings, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, and installed features and accessories.

Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

Manufacturer's certification that products meet or exceed specified requirements.

Manufacturer’s detailed field testing procedures.

Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

QUALITY ASSURANCE

Comply with the following:
NFPA 70 (National Electrical Code).
NFPA 101 (Life Safety Code).
NFPA 111; meet requirements for Level 1 system.

Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

DELIVERY, STORAGE, AND HANDLING

Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

Handle carefully in accordance with manufacturer's instructions to avoid damage to inverter system components, enclosure, and finish.

Do not exceed maximum ambient temperature requirements for batteries at any time, which reduces battery service life. Replace batteries exposed to temperatures in excess of manufacturer's requirements.

FIELD CONDITIONS

WARRANTY

Inverter Assemblies: Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

Batteries: Provide pro-rata warranty for the duration of rated design life.

WARRANTY

Include with the power supply submittal drawings a warranty of one year on the central battery equipment unit and a separate 6-year warranty on life and performance on the battery supplied by the battery manufacturer. Warranties shall be written on the manufacturer's letterhead and signed by a corporate officer.

Warranty includes the following:
Equipment complies with the latest adopted National Electrical Code.
The complete assembly will provide its full rated output under normal operation for 90 minutes at any time throughout the 1-year warranty period.
Indicate the battery manufacturer and warrant each individual battery for 6 years under normal operation.
A battery will be considered to have failed when it does not provide 80 percent of its initial ampere-hour capacity.
Each power supply shall be factory tested under full load operating conditions.

PART 2 PRODUCTS

CENTRALIZED EMERGENCY LIGHTING INVERTERS - GENERAL REQUIREMENTS

Provide complete centralized emergency lighting inverter system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

Provide products listed, classified, and labeled as suitable for the purpose intended.

Inverter Assemblies: Manufactured units consisting of inverters, batteries, enclosures, and associated components specifically designed for emergency lighting applications; microprocessor-based utilizing pulse width modulation (PWM) with insulated gate bipolar transistors (IGBT's); listed and labeled as complying with UL 924.
Battery Run Times of 90 Minutes: Listed as complying with UL 924 for "emergency lighting and power equipment".
Battery Run Times Other than 90 Minutes: Listed as complying with UL 924 for "auxiliary lighting and power equipment".

Increase indicated power ratings as required to accommodate any applicable inverter load restrictions.

Battery System:
Provide battery capacity as required for achieving battery run time indicated.
Battery Charger: Microprocessor-controlled, temperature compensated; capable of returning supplied battery(s) from fully discharged to fully charged condition within time required by NFPA 111 and UL 924 unless otherwise indicated.
Provide automatic low voltage battery disconnect to prevent battery "deep discharge" damage.

Short Circuit Current Rating: Provide inverter assemblies with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

Automatic Sequence of Operations:
Upon failure or degradation of primary/normal input power, transfer load to battery power.

When primary/normal input power has been restored, retransfer load to primary/normal power and recharge battery.

Features (Units 500 VA and Larger):
Control Functions:
Automatic mode.
Manual Test Mode: Simulates failure of primary/normal source.
Automatic Bypass Mode (UPS Inverters Only): Upon applicable inverter circuit trouble/fault static transfer switch removes inverter from circuit and delivers power directly from primary/normal source (when available) to load.
Manual Bypass Mode: Manual bypass switch removes unit from circuit and delivers power directly from primary/normal source to load for unit maintenance purposes.
Self-testing/self-diagnostics.
Status Indications:
Connected to primary/normal source.
Connected to battery power.
Primary/normal source available.
Battery charging.
Unit in manual bypass mode.
Alarm Indications:
Output overload/overcurrent.
High temperature.
Low battery.
Other Features:
Input circuit breaker.
Event log.
Provide output transfer delay with intentional delay setting adjustable from zero (0) seconds to seven and a half (7.5) seconds.

UNINTERRUPTIBLE POWER SUPPLY (UPS) CENTRALIZED EMERGENCY LIGHTING INVERTERS

Manufacturers:
Uninterruptible Power Supply (UPS) Centralized Emergency Lighting Inverters - Basis of Design: Emergi Lite High Capacity Mini Inverter Series.
Substitutions: See Section 01 60 00 - Product Requirements.

Description: Online, double-conversion type inverters with no transfer time (0 ms) to battery power source upon loss of normal power source; suitable for emergency operation of incandescent, LED, fluorescent, and HID light sources.

Uninterruptible Power Supply (UPS) Centralized Emergency Lighting Inverter Number _____:
Nominal Input/Output Voltage: _____ VAC, _____ -phase, _____ -wire (plus ground) input/output.
Nominal Power Rating: As indicated on drawings.
Battery Type: Valve-regulated lead acid (VRLA)/sealed lead calcium _____.
Features:
Internal manual bypass switch; closed transition (make-before-break) transfer.

SOURCE QUALITY CONTROL

See Section 01 40 00 - Quality Requirements, for additional requirements.

Perform production tests on inverter assemblies at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

Description: Emergency power supply system designed for Level 1 applications and consisting of rectifier/charger unit, storage battery, and solid state inverter with mechanical transfer switch, in one or several enclosures. Provide unit suitable for operating HID lamps without extinguishing lamp on transfer.

Provide full output for 90 minutes of operation.

Transfer module shall automatically transfer the emergency system loads to the output power modules within with an intentional delay of no less than 1 second and no more than 3 seconds following normal power failure. Upon restoration of normal power, provide a delay of return to normal power to assure an in-phase transfer. In the event of a prolonged outage, the power modules will be removed from the line when the batteries discharge to nominally 87 percent of full charge voltage.

Provide with the following features: Overload capacity of 125 percent for 5 minutes, low voltage battery disconnect, short circuit proof, current limiting, fused battery circuit, reverse polarity, brownout protection.

Microprocessor Control Unit:

CONTROLS

Instruments, controls, indicating lights and LCD display screen factory mounted on the front of the cabinet for easy monitoring and operation without requiring access to the interior.

Control panel contains AC line switch, charging indicating light, test switch, AC output voltmeter, DC voltmeter, DC ammeter, electrolyte level alarm. When fuses or breakers are used to protect components, visual alarms provided on the control panel indicate tripped conditions.

Automatic monthly and annual self-testing ability.

Continuous self-diagnostic and self-testing system.

Provide with the following alarm functions: high/low battery charger fault, near low battery, low battery, load reduction fault, output overload, high/low AC input volts, high ambient temperature, inverter fault, output fault and circuit breaker trip.

Class C auxiliary contacts to indicate when unit has transferred to the battery source.

Battery charger module solid state microprocessor controlled, capable of fully recharging the batteries within listed UL requirements.

BATTERY CHARGER

Charger constantly monitors the batteries, providing automatic discharge and charge only when needed.

Internally protects against short circuits and automatically recovers to charge batteries when the fault is removed.

Sealed, maintenance free lead-calcium type, series and parallel connected.

STORAGE BATTERIES

Battery cases impact resistant with vapor-tight removable caps and lead connectors integrally molded into the cover.

Equip batteries with an electrolyte level sensing device to alarm upon low liquid level.

Rated for an operating temperature limit of a minimum 32 degrees F and maximum of 100 degrees F.

Mount components in one or more freestanding metal cabinets of sufficient strength to handle the weight of the components.

CABINET

Durable finish, factory applied, NEMA 1 rating, 14 gauge steel with hinged lockable doors.

Provide either a cabinet for combined inverter unit with battery storage or separate inverter and battery cabinets, depending upon unit rating.

PART 3 EXECUTION

EXAMINATION

Verify field measurements are as indicated.

Verify ratings and configurations of inverter assemblies are consistent with indicated requirements.

Verify rough-ins for field connections are in the proper locations.

Verify mounting surfaces are ready to receive inverter assemblies.

Verify conditions are satisfactory for installation prior to starting work.

INSPECTION

After equipment has arrived at the job site, the Owner (or the Owner's representative), Contractor, and Manufacturer's representative will perform a visual inspection for physical damage and compare nameplate data with drawings and specifications. Manufacturer to correct problems encountered.

INSTALLATION

Perform work in accordance with NECA 1 (general workmanship).

Install inverter assemblies in accordance with applicable requirements of NECA 416.

Install products in accordance with manufacturer's instructions.

Arrange equipment to provide minimum clearances and required maintenance access.

Provide required support and attachment in accordance with Section 26 05 29.

Install inverter assemblies plumb and level.

Unless otherwise indicated, mount floor-mounted inverter assemblies on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

Provide grounding and bonding in accordance with Section 26 05 26.

FIELD QUALITY CONTROL

Perform the following inspections and test procedures by factory-trained field service personnel prior to equipment system start-up:
Visual Inspection:
Inspect equipment for signs of damage.
Verify installation per drawings.
Inspect cabinets for foreign objects.
Verify neutral and ground conductors are properly sized and configured.
Inspect cell cases.
Inspect each cell for proper polarity.
Verify printed circuit boards are configured properly.
Mechanical Inspection:
Check control wiring connections for tightness.
Check power wiring connections for tightness.
Check terminal screws, nuts, and/or spade lugs for tightness.
Electrical Inspection:
Check fuses for continuity.
Confirm input voltage and phase rotation is correct.
Verify control transformer connections are correct for voltages being used.
Assure connection and voltage of the battery string(s).

UNIT START-UP TESTING

Provide factory trained field service personnel to perform the following functional testing operations during start-up of the unit:
Energize control power.
Perform control/logic checks and adjust to meet specification.
Verify DC float and equalize voltage levels.
Verify DC voltage clamp and overvoltage shutdown levels.
Verify battery discharge, low battery warning and low battery shutdown levels.
Verify fuse monitor alarms and system shutdown.
Verify inverter voltages and regulation circuits.
Verify inverter/bypass sync circuits and set overlap time.
Perform manual transfers and returns.
Simulate utility outage.
Verify proper recharge.

MANUFACTURER'S FIELD SERVICE

Service Personnel:
Nationwide service organization, consisting of factory-trained field service personnel dedicated to the start-up and maintenance of central battery equipment.
Provide a national dispatch center to coordinate field service personnel schedules. One toll-free number reaches a qualified support person 24 hours/day, 7 days/week, 365 days/year. If emergency service is required, telephone response time is 20 minutes or less and on-site response time is four hours or less.
Assign two local customer engineers to the site with a regional office as a backup.

CLOSEOUT ACTIVITIES

See Section 01 78 00 - Closeout Submittals, for closeout submittals.

See Section 01 79 00 - Demonstration and Training, for additional requirements.

Training: Train Owner's personnel on operation, adjustment, and maintenance of emergency lighting inverter system.

MAINTENANCE

See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

Provide trouble call-back service upon notification by Owner:

END OF SECTION

PART 1 GENERAL

SUMMARY

This Section includes:
Lenses.
Reflector Cones.
Housings.
Finish.
Suspension.
Lamps and Sockets.
Power Supplies.
Emergency LED Drivers.
Transformers.
Track Lighting Systems.
Custom Luminaires.
Exterior Luminaires.
Extra Material.
Disposal and Replacement.

DEFINITIONS

BACNET - Protocol for integration with BAS/BMS/EMS.

BAS - Buiding Automation System.

BMS - Building Management System.

EMS - Energy Management System.

CCT- Correlated Color Temperature.

CRI - Color Rendering Index.

CS - Control Station.

D - Dimming Wall Switch.

DT - Dual Technology (PIR + U).

FC - Footcandles.
The metric for measuring illuminance light levels.
GUI - Graphic User Interface.
LCP - Lighting Control Panel.
LED - Light Emitting Diode.
LonWorks - Protocol for integration with BAS/BMS/EMS.
MTBF - Minimum Time Between Failures.
Total hours of testing / Number of failures.
OS/VS - Occupancy Sensor / Vacancy Sensor.
Occupancy sensors provide automatic on and automatic shut-off.
Vacancy sensors provide automatic shut-off only, and require manual-on.
PC - Photocell.
PIR - Passive Infrared Technology.
Power Supply Ballasts and LED drivers.
RS - RS-232 Connection for AV Integration.
SC - Scene Control.
TC - Timeclock, or astronomical timeclock.
U - Ultrasonic Technology.
WS - Wall Switch.
WS/O - Wallbox Occupancy Sensor Switch.
Wall Switch with integrated Occupancy Sensor.

REFERENCE STANDARDS

ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts.

ANSI E1.11 - Entertainment Technology - USITT DMX512-A, Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories.

ANSI E1.20 - Entertainment Technology - RDM - Remote Device Management over DMX512 Networks.

ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code).

IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements.

IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products.

IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources.

NFPA 70 - National Electrical Code.

TIA-485 - Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems.

UL 924 - Emergency Lighting and Power Equipment.

QUALITY ASSURANCE

Lighting design for this project was based on luminaire types and manufacturers as specified.

Basis of Design manufacturers are pre-qualified to bid on products where specified. Inclusion of manufacturer and product series does not relieve specified manufacturer from providing product as described in luminaire schedule; modifications to standard product, if required, include with initial bid.

Alternate manufacturers listed in the Luminaire Schedule do not require prior approval but included with the shop drawing submittal. Inclusion of manufacturer and product series as an alternate does not relieve the manufacturer from providing product equivalent to the basis of design as described in luminaire schedule; modifications to standard product, if required, include with initial bid.

Or Approved or Pre-Bid Approved Equal:
Submit Substitution Request prior to bid, complying with requirements of Division 01, General Requirements.
Approval determined by review of the following luminaire characteristics where applicable. Lack of pertinent data on characteristic constitutes justification for rejection of the submittal.
Performance:
Distribution.
Utilization.
Average brightness/maximum brightness.
Spacing to mounting height ratio.
Visual comfort probability.
Construction:
Engineering.
Workmanship.
Rigidity.
Permanence of materials and finishes.
Installation Ease:
Captive parts and captive hardware.
Provision for leveling.
Through-wiring ease.
Maintenance:
Relamping ease.
Ease of replacement of ballast and lamp sockets.
Appearance:
Architectural integration.

Light tightness.
Neat, trim styling.
Conformance with design intent.

GENERAL REQUIREMENTS

Provide lighting outlets indicated on the Drawings with a luminaire of the type designated and appropriate for the location.

Where a luminaire type designation has been omitted and cannot be determined by the Contractor, request a clarification from the Architect in writing and provide a suitable luminaire type as directed.

Coordinate installation of luminaires with the ceiling installation and other trades to provide a total system that is neat and orderly in appearance.

Luminaires located in fire rated assemblies rated for use in such assemblies or have assembly maintained by the installer through the use of appropriate construction techniques to maintain the assembly rating. It is the responsibility of the Contractor to maintain the assembly rating and provide required components during construction. Coordinate luminaires impacted with Division 01, General Requirements, and life safety documents.

Install remote power supplies and transformers in enclosures as required by luminaire specified. Locate remote power supplies and transformers as shown on drawings; where no location is shown, provide recommendation for approval prior to commencing field installation. Locate remote mounted power supplies and transformers within the distance limitations specified by the manufacturer.

Exterior pole lights have an appropriated pole base as part of the assembly. For pole lights in pedestrian areas, use a flush pole base. Pole lights in parking areas a raised base used. Pole bases, footings, and structural components reviewed and approved by a state licensed structural engineer prior to ordering and installation.

Linear lighting elements installed on building exterior, in coves, soffits, panels and other architectural materials are the longest sections available to meet the intent of the design and centered in the available space. Other items required to make the lights function installed out of site and coordinated with Architect, Landscape Architect, Lighting Designer, and Electrical Engineer of Record. Transformers, drivers, and ballasts in suitable enclosures. Required connection points are the minimum box or connector available from the manufacturer. Standard electrical boxes are not allowed to produce linear runs in architectural coves. Ancillary material required is concealed from view. Coordinate final ceiling material, dimensions, and limitations with the ceiling manufacturer prior to ordering and installation.

Coordinate voltage requirements to each luminaire as indicated on drawings.

Verify luminaires carry a valid UL or ETL listing. Luminaires located in outdoor locations to carry and appropriate wet or damp listing as required for the mounting application.

Procure luminaires through a distributor located within 200 miles of the project site with a valid business license in the state the project is located.

Upon request of the Architect, Engineer, or Owner, provide back-up pricing in a unit cost breakdown per luminaire. Back-up pricing includes distributor net pricing, Contractor net pricing, final Owner pricing and mark-ups and discounts (lot price or all-or-none) associated with the luminaires.

Lighting related change orders to include back-up pricing noted above for review by the Engineer and Lighting Designer.

Provide manufacturer's warranty covering 5 years on drivers from date of purchase. Luminaire manufacture to operate driver at or below the required driver warranty temperature. Luminaire manufacturers failing to operate the driver, at the project required ambient temperature and within the driver manufacturer warranty parameters will be responsible for driver warranty related costs over the warranty period.

80 percent of the luminaire material by weight at a minimum should be recyclable at end of life. Design luminaire for ease of component replacement and end-of-life disassembly.

SUBMITTALS

Submit the following in accordance with Section 26 05 00 - Common Work Results for Electrical:
Shop Drawings, to include:

Product Data.
Provide manufacturer's published product data information.
This information is to be relevant to the specified product only.
Submittals limited to not more than three sheets for each type specified.
They are specifically not to have configurations available included for review.
Submittals that contain information that is not relevant to the product specified will be rejected in total and resubmission will be required.
Luminaire dimensions on a fully dimensioned line drawing.
Lamp information, including array configuration:
For LED lamps: proof of conformance with the following: ANSI C78.377-2015, IES LM-79-2008, IES LM-80-2008, IES LM 82-2012, IES LM 84-14, IES LM 85-14, IES TM 21-2011, IES TM 28-14 and special certifications required by the contract documents.
Lamp socket information.
Power supply and transformer information using ballast manufacturers published product data information. Multiple power supplies or transformers may be submitted for single luminaire if compatible with specification included in contract documents. Include certification of lamp and power supply and transformer compatibility for submitted.
Mounting details including clips, canopies, supports, and methods for attachment to structure. Provide equipment required for row configurations.
UL/ETL Labeling Information
Manufacturer's Warranty
Photometric Reports consisting of the following:
Candlepower distribution curves: Provide five plane candlepower distribution data at no more than 5 degree vertical angle increments.
Coefficient of utilization table.
Zonal lumen summary including overall luminaire efficiency.
Luminaire luminance: Provide measured maximum brightness data for luminaires with reflectors and average brightness data for luminaires with refractors.
Spacing to mounting height ratio. If parallel and perpendicular ratios differ, provide data on each plane.
Pole information to include maximum supported effective projected area (EPA) and weight for the design wind speed, as well as structural calculations for each pole proposed.
VCP calculations (where applicable): For general office lighting luminaires, provide typical VCP calculations for ceiling heights between 9-feet and 12-feet at 1-foot increments, for room sizes 20-feet by 20-feet and 30-feet by 30-feet.
Special requirements of the specification.
Operation and Maintenance Data:
Prepare two copies of a Lighting Systems Maintenance Manual consisting of the following in a hard-cover binder for review. After review, Architect will deliver one copy to Owner. Manual to include:
One complete set of final submittals of actual product installed, including product data and shop drawings. Include product data for actual power supply and transformer installed where applicable.
List of lamps used in Project, cross-referenced to fixture types, with specific manufacturer's names and ordering codes.
Re-lamping instructions for lamps that require special precautions (LED, tungsten halogen, metal halide, etc.).
Lighting fixture cleaning instruction, including chemicals to be used or avoided.
Parts list of major luminaire components and ordering information for replacement
Copies of manufacturer warranties on product.
Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.
Manufacturer's Installation Instructions:
Indicate application conditions and limitations of use stipulated by product testing agency.
Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
Closeout Submittals:
Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and pull or junction boxes.

Operation and Maintenance Data: Instructions for each product including information on replacement parts.
Maintenance Materials: Furnish for Owner's use in maintenance of project.

PART 2 PRODUCTS

GENERAL

Luminaires new and complete with mounting accessories, junction boxes, trims, and lamps.

Luminaire assemblies UL listed.

Luminaires UL listed appropriate to mounting conditions and application.

Each luminaire family type (downlights, troffers, etc.) supplied by only one manufacturer.

Install recessed luminaires in fire rated ceilings and use a fire rated protective cover thermally protected for this application and carry a fire rated listing.

Luminaires installed under canopies, roofs, or open areas and similar damp or wet locations to be UL listed and labeled as suitable for damp or wet locations.

LENSES

Mechanically secured from within the housing.

Interior linear prisms with smooth exterior.

Prismatic Acrylic:
12-inch by 24-inches and Larger: Extruded of clear virgin acrylic plastic, 0.125-inch minimum overall thickness, 0.1-inch nominal unpenetrated thickness, Pattern 12 with flat sided female prisms running at 45 degrees off panel axis unless otherwise specified in the luminaire schedule. Concave prisms are not acceptable.
12-inch by 24-inches and Larger: Low brightness type, extruded of clear virgin acrylic plastic, 0.156-inch minimum overall thickness, 0.1-inch nominal unpenetrated thickness, Pattern 19 with flat sided male prisms running parallel with panel axis unless otherwise specified in the luminaire schedule. Concave prisms are not acceptable.
12-inch by 24-inch and Larger: Injection molded of clear virgin acrylic plastic, 0.16-inch minimum overall thickness with 0.125-inch nominal unpenetrated thickness square cone base, similar to Pattern 12 configuration.
As specified in the Luminaire Schedule.

Opal Acrylic:
Extruded or injection molded of virgin acrylic plastic, 0.08-inch minimum overall thickness.
As specified in the Luminaire Schedule.

Opal Acrylic Overlay: High transmittance type, extruded of virgin acrylic plastic, 0.04-inch overall thickness, with minimum 80 percent light transmittance.

REFLECTOR CONES

Spun of uniform gauge aluminum, free of spinning marks or other defects.

Integral trim flange.

Color and finish as specified in Luminaire Schedule.

White Reflectors:
Steel or aluminum, minimum 22 gauge, with hard baked white enamel finish with minimum 85 percent reflectance.

Alzak Reflectors:
Low iridescent specular or as indicated in the luminaire schedule, Alzak or Coilzak with minimum reflectance of 90 percent.
Supply luminaires using Alzak reflector cones by the same manufacturer unless directed otherwise in Luminaire Schedule.

HOUSINGS

Dimensions:

Proper for the various wattage noted on the plans and as recommended by the luminaire manufacturer or as specified in the luminaire schedule.

Extruded Aluminum Housing:
One piece housing of AA 6063 T5 extruded aluminum with 0.14 minimum thickness smooth and free of tooling lines in one uninterrupted section of 1-foot to 24-foot with the cross sectional dimensions as indicated in the Luminaire Schedule.
Section lengths as shown on the drawings and able to be transported into and out of the installation location after final construction without building demolition being required.

Steel Housing:
20 gauge minimum, free of dents, scratches, or other defects.
Fill and sand exposed weld marks, joints, and seams smooth before finishing. Clean and dress edges to remove sharp edges or burrs.
Section lengths as shown on the drawings comprised of 1-foot to 12-foot lengths.

Sheet Metal Housings:
Minimum 22 gauge cold-rolled steel, with welded joints. Exposed weld marks and seams filled and ground smooth.

Door Frames for lensed luminaires:
White painted, flat aluminum with mitered corners, rotary cam latches to hinge from either side.

End Plates:
Mechanically attached die cast end plates without exposed fasteners. End caps to be minimum 0.125-inch thick.

Provide an internal alignment spline where housing sections are joined together to form a continuous row.

Recessed Luminaires
Rated for use in recessed applications.
If required by the Owner or design team, the manufacturer must produce test data proving the product is rated for use in recessed applications.
Equip with through wire junction box. Box, power supply, and replaceable components accessible from the ceiling opening of the luminaire.

Luminaires used as air-handling registers for HVAC systems meet the requirements of NFPA 90A.

For wet and damp use, LED-based luminaire to be sealed, rated, and tested for appropriate environmental conditions and may not be accomplished by using an additional housing or enclosure.

FINISH

Visible surfaces to be of color and texture as directed in Luminaire Schedule.
Baked white dry polyester powder, if not specified, with a minimum average reflectance of 85 percent on exposed and light reflecting surfaces.

Concealed interior and exterior luminaire surfaces to be Matte black or as recommended by the luminaire manufacturer.

Prepare steel components for finishing with a 5-step zinc phosphating process prior to painting.

Paint luminaire (including painted component parts) after fabrication unless specifically noted in the Luminaire Schedule.

Exposed aluminum surfaces:
Satin etched and clear anodized.
Treat with an acid wash and clear water rinse prior to painting.
Electrostatically paint or powder coat and oven bake in the color indicated in the Luminaire Schedule.

Exposed steel surfaces:
Treat with acid wash and clear water rinse, then prime coat.
Electrostatically paint or powder coat and oven bake in the color indicated in the Luminaire Schedule.

SUSPENSION

Suspension Devices, type as specified in the Luminaire Schedule:
Aircraft Cable:

Stainless steel type - 3/32-inch nominal diameter, stranded, with positive pressure, field adjustable clamp at fixture connection.
Rigid Pendant:
1/2-inch nominal diameter or as specifically shown on drawings.
Supplied by fixture manufacturer when available as standard product.
At fixture end of stems, provide earthquake type swivel fitting to permit 45 degree swing in any direction away from vertical.
Flat canopy to permit splice inspection after installation.
Chain Hangers:
Length to suit fixture mounting height if shown or as field conditions dictate.
Use two heavy duty chains with S hooks at each suspension point.
Length to suit mounting height as shown on Drawings.
Suspension system must permit ±1/2-inch minimum vertical adjustment after installation.

Supports:
Provide internal safety cable from fixture body to structure.
Carry fixture weight to structure and provide horizontal bracing from suspension points to ceiling framing to prevent sideways shifting. Provide diagonal seismic restraint wires per code.

Feed Point:
Flat-plate canopy to cover outlet box, with holes for support cable and power cord, concealed fasteners to permit splice inspection after installation.
At the electrified connection provide straight cord feed. Provide a separate feed point where emergency feed is required.
Power Cord:
White multi-conductor cord, parallel to support cable (aircraft cable); within pendant (rigid pendant); or flexible conduit (chain hanger).
Provide a separate fee point where emergency feed is required.

Non-feed Points:
1/2-inch OD polished chrome end sleeve, inside threaded 1/4-inch-20, with 2 -inch diameter. Flat white plate to cover hole in ceiling. Top of cable with ball swaged on end, to fit inside sleeve.
Provide support above ceiling as required.

Suspension method allows adjustment to be made in hanging length to allow for variance in ceiling height.

Exposed paintable suspension components have the same finish and color as the luminaire housing.

LAMPS AND SOCKETS

Lamp each luminaire with the suitable lamp cataloged for the specific luminaire type and as indicated by the manufacturer, or as specifically indicated in the Luminaire Schedule, or as specified herein.

Lamps to be field replaceable.

Lamp sockets to be of configuration and design to accept standard LED lamps and circuit boards.

LED lamps to meet or exceed 50,000 hours as defined by LM-80-08 based on both the ambient temperature listed and the LEDs B10L70 performance curve as published by the LED lamp manufacturer.

LED lamps to be high brightness and proven quality from established and reputable LED manufacturers, including:
Nichia.
Osram-SemiOpto.
Cree.
Philips Lumileds.
Seoul Semiconductor.
Bridgelux.
General Electric Gelcore.
Xicato.
Osram.

Replacement Lamps:

Sorra.
Toshiba.

LED lamps that are integral into the housing; light bars, diodes, boards and other, to be rated and tested for use in the fixture specified and compatible with the driver tested and compatible with that fixture.

Screw-In Base Replacement LED Lamps:
Manufacturer to provide wattage restriction label on socket, equivalent to specified wattage on LED replacement lamp.
LED replacement lamps not to be placed in air-tight enclosures or in insulated air tight (ICAT) rated luminaire enclosures without dedicated heat dissipation and thermal management of the luminaire system.

Color Rendering Index (CRI):
80 or higher for ambient lighting in common spaces.
90 or higher for accent lighting in common spaces.
95 or higher for art lighting.
As indicated in the luminaire schedule.

Color Rendering Index (CRI): 90+ per ANSI C78.377-2008/CIE 13.3-1995 unless noted otherwise on the luminaire schedule.

Correlated Color Temperature (CCT) per luminaire schedule:
Color consistency not to exceed a +/- tolerance of greater than two MacAdam Ellipses over the life of the luminaire.

Adjustable Lamp Mechanisms: To have aiming stops which can be permanently set to position lamp vertically and rotationally.

High power LED luminaire thermally protected using one or more of the following thermal management techniques: metal core board, gap pad, and/or internal monitoring firmware

Operating Temperature: -22 degrees F to 115 degrees F.:
Operate below manufacturer's published die junction temperatures when operated at 1W at 350 mA in an elevated ambient of 46 degrees C.

Utilize quick-connect connections to replaceable boards to meet ANSI and UL/ETL and NEMA requirements.

POWER SUPPLIES

UL recognized under the component program and modular for simple field replacement.

Rate for use with the LED array specified:
Warranty array and driver as an assembly.
5 year full replacement, non-pro-rated warranty is required on electronic components.

Luminaires requiring more than one driver are not permitted, unless specified in the luminaire schedule.

Power supplies used in enclosed and gasketed luminaires listed for use in wet locations, Type 1 construction.

Rate for the expected ambient temperature in which they are installed:
Exterior installed power supplies rated to start the lamps at 0 degrees F.

Operate for a (+/- 10 percent) supply voltage of 120V through 277VAC at 60Hz.

Power Factor: 0.9 minimum.

Lifetime minimum:
50,000 hours at full load and 77 degrees F ambient.
Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.

Minimum time between failures (MTBF) greater than 300,000 hours at full load and 77 degrees F ambient, in accordance with MIL-HDBK-217.

Driver and luminaire electronics deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10):
Flicker index to be less than 5 percent at frequencies below 1000 Hz.

Label systems using tandem wired luminaires be labeled accordingly. Locate label in the lamp compartment of each luminaire and identify the function of that luminaire. Do not make the label visible from room.

Total Harmonic Distortion less than 20 percent and meet ANSI C82.11 maximum allowable THD requirements at full output. At no point in the dimming curve allow imbalance current to exceed full output THD.

Meet or exceed 30mA2s at 277VAC for up to 50Ws of load and 75A at 240us at 277VAC for 100 watts of load.

Withstand up to a 1,000V surge without impairment of performance as defined by ANSI C62.41 Category A.

Housing have circuit diagrams and lamp connections applied thereto.

Must be Reduction of Hazardous Substances (RoHS) compliant

Provide no light output when the analog control signal drops below 0.5 V, or the DALI/DMX digital signal calls for light to be extinguished and consume 0.5 watts or less in this standby. Control deadband between 0.5V and 0.65V included to allow for voltage variation of incoming signal without causing noticeable variation in fixture to fixture output.

Support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
Adjustment of forward LED voltage, supporting 3V through 55V.
Adjustment of LED current from 200mA to 1.05A at the 100 percent control input point in increments of 1mA.
Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.

Remote: Driver may be remote mounted up to 300-feet depending on power level and wire gauge.

Dimming Drivers:
Dimming power supplies controlled by a common controller provided by the same manufacturer.
Manufacturer to have minimum 5 years' experience in manufacturing of dimmable electronic lighting drivers.
LED dimming to be equal in range and quality to a commercial grade incandescent dimmer. Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in a commercial environment.
Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
Provide step-free, continuous dimming to black from 100 percent to 0.1 percent and 0 percent relative light output, or 100 - 1 percent light output and step to 0 percent where indicated. Driver responds similarly when raising from 0 percent to 100 percent.
Driver to be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.
Track evenly across multiple fixtures at light levels, and provide input signal to output light level that allow smooth adjustment over the entire dimming range.
Limit inrush current.
No visible change in light output with a variation of plus/minus 10 percent line voltage input.
Ability to configure a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels
Basis of Design Product: eldoLED or subject to compliance and prior approval with specified requirements of this section, one of the following:
eldoLED.
Philips.
Osram Sylvania.
Tridonic.
General Electric.
Dimming Protocols:

If not otherwise noted on the luminaire schedule, dimming LED drivers to be 0-10V.
4-Wire (0-10V DC Voltage Controlled) Dimming Drivers
Must meet IEC 60929 Annex E for General White Lighting LED drivers.
Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
Must meet ESTA E1.3 for RGBW LED drivers.
0-10V input protected from line voltage miswire, and immune and output unresponsive to induced AC voltage on the control leads.
Digital (DALI Low Voltage Controlled) Dimming Drivers
Must meet IEC 62386.
Digital Multiplex (DMX Low Voltage Controlled) Dimming Drivers
Must meet DMX / RDM: ANSI/TIA-485, ANSI E1.11 - USITT DMX512A and ANSI E1.20 (Explore and Address)
Capable of signal interpolation and smoothing of color and intensity transitions.
Luminaires requiring more than one driver are not permitted.
Drivers may be connected to the DMX bus by a T-tap spur not to exceed 12-inch in absolute length. In other cases, a DMX input and output connection must be provided.
As indicated in the luminaire schedule.

EMERGENCY LED DRIVERS

Consist of a high-temperature, replaceable maintenance-free nickel cadmium battery, integral charger, and electronic circuitry enclosed in single compact case. Provide solid-state charging indicator light to monitor the charger and battery, a double-pole test switch, and installation hardware.

Emergency driver operates lamps for a minimum of 90 minutes in the emergency mode. Lumen output at end of 90 minutes, 60 percent of initial lumen output per UL 924.

UL listed for installation either inside or on top of the luminaire and be warranted for a full five years from date of installation.

Install and wire by the luminaire manufacturer unless specified for field installation in the Luminaire Schedule.

Wire as either Nightlight (always on) or switchable (with power failure sensing feed) as shown on the drawings.

Mount in accordance with manufacturer's installation requirements.

Initial lumen output to be full output of the luminaire rating.

TRANSFORMERS

Provide proper lamp voltage to low voltage lamps.
Integral:
Magnetic: Encapsulated for silent operation, securely mounted to the luminaire and removable through the aperture for hard ceiling installations or remote where shown on drawings.
Electronic: Do not provide electronic transformers unless directed in the Luminaire Schedule.
Remote:
Magnetic:
Encapsulated for silent operation, securely mounted accessible in location shown on drawings.
Provide code-sized primary and secondary circuit protection via fuses, quantity of secondary circuits as required to serve specified load.
Electronic:
Do not provide electronic transformers unless directed in the Luminaire Schedule.

TRACK LIGHTING SYSTEMS

Lighting Track:
Extruded aluminum track with extruded poly-vinyl insulator.
20A, copper conductor strips with separate ground to provide electrical and mechanical connection for the specified track mounted luminaires.

Number of circuits as indicated in luminaire schedule, with separate neutrals per circuit.
Provide connectors, elbows, stems, feed ends, end caps and fittings to make a complete system.

Track Fittings:
Provide positive mechanical and electrical connection for track heads to track.
Removable fitting either twists into or snaps into specified lighting track.

Luminaire dimensions: Proper for the various wattage noted on the plans and as recommended by the luminaire manufacturer or as specified.

Adjustable Lamp Mechanisms:
Adjustable aiming which can be set to position lamp vertically and rotationally.

Transformers:
Provide proper lamp voltage to low voltage lamps.
Magnetic transformers encapsulated for silent operation.
Integrally mount Magnetic and electronic transformers to luminaire.

Finish: Visible surfaces to be of color and texture as directed in Luminaire Schedule.

Labels: Track and track fittings compatible and be UL labeled and listed as a system.

CUSTOM LUMINAIRES

Custom luminaire manufacturer no less than five years of continuous experience in the design and manufacture of custom lighting elements of the type and quality shown.

Specifications and drawings are intended to convey the features, function and character of the custom luminaire only and do not necessarily illustrate every component or detail required in the finished piece of equipment.

Include details and components that are necessary for the proper appearance and functioning of the custom luminaire.

Provide operational sample prototype luminaire for review and revision, if specified, of each custom luminaire type. Install and connect sample prototype luminaire by the Contractor in a mutually acceptable location for demonstration and evaluation by the design team. Final judges on determining whether the prototype sample complies with specification is up to the Architect and Lighting Consultant.

EXTERIOR LUMINAIRES

Label fixtures from the factory for use in the designed installation. It is the responsibility of the Contractor to verify labeling and installation requirements with the NEC and applicable codes and standards.
External Label: ANSI C136.15
Luminaires must have locality-appropriate governing mark and certification.

The luminaire must be subjected to 100,000 cycles of 2 Gs at the resonant frequency of the luminaire (between 5 and 30 Hz) applied at the center of gravity of the luminaire on three primary axes per ANSI C136.31 without damage to the luminaire. Fully functional luminaire upon completing the test.

Luminaire must be IP and/or UL-listed for damp or wet locations, as appropriate for exterior application, and wiring cavity must be field accessible for service or repair needs.

Provide luminaires fully assembled and electrically tested before shipment from factory.

Optical cavity must be a minimum IEC 60529/IP65.

Rate luminaires for -4 degrees F to 104 degrees F operation.

The coating must be capable of surviving ASTM B117 Salt Fog environment for 500 hour minimum without blistering or peeling. The coating must demonstrate gloss retention of greater than or equal to 90 percent for 500 hour exposure QUV test per ASTM G53 UVB313, 4 hour UV-B 140 degrees F/4 hour condensation 122 degrees F.

Provide luminaires with a NEMA distribution pattern as indicated in the luminaire schedule.

Water feature and fountain lighting to meet applicable codes and regulations.

Project Conditions Coordination:
Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under Work of Other Sections, or by others.

Coordinate elevation to obtain specified foundation height.
Notify Owner of conflicts or deviations; obtain direction prior to proceeding with Work.

Exterior Lenses
In-grade lenses drive-over and cool touch rated.
For lenses not integral to the LED lamp, construct the luminaire optical enclosure (lens/window) of clear and UV-resistant polycarbonate, acrylic, or glass.

Unless otherwise indicated, provide cast-in-place embedded style concrete foundations with constructed forms for square foundations or round foundations with spirally wrapped treated paper forms. Provide concrete, anchor bolts, and reinforcing steel as indicated in the Drawings.

Poles:
Provide poles of material and form as indicated in the luminaire schedule. Provide poles able to withstand winds of not less than 100 mph and a gust factor of 1.3 with an ice load criteria up to 1/2-inch thick without damage to the pole and attached luminaire.
Provide poles with a hand-hole and removable hand-hole coverplate that matches the material and finish of the pole. Install covers with vandal resistant bolts. Locate hand-hole located approximately 18-inches above the pole base.
Provide poles with provisions for installation of Owner provided and installed security cameras. Provide hand-hole with removable hand-hole coverplate that matches the material and finish of the pole. Locate hand-hole based on Owner design of security cameras.
Provide poles with an internal ground lug easily accessible from the hand-hole.
Provide poles with a base plate welded to the pole utilizing a backup ring and full-penetration welded connection.
Provide a one piece base cover to completely cover foundation hardware.
Aluminum Poles:
Seamless extruded aluminum shafts fully welded to a cast aluminum anchor base assembly.
Provide shaft square, straight, and meeting requirements of AASHTO Standard Specifications.
Pole Height: As indicated in the Luminaire Schedule.
Pole Finish:
Provide external surfaces of the pole, base cover, support arms, and luminaires finished in the same material and color.
Provide poles chemically cleaned, rinsed, phosphatized, sealed, and dried.
Apply an electrostatic application of polyester-power paint to external surfaces.
Oven-bake complete unit to form a homogeneous, non-porous surface. Provide completed finish with no sags, drips, oxidation, or runs.
Anchor Bolts: Provided by pole manufacturer of size and length and quantity as recommended by pole manufacturer.
Fabricate anchor bolts from hot rolled carbon steel bar with an L bend on one end.
Provide galvanized anchor bolts with a minimum of 12-inches on the threaded end.
Provide bolt circle and bolt projection dimensions with manufacturer's Shop Drawings.
Wrap poles in a protective material for shipment to the Project site.

EXTRA MATERIAL

Furnish extra materials described below that match product installed and that are packaged with protective covering for storage and identified with labels describing contents.
Glass and plastic lenses, covers, louvers, globes, guards, and other removable fixture parts: 5 percent or one dozen (whichever is less) of each type and rating installed. Furnish at least one of each type.
Control gear: 5 percent or one dozen (whichever is less) of each field-replaceable control module, driver, ballast, or individual fixture transformer. For fixtures with non-easily replaceable control gear provide 5 percent or one dozen (whichever is less) extra fixtures. Confirm non-replaceable products during submittal process.
Adjustable accent lights (track, recessed, or surface mounted): 10 percent of each beam angle lens (or removable lens accessory), 10 percent or one dozen (whichever is less) additional accessory lenses, color filters, louvers, and other accessories specified for use during final focusing.
For non-decorative LED lights, provide 2 percent additional fixtures, or minimum two fixtures.
Touch-Up Paint: 2 gallons, to match color of pole finish.

DISPOSAL AND REPLACEMENT

LED manufacturer is responsible for the disposal of expired LED arrays and heat sinks. Clearly label fixture with return information, disposal procedures and manufacturer disposal contact information.

Owner will pay for shipping.

Manufacturer is required to inform the Owner of new power requirements and /or lumen output values if new replacement components prior to shipping replacement parts.

Label disposal and replacement information inside the luminaire and in the project operation and maintenance manuals along with O&M requirements listed in Division 01, General Requirements.

PART 3 EXECUTION

INSTALLATION

Meet general requirements of NFPA 70, National Electric Code.

Mounting heights specified on drawings:
Wall Mounted Luminaires:
Centerline of luminaire.
Pendant Mounted Luminaires:
Bottom of luminaire unless specifically identified in the Luminaire Schedule or on drawings.

Support:
Support by separate means from the building structure and not from the ceiling system, ductwork, piping, or other systems.
Final decision as to adequacy of support and alignment will be given by the Architect.

Power Supplies:
Do not install equipment until following conditions can be maintained in spaces to receive equipment:
Ambient temperature: -4 degrees to 122 degrees F.
Relative humidity: Maximum 90 percent, non-condensing.
Protected from dust and excess moisture during installation.
Install per manufacturers prescribed methods.
Located remote mounted power supplies and transformers within the distance limitations specified by the power supply manufacturer.

Level luminaires, align in straight lines, and locate as shown on the architectural elevations and reflected ceiling plan.

Manufacturer's labels or monograms not visible after luminaire is installed, but must be included for future reference.

Recessed Luminaires:
Trims which fit neatly and tightly to the surfaces in which they are installed without light leaks or gaps.
Install heat resistant non-rubber gaskets to prevent light leaks or moisture from entering between luminaires trim and the surface to which they are mounted.

Pole Luminaires:
Provide cast-in-place concrete foundations for pole mounted luminaires.
Concrete: As specified in Division 03, Concrete.
Foundation Forms: As indicated.
Place anchor bolts in foundation as recommended by manufacturer in the required bolt circle size.
Tie reinforcing steel in foundation to the anchor bolts to form a solid cage.
Tamp wet concrete during pouring to assure complete coverage below, around and within the cage and form.
Hand finish top of foundation to produce a smooth, level surface.
Provide a minimum 10-foot copper-clad steel ground rod at each pole base. Connect from ground rod to the ground lug in the pole with minimum AWG 8 copper conductor.
Install pole mounted luminaires plumb with luminaires level, and with reflector distribution in the direction indicated in the Drawings.
Grout around the pole base at the foundation to close openings.
Install pole base cover over exposed installation hardware.

Tungsten Halogen Lamps:
When lamping tungsten halogen luminaires use silk gloves to insert lamps.
Do not energize tungsten halogen luminaires during construction to prevent dust build up on lamp, socket and lamp chamber. Lamping occurs as last stage of construction.

COORDINATION OF WORK

Architectural Reflected Ceiling Plans take preference as to the exact placement of the luminaires in the ceiling.

Determine ceiling types in each area and provide suitable accessories and mounting frames where required for recessed luminaires. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed.

AIMING

Aim luminaires with proper lamps installed.

Aim directional luminaires, including but not limited to luminaires described in the Contract Documents or by the luminaire manufacturer as aimable, adjustable, or asymmetric as follows:
Provide the lighting pattern for which the luminaire is designed.
Provide the lighting pattern as shown on the drawings.
Predetermined aiming points as shown on the drawings.
Where aiming cannot be determined, request, in writing, clarification from the Architect, indicating luminaires needing clarification.

Re-aim luminaires as determined by Architect during final project walkthrough.

Install adjustable luminaires with dead zone of rotation away from intended aiming point.

PROJECT CLOSEOUT

Leave luminaires clean at the time of acceptance of the work. If luminaires are deemed dirty by the Architect at completion of the work, clean them at no additional cost. Protective plastic wrap is to be removed from parabolic luminaires just prior to Owner acceptance.

Provide fixtures with new lamps operating at time of final acceptance. Exception: For fluorescent dimming fixtures, provide minimum 100 hour/maximum 200 hour, continuously lit lamps or per ballast manufacturer's recommendations.

Where incandescent lamps are used for construction lighting, replace the lamps with new lamps just prior to occupancy by the Owner.

END OF SECTION

PART 1 GENERAL

SUMMARY

This Section includes Design-Build work.

Work included in Section 27 05 00 - Common Work Results for Communications applies to Division 27, Communications work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of communications systems for proposed project:

Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

Additional conditions apply to this Division including, but not limited to:
Specifications including General and Supplementary Conditions and Division 01, General Requirements.
Drawings
General provisions of the Contract
Addenda
Owner/Architect Agreement
Owner/Contractor Agreement
Codes, Standards, Public Ordinances and Permits

RELATED SECTIONS

Division 01, General Requirements

Division 27, Communications

Section 26 05 33.16 - Boxes for Electrical Systems

REFERENCE STANDARDS

ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

UL 1479 - Standard for Fire Tests of Penetration Firestops.

UL 1863 - Communications-Circuit Accessories.

UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

REFERENCES

References, Codes and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 27 Sections and those listed in this section.

Supervisors and Lead Installers:
Working knowledge and understanding of the following documents and codes or their most recent updates and familiar with the requirements that pertain to this installation.
Installers familiar with and have practical working knowledge of the requirements that pertain to this installation.

Codes:
Comply with applicable sections of the most recent editions and addenda of following for interior and exterior installations.
Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
IBC - International Building Code
NEC/NFPA 70 - National Electrical Code
NESC IEEE - National Electrical Safety Code
State of California:
CBC - California Building Code
CEC - California Electrical Code
CEC T24 - California Energy Code Title 24
CFC - California Fire Code
CSFM - California State Fire Marshal

DSA - Division of State Architect Regulations and Requirements
HCAI - Department of Health Care Access and Information
State of Oregon:
OAR - Oregon Administrative Rules
OESC - Oregon Electrical Specialty Code
OFC - Oregon Fire Code
OSSC - Oregon Structural Specialty Code
OEESC - Oregon Energy Efficiency Specialty Code
Oregon Elevator Specialty Code
State of Washington:
IBC - International Building Code
IFC - International Fire Code
WAC - Washington Administrative Code
WSEC - Washington State Energy Code
Guidelines for Design and Construction of Health Care Facilities

Standards:
Comply with applicable sections of the most recent editions and addenda of the following for installations and testing of communications cabling, connectors, and related hardware.
Reference standards and guidelines include but are not limited to the latest adopted editions from the following:
ANSI - American National Standards Institute
NEMA - National Electrical Manufacturers Association
TIA - Telecommunications Industries Association
TIA TSB-125 - Guidelines for Maintaining Optical Fiber Polarity Through Reverse-Pair Positioning
TIA TSB-140 - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems
TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant - OFSTP-7
T-526-14-A - Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant - SFSTP-14
ANSI/TIA-568.0-D - Generic Telecommunications Cabling for Customer Premises
ANSI/TIA-568.1-D - Commercial Building Telecommunications Cabling Standard Part 1: General Requirements
ANSI/TIA-568-C.2 - Commercial Building Telecommunications Cabling Standard-Part 2: Balanced Twisted Pair Cabling Components
ANSI/TIA-568-3-D - Optical Fiber Cabling Components Standard
ANSI/TIA-569-C - Commercial Building Standards for Telecommunications Pathways and Spaces
ANSI/TIA-598-C - Optical Fiber Cable Color Coding
ANSI/TIA-604.2-A - FOCIS 2-Fiber Optic Connector Intermateablility Standard
ANSI/TIA-606 - Administration Standard for Commercial Telecommunications Infrastructures
ANSI/TIA/607-C - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
ANSI/TIA-758-A - Customer-owned Outside Plant Telecommunications Infrastructure Standard
ANSI/TIA-854 A - Full Duplex Ethernet Specification for 1000 Mb/s (1000BASE-TX) Operating over Category 6 Balanced Twisted-Pair Cabling
ANSI/TIA-862-B - Structured Cabling Infrastructure Standard for Intelligent Building Systems
ANSI/TIA-4994 - Standard for Sustainable Information Communications Technology
ANSI/NECA/BICSI 568-2006 - Standard for Installing Telecommunications Systems
Other Reference Materials
ANSI/NECA/GICSI-568-2006 - Standard, Installing Commercial Building Telecommunications Cabling
COOSP BICSI - Outside Plant Design Reference Manual
ESSDRM BICSI - Electronic Safety and Security Reference Manual
ITSIM BICSI - Information Transport Systems Installation Methods Manual
NDRM BICSI - Network Design Reference Manual
TDMM BICSI - Telecommunications Distribution Methods Manual
WDRM BICSI - Wireless Design Reference Manual
IEEE - Institute of Electrical and Electronic Engineers

NEMA - National Electrical Manufacturers Association
UL - Underwriters Laboratories Cable Certification and Follow Up Program
ASA - American Standards Association

QUALITY ASSURANCE

Perform work in accordance with contract documents and governing codes and standards.

Personnel performing the work of this Section thoroughly familiar with the cabling methods set forth in the latest release of the TDMM.

RCDD reviews required work prior to commencing. Oversee the installation and will have the end responsibility for the quality of the installation work performed. Submitted designs and or changes to the design must be approved and signed off by the RCDD.

Installed cabling systems not to generate nor be susceptible to harmful electromagnetic emission, radiation, or induction that degrades cabling systems.

Expansion Capability: Unless otherwise indicated, provide spare positions in wall fields, cross connects, and patch panels, as well as space in distribution and riser pathways to accommodate minimum 15 percent future growth.

Backward Compatibility: The provided solution backward compatible with lower category ratings such that if higher category components are used with lower category components, the permanent link and channel measures meet or exceed the lower channel's specified parameters.

Component Compliance: The provided solution's components each meet the minimum transmission specifications listed herein such that no individual component will be less than specifications for permanent and channel, regardless of the fact that tests for permanent and channel ultimately meet required specifications.

Visibly damaged goods are to be returned to the supplier and replaced at no additional cost to the Owner.

CONTRACTOR RESPONSIBILITY AND QUALIFICATIONS

Provide components, materials, services, and labor essential for a complete and functional structured cabling system.

Comply with local, state, and federal laws and regulations applicable to the work to be performed although said law, rule, or regulation is not identified herein.

Examination of building and site responsibility:
Examine site and building prior to installation to determine conditions affecting the scope of work.
Contact Owner representative for arrangements.
Systems and cabling are assumed working and in good condition unless Contractor documents exceptions.

Respect and protect the privacy and confidentiality of Owner, its employees, processes, products, and intellectual property to the extent necessary, consistent with the legal responsibilities of the State of Oregon and Owner policies.

Use of Sub-Contractors:
Inform in writing to Owner's representative and General Contractor about the intention to use sub-contractors and the scope of work for which they are being hired.
Owner's representative prior to the sub-contractor's hiring and start of work must approve the use of sub-contractors in writing.

Provide a sufficient number of technicians for this project to stay on schedule.

Contractor Qualifications:
Fully conversant and capable in the cabling and equipment installation of communications systems including, but not limited to:
Data/Voice Structured Cabling
Audio and Video System Types
Minimum of five years' experience in the design, installation, testing, and maintenance of communications systems.

Must employ at least one full time BICSI certified RCDD who is involved in reviewing work performed by Contractor on this project.
Verification of current BICSI Certified Installer, or equivalent.
Personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.
Installers: Only technicians certified by approved equipment manufacturer are approved.
Maintain a local service facility which stocks spare devices and/or components for servicing systems.
Have performed successful installation and maintenance of at least three projects similar in scope and size. Provide project references for these three projects, including scope of Work, project type, Owner/user contact name and telephone number.

MANUFACTURERS

Equipment in these Sections are the standard products of a manufacturer regularly engaged in the manufacture of such products unless specified otherwise. Components used in the system commercial products that comply with these Specifications.

Each component of equipment identifies the manufacturer's name, model, and applicable serial number. The Owner's authorized representative retains the right to reject products that reflect, in their opinion, sub-standard design practices, manufacturing procedures, support services, or warranty policies.

CHANGE ORDERS

Supplemental cost proposals by the Contractor accompanied with a complete itemized breakdown of labor and materials. At the Architect's request, Contractor's estimating sheets for the supplemental cost proposals made available to the Architect.

Separate and allocate labor for each item of work.

WARRANTY

The chosen Communications Contractor provide a minimum 1 year warranty on material, installation, and workmanship.

Provide a written warranty covering the work of this Division as required by the General Conditions.

Apparatus:
Free of defects of material and workmanship and in accord with the Contract Documents.
Built and installed to deliver its full rated capacity at the efficiency for which it was designed.

Include in Contractor's warranty for Work of Division 27, Communications system damage caused by failures of system component.

ALLOWANCES

Comply with Division 01, General Requirements.

ALTERNATES

Comply with Division 01, General Requirements.

Refer to Electrical Drawings for detailed information relating to the appropriate alternates.

GENERAL

Meet or exceed applicable referenced standards, federal, state, and local requirements and conform to codes and ordinances of authorities having jurisdiction.

SUBMITTALS

General:
Guidelines set forth in this Section pertain to Division 27, Communications specifications included in this project.
Submit the following deliverables to the Owner and Design Team prior to ordering equipment or installation of equipment.
Partial submittals will not be considered, reviewed, or stored, and such submittals will not be returned.

Materials and equipment listed that are not in accordance with specification requirements and/or not prior approved may be rejected.
The approval of material, equipment, systems, and shop drawings is a general approval subject to the Drawings, Specifications, and verification of measurements at the job. Approval does not relieve the Contractor from the responsibility of shop drawing errors. Carefully check and correct shop drawings prior to submission for approval.

Informational Submittals:
Field Test Reports:
Submit sample cable test reports showing report format and parameters tested.
Submit minimum of 2 weeks prior to final punch walkthrough. Maintain test equipment on-site during punch for sample proof-of-performance tests.
Proposed test forms for fiber backbone, copper backbone, and horizontal UTP cable.
Certificates:
Certify that field tests have been performed and that work meets or exceeds specified requirements.
Certify that factory tests have been performed and that work meets or exceeds specified requirements.
Certificates may be based on recent or previous test results, provided material or products tested are identical to those proposed for this Project.
Optical loss budget calculations for each optical fiber run.
Calibration report of test equipment for fiber and copper. Last calibration date should not be older than one year from the first day of testing.
Name(s) and copy of installer's certificates as it pertains to the system design (e.g. RCDD, CTS, NICET, etc.).

Shop Drawings:
Original bid contract documents are not to be used as shop drawings. Generate three-dimensional original shop drawings utilizing CAD software (i.e. AutoCAD, Revit, etc.)
Shop drawings that appear to be traces or overlays of original bid contract documents immediately rejected.
Where scope is distributed among multiple sub-contractors, each sub-contractor's submittal makes reference the other submittal where connections to equipment provided by other sub-contractors is required.
Example: Contractor A provides System X shop drawings. Contractor B provides System Y shop drawings. Both sets of shop drawings must make references to each other where systems X or Y are interdependent on each other to function.
General Requirements:
Clear and legible
Utilize the same sheet size as the contract drawings.
Use minimum of 1/8-inch text height for text, symbol text, and subscript text.
Plan drawings utilize the same scale as issued in the contract documents.
Plan drawings utilize the same sheet order as issued in the contract documents.
Plan drawings utilize the same grid-line locations relative to the sheet as issued in the contract document (this is to aid overlay and checking of shop drawings vs. contract documents and to aid the as-built documentation).
Sheets, including the cover sheet include a title block containing the following information:
System specific sheet number
Project name, specification section number, and Section title name
Floor name, area, and/or floor description matching that of the contract drawings.
Include architectural information on the shop drawings including, but not limited to the following:
Match Lines
Grid Lines
Grid Bubbles
Key Plans
Enlarged Floor Plan Callouts
Cover Sheet:
The first page of shop drawings includes a coversheet containing the following information:
Site Information:
Name of Site

Address
City
Zip Code
Installing Contractor's Information:
Business Name
Local Office Address
Phone Number
Website
Primary Contact Person:
Name
Phone Number
Email Address
Provide sheet index on the coversheet.
Legends:
Symbols:
Shop drawings include an associated symbol for each device used on the symbol legend, including but not limited to the following:
Symbol Name
Device Description
Rough-in Requirements
Applicable Manufacturer
Manufacturer's Model Number
Wiring:
Shop drawings include an associated symbol for each wire used on the symbol legend, including but not limited to the following:
Cable Designator
Cable Manufacturer
Model Number
Cable Rating (e.g. CMP, CMR, OSP, etc.)
Size of Conductors
Quantity of Conductors
Each cable type has a different designation.
Plans and Elevations:
Plan Views:
Devices, cabinets, racks, and termination blocks.
Raceways (conduits, cable trays, ladder racks, floor ducts, junction boxes, pull boxes, splice boxes, manholes, and associated supports).
Field devices with their respective address number.
IP addresses for TCP/IP devices included in the system.
Equipment clearances for racks/cabinets.
Elevation Views:
Termination blocks, patch panels, wire managers, and other devices.
Vertical and horizontal offsets and transitions.
Vertical elevation of cable trays above the floor or bottom of ceiling structure.
Clearances for access above and to side of cable trays.
Rack Layouts
Intended equipment layout within the racks.
Blank filler plates in spaces where equipment is not installed.
Areas within the rack for equipment furnished by or reserved by others.
Indicate rack unit size of equipment, and total rack units available in the rack.
Details and Diagrams:
Details:
Mounting details for head-end equipment, racks, and field devices.
Diagrams:

Associated one-line or riser diagram showing connections between devices and connections to equipment provided in other systems.
Indicate cable type, sizes, and quantities between each TR for backbone copper and fiber cabling.
Show field devices with their respective room names/numbers and connections to their associated equipment.
Show field devices with their respective address number.
Show IP addresses for TCP/IP devices included in the system.
System Labeling Schedules:
Electronic copy of labeling schedules, in software and format selected by Owner.
Deferred Submittals:
Mounting Details:
Provide engineering analysis, calculations, and drawing details of device restraints and supports for maximum loading in compliance with Code and coordinated with all trades.
Details to show loads, connection type/materials, dimensions, etc., specific to each unique installation instance.
Details to indicate both expected and maximum loads.
Analysis to adhere to seismic bracing requirements in the jurisdiction specific to the project.
Details to be stamped and signed by an Engineer licensed for the applicable work in the project's area of jurisdiction.
Provide details for:
Floor mounted equipment racks, including raised floor supports.
Cable tray, runway, and wire-basket tray.
Ceiling and Wall:
Supported flat panel displays.
Supported projectors and projection screens.
Roof-mount devices, braced to withstand maximum wind gusts and uplift pressures.
Conduit and junction boxes infrastructure systems.
Antennas and satellite dishes.
Other ceiling and wall supported devices weighing more than 20 pounds.

Equipment/Product Data Submittals:
Submit a single package of the related submittals for the products called out in Division 27, Communications Specifications.
Two indexed sets of manufacturer's technical data for each product including product description, specifications including labeling or listing by an agency acceptable to the Owner, storage requirements and Materials Transparency Information.
Submitted digitally (e.g. in PDF) and have digital bookmarks for navigating the document set, organized as follows:
Primary division (e.g. 27)
Submittal section (e.g. 271500)
Product name (e.g. "PATCH PANELS")
For each applicable section within the Division 27, Communications, organize as follows:
Cover sheet for each applicable section number.
Include the Contractor's contact information
Table of contents with the following information per line:
Equipment Type
Manufacturer
Model Number
Page Number (with hyperlink to product data sheet's page)
Apply header to each page of each sections submittals including the following:
Title of Division 27 section the products fall under (e.g. Section 26 05 00 - Common Work Results for Electrical).
Apply footer to the bottom of each submittal package including the following:
Clearly labeled page numbers
Date of submittal (YYYY-MM-DD)

Where more than one product is called out on the same sheet, clearly highlight or mark which product is proposed for use.
Materials Transparency - Environmental Impacts:
For each product included in project, provide copies of current environmental product disclosures including:
Environmental Product Declarations (EPDs)
Product-specific, Type III, also known as manufacturer-specific EPD.
When not available, the following are acceptable:
Industry-wide, Type III EPD
Other product-specific lifecycle assessments (LCAs)
CIBSE TM65 mid-level or basic calculation
For each product that does not have associated environmental product disclosures, clearly note that EPD and product certifications were requested from the manufacturer, along with the manufacturer's written response.
Materials Transparency – Recycled Content:
For each product, provide a breakdown of recycled content by material and pre- and post-consumer percentages.
For each product that does not have recycled content, submittal to clearly note that recycled content was requested from the manufacturer along with the manufacturer's response.

Project Closeout:
Manufacturer's Installation, Start-Up, and Adjustment Instructions.
Operation and Maintenance Data.
Update to the Equipment/Product Data Submittals with identical document structure and digital document requirements.
Include digital copy in both of the following:
Archival quality DVD-R
USB flash drive
Include full manuals of equipment provided (data sheets alone not acceptable).
Include test data and reports.
Include original software configuration files and programming software for head-end equipment.
Software files consist of both the original "un-compiled" file used for creating the system, as well as the compiled firmware/instructions that are loaded onto the head-end equipment/device. This includes, but is not limited to, the following typical systems:
Access Control
Audio-Visual
Clock
Intercom
Intrusion Alarm
Public Address
Video Surveillance
Master/Community/Satellite Antenna Television
Information Display / Digital Signage
Special Warranty:
Do not offer a special warranty to Owner to supplement the standard warranty requirement covered in this Specification.
With respect to the installation of Approved Manufacturer's Cabling System, furnish Approved Manufacturer's Cabling System application / system standard warranty.

PRODUCT ASSURANCE

UL and/or ETL approved and labeled in accordance with NEC for products where labeling service normally applies.

Label materials and equipment requiring UL 94, 149, or UL 1863. Modification of products that nullifies UL labels is not permitted.

Materials and equipment provided by standard Commercial-Off-The-Shelf (COTS) products of a manufacture engaged in the manufacture of such products.

Typical commercial designs that comply with the requirements specified. Materials and equipment readily available through manufacturers and/or distributors. Supply equipment complete with optional items required for proper installation.

Materials or Manufactures not listed in this Division 27, Communications but are required materials to provide a complete and functioning cable infrastructure system have cut sheets and product data included in the material and procedures submittal package.

Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance and backward compatibility.

Test fiber cable while on the reel prior to installation of the cable. Assume liability for replacement of cable should it be found defective at this time or a later date prior to customer acceptance.

ADMINISTRATIVE REQUIREMENTS

Coordination
Review Drawings of other trades and Owner provided equipment to avoid conflicts.
Report potential conflicts to Architect, provide resolution prior to rough-in.
Architectural Drawings take precedence regarding exact placement of system components and equipment.
Verify the physical dimensions of equipment to fit the space available.
Coordinate access routes through the construction and equipment move-in planning, and provide required equipment, transport and services necessary to facilitate installation of equipment.
Where connections are required for equipment provided as Work of other Divisions, coordinate rough in and connection requirements for that equipment with its supplier and installer prior to commencing work.
Notify Architect of any discrepancies between the actual rough in and connection requirements, and those identified on Drawings for resolution prior to installation.
Coordinate underground work with other trades working on the site.
Common trenches may be used with other trades, provided clearances required by codes and ordinances are maintained.
Coordinate installation of required supporting devices and set sleeves in architectural and structural components as they are constructed.
1Coordinate location of access panels and doors for items concealed behind finished surfaces with Architect.
Coordinate sleeve selection and application with firestopping specified elsewhere.
Finishes: Coordinate with Architect, finish to match surrounding surfaces.
Coordinate arrangement, mounting, and support of communications equipment with Architect, Communication Design Professional or Owner Information Technology Team:
To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
To provide the most efficient pathway for structured cabling endpoint devices such that the cabling never exceeds the 295-feet.

COORDINATION

Coordinate arrangement, mounting, and support of communications equipment with Architect, Communication Design Professional or Owner Information Technology Team:
To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
To provide the most efficient pathway for structured cabling endpoint devices such that the cabling never exceeds the 295-feet permanent link distance. Pathways must be shown on shop drawings for review prior to installation.
To provide for ease of disconnecting the equipment with minimum interference to other installations.
To allow right-of-way for piping and conduit installed at required slope.
Racks and Communication Cabinets: 3-foot minimum.
Open Pathways - Cable Tray, J-Hooks: 12-inch clear on working side; 3-inch clear from ceiling tiles.
Closed Pathways - Conduit (Above and Below Grade):
3-inch clear from electrical pathways concrete encased.
12-inch clear in electrical pathways in dirt.

48-inch clear electrical Motors and transformers.

Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08, Openings.

Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07, Thermal and Moisture Protection.

Responsible for coordination with all trades, to include required scheduling of materials and/or equipment with Owner and/or General Contractor for delivery, storage, and protection of equipment as required.

Finishes: Where specific device finishes have not been identified, selected by Owner or Architect, finish to match surrounding surfaces.

PRE-INSTALLATION CONFERENCE

Arrange and schedule pre-installation conference prior to beginning work of this Section Division 27, Communications.

Agenda: Clarify questions in writing related to work to be performed, scheduling, coordination, etc., with Consultant and/or Project Manager/Owner representative.

Individuals, who will be in an on-site supervisory capacity, are required to attend the pre-installation conference. This includes project managers, site supervisor, and lead installers. Individuals who do not attend the conference will not be permitted to supervise the personnel that install, terminate, or test communications cables on the project. Oversee the installation is required to attend the pre-installation conference.

The manufacturer that will be providing the extended warranty is required to have a representative attend the pre-installation conference.

FIELD QUALITY CONTROL

Perform the following field inspections during installation and commissioning:
Visually inspect UTP and optical fiber jacket materials for NRTL certification markings.
Visually inspect cabling placements, pathways, and terminations in communications equipment rooms, telecommunications rooms, and work areas for compliance with standards and codes.
Visually inspect grounding and bonding for compliance with standards and codes.
Visually inspect installed cable trays, cable pathways, and wall penetrations for compliance with standards and codes.

Responsible for field inspections and will submit a signed weekly inspection report to Owner.

ALTERNATES, SUBSTITUTIONS, AND CHANGE ORDERS

If a proposed alternate material submitted as an “or approved equal” to or exceeds specified requirements, provide manufacturer’s specifications in writing for written approval prior to purchase and installation of proposed materials. The proposed material substitution not void or change manufacturer’s warranty.

Provide a complete cabling infrastructure according to these written specifications and drawings. Changes from the Owner changes the scope of work to be performed by the Contractor, put in writing. Respond to changes with a complete material list, labor, and taxes in writing presented to the Owner for approval. Do not proceed with additional scope of work without a signed approval by the Owner.

Additional work performed by the Contractor will not be paid by Owner without signed approval of these changes prior to implementing changes. Submit a copy of signed change order upon billing.

Refer to Technology Drawings for detailed information relating to the appropriate alternates.

PROJECT MANAGEMENT

Designate a project manager to act as the single point of contact. Project manager to oversee work performed to ensure a quality installation compliant with specifications as outlined in documents (which includes specifications and drawings). Owner or Consulting Engineer will review a copy of the resume of the on-site project managers and each on-site team.

Contractor project manager/supervisor to attend meetings arranged by General Contractor, Architect, Owner's representatives, and/or other parties affected by work of this specification.

DELIVERY AND STORAGE

Assume custody and responsibility for the items upon delivery and determining that the contents are complete and in satisfactory condition for installation.

Delivery, loss, storage, and protection: Materials and equipment delivered and placed in storage stored with protection from the weather, humidity, and temperature variation, dirt, and dust or other contaminants.

Coordinate deliveries and submittals with the General Contractor/Owner to ensure a timely scheduled installation.

Responsible for handling and control of cabling equipment and liable for material loss due to delivery and storage problems.

No equipment or materials delivered to the job site more than three weeks prior to the commencement of its installation. Coordinate with General Contractor/Owner on location of storage materials.

AS-BUILTS

Record copy and as-built drawings.
Provide record copy drawings periodically throughout the project as requested by the General Contractor or Owner, and at end of the project on CD-ROM. Record copy drawings at the end of the project in AutoCAD format and include notations reflecting the as built conditions of additions to or variation from the drawings provided such as, but not limited to, cable paths and termination points. AutoCAD drawings are to incorporate test data imported from the test instruments.
As built drawings include, but are not limited to: block diagrams, frame and cable labeling, cable termination points, equipment room layouts, rack elevations, and frame installation details. The as-built drawings includes field changes made up to construction completion:
Field directed changes to cross connect and patching schedule.
Horizontal cable routing changes.
Backbone cable routing or location changes, inclusive outside plant physical pathways (if within scope of this project).
Associated detail drawings.

CLEANING

After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, dust, and construction debris and repair damaged finish, including chips, scratches, and abrasions. This includes touching up paint removed for grounding.

Provide a clean work environment, free from trash/rubbish accumulated during and after cabling installation.

Maintain construction materials and refuse within the area of work. Clean the work area at the end of each day.

Keep liquids off finished floors, carpets, tiles, racks, and equipment. If liquid damages finishes or equipment, provide professional services to clean or repair scratched/soiled finishes or damaged equipment at the Contractors own expense.

PAINTING

Certain Division 27, Communications Sections contain the requirement of painting, it is the responsibility of the Contractor to coordinate the requirements and labor involved to complete this work with the General Contractor.

Touch up marred and bared surfaces of primed, galvanized, and finish painted equipment, materials, and accessories installed.

Restore patched surfaces as close to the original condition and finish as reasonably possible. Where patching occurs in smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received two coats of primer and two coats of finished paint.

PART 2 PRODUCTS

GENERAL

Where specified materials or methods conflict with applicable codes, the more stringent requirement applies.

Provide apparatus built and installed to deliver its full rated capacity at the efficiency for which it was designed.

Materials and Equipment:
Use materials and equipment that are:
New
Of quality meeting or exceeding specified standards.
Free of faults and defects.
Conforming to Contract Documents.
Of size, make, type, and quality specified.
Suitable for the installation indicated.
Manufactured in accordance with NEMA, ANSI, UL, or other applicable standards.
Otherwise as specified in Division 01, General Requirements.
Where two or more units of the same class of equipment are furnished, use products of the same manufacturer.
Component parts of the entire system need not be products of same manufacturer.

Basis of Design:
First listed manufacturer specified by performance or model number considered the Basis of Design.
If other equipment is provided in lieu of the Basis of Design equipment, assume responsibility for changes and costs which may be necessary to accommodate this equipment, including, but not limited to:
Different sizes and locations for connections.
Different dimensions.
Different access requirements.
Different configurations of connected equipment.
Other differences.

PART 3 EXECUTION

INSTALLATION

General:
Full and complete compliance with standards and guidelines set forth in this and subsequent specifications.
Field verify existing conditions prior to installation and make note of conflicts and discrepancies between these specifications and construction drawings to the Owner immediately.
Field discrepancies not noted to the Owner or Design Team prior to installation commencement the responsibility of the Contractor and repaired at no cost to the Owner.
Provide a complete and properly operating system for each item of equipment specified.
Install materials in a neat and professional manner.
Comply with equipment manufacturer’s written instructions, the best industry practices, and the Contract Documents.

Clarification:
Where there is a conflict among manufacturer' s instruction, best practice, and the Documents, request clarification from the Architect prior to rough-in.
Architect’s decision will be final.
Remove and correct work installed without clarification by the Contractor at no cost to the Owner.

Existing concrete, block, or brick walls are considered not accessible and may require use of Surface Mounted Raceway (SMR) if existing concealed raceway and device boxes are not available for reuse or do not meet the intent of the design. Coordinate route and installation where SMR is required with the Architect/Engineer prior to rough-in. Responsible for reinstalling SMR routed without such prior approval to the Architect’s satisfaction.

Existing stud walls (wood or metal) with or without blocking with plaster, plasterboard, or paneling finish are considered accessible with accessible ceiling, attic, tunnel, or crawl space above, below, or adjacent. Remove, patch, and repair finished surface as required to conceal rough-in for new device locations. If it is determined that a specific instance will not permit concealment of rough-in due to obstructions such as beams, headers, and other structural elements, prior approval before rough-in from the Architect is required.

INSTALLATION IN RATED CONSTRUCTION

Install intumescent material around ducts, conduits, and other telecommunications elements penetrating rated construction.

Comply with firestop materials manufacturer's written instructions to prevent spread of smoke or fire through sleeves or block-outs penetrating rated fire barriers.

Provide firestop materials specified in Division 07, Thermal and Moisture Protection, and as follows:
Capable of passing a 3-hour test per ASTM E814 (UL 1479).
Consisting of material capable of expanding nominally eight times when exposed to temperatures of 250 degrees F - 350 degrees F.
An alternate method utilizing intumescent materials in caulk or putty complying with Division 07, Thermal and Moisture Protection may be used.

EQUIPMENT AND CABLING SUPPORT

Minimum Support Capacity:
Provide fastening devices and supports for equipment, panels, outlets, and cabinets capable of supporting not less than four times the ultimate weight of the object or objects fastened to or suspended from the building structure.

Support junction boxes, pull boxes, or other conduit terminating housings located above the suspended ceiling from the floor above, roof, or penthouse floor structure to prevent sagging or swaying.

Conduits:
Support suspended conduits 1-inch and larger from the overhead structural system with metal ring or trapeze hangers and threaded steel rod having a safety factor of four.
Conduits smaller than one 1-inch installed in ceiling cavities may be supported on the mechanical system supports when available space and support capacity has been coordinated with the sub-contractor installing the supports.
Anchor conduit installed in poured concrete to the steel reinforcing with 14 AWG black iron wire.

Powder actuated or similar shot-in fastening devices will not be permitted for technology work except by review from the project structural engineer.

Support exposed cable at most every five feet using wide-base cable supports manufactured for that purpose. Mount as high as possible next to floor/ roof deck. Do not support cabling from building elements that have not been specifically manufactured for that purpose. Do not run cable through structural members or in contact with pipes, ducts, or other potentially damaging items.

Install cable and supports above fire-sprinkler systems and do not attach to the system or ancillary equipment or hardware. Install the cable system and support hardware so as not to obscure valves, conduit, boxes, or other control devices.

ALIGNMENT

Install panels, cabinets, and equipment level and plumb, parallel with structural building lines.

Install equipment and enclosures fitted neatly, without gaps, openings, or distortion.

Properly and neatly close unused openings with approved devices.

Fit surface panels, devices, and outlets with neat, appropriate, trims, plates, or covers without overhanging edges, protruding corners, or raw edges.

CUTTING AND PATCHING

General:
Comply with Division 01, General Requirements.

Restore to original condition new or existing work cut or damaged by installation, testing, and removal of work.
Patch and finish spaces around conduits passing through floors and walls to match the adjacent construction, including painting or other finishes.
Clean up and remove dirt and debris.

Make additional required openings by drilling or cutting. Use of jackhammer is prohibited.

Fill holes that are cut oversize so that a tight fit is obtained around the objects passing through.
In rated construction, comply with Division 07, Thermal and Moisture Protection.

Obtain Architect's permission and direction prior to piercing beams or columns.

Where alterations disturb lawns, paving, walks, and other permanent site improvements, repair and refinish surfaces to condition existing prior to commencement of work.

PROTECTION OF WORK

Protect telecommunication work and equipment installed under this Division against damage by other trades, weather conditions, or other causes.
Equipment found damaged or in other than new condition will be rejected as defective.

Keep equipment, panels, outlets, and related telecommunication equipment covered or closed to exclude dust, dirt, and splashes of plaster, cement, paint, or other construction material spray.
Equipment not free of contamination is not acceptable.

Provide enclosures and trims in new condition, free of rust, scratches, and other finish defects.
If damaged, properly refinish in a manner acceptable to the Architect.

COMPLETION AND TESTING

General:
Comply with Division 01, General Requirements.

Upon completion, test systems to show that installed equipment operates as designed and specified, free of faults.
Schedule system tests so that several occur on the same day.
Coordinate testing schedule with construction phasing.
Submit systems test reports for Design Team review and feedback.
Schedule proof-of-performance testing with Design Team representative and/or Owner's representative.

A qualified Contractor with required tools to conduct cable and equipment tests. Arrange to have the equipment factory representative present for those tests where the manufacturer' s warranty could be impacted by the absence of a factory representative.

Perform tests per the requirements of each of the following systems:
Horizontal data/voice structured cabling system.
Backbone data/voice cabling system.
Audio/video systems.

Software and Programming
Software, firmware, web-based GUI, and other systems with username and login credentials given unique passwords from the factory defaults.
Maintaining factory default credentials is not acceptable.
Document username/passwords for equipment in the as-built/O&M manuals.

Provide a written record of final performance tests after final proof-of-performance review and acceptance, and submit with operation and maintenance data.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Conductors.

Grounding Busbars.

Compression Lugs.

Taps

Work Covered by this section consists of furnishing and installing equipment, suppies, labor, materials, and testing fora complete and working system.

RELATED REQUIREMENTS

Division 01, General Requirements.

Division 26, Electrical.

Division 27, Communications.

Division 28, Electronic Safety and Security.

DEFINITIONS

Backbone: A facility (e.g., pathway, cable, or conductors) between telecommunications rooms or floor distribution terminals, entrance facilities, and equipment rooms within or between buildings.

Backbone Bonding Conductor (BBC): When there are multiple TBBs, the BBC is employed to interconnect them through the associated busbars, either on the same floor in a multi-story building or in the same general area of a single-story building. Previously referred to as a Grounding Equalizer (GE).

Bonding: The permanent joining of metallic parts to form an electrically conductive path that will assure electrical continuity and the capacity to safely conduct current likely to be imposed.

Common Bonding Network (CBN): The set of metallic components that are interconnected to form the principal means for effectively bonding and grounding equipment inside a building to the electrode system.

EMI (Electromagnetic Interference): The interference in signal transmission or reception resulting from the radiation of electrical or magnetic fields.

Entrance Facility (telecommunications): An entrance to a building for both public and private network service cables (including antennas) including the entrance point at the building wall and continuing to the entrance room or space. Sometimes known as Main Point of Entry/Main Point of Presence (MPOE/MPOP).

Equipment Room (telecommunications):
A centralized space for telecommunications equipment that serves the occupants of the building.
An equipment room is considered distinct from a telecommunications room because of the nature or complexity of the equipment.
Sometimes known as Main Distribution Frame (MDF).

Exothermic Weld: A method of permanently bonding two metals together by a controlled heat reaction resulting in a molecular bond.

Ground: A conducting connection, whether intentional or incidental, between an electrical circuit or equipment and the earth or to some conducting body that serves in place of the earth.

Telecommunications Bonding Conductor (TBC): The conductor used to connect the grounding electrode to the Primary Bonding Busbar.

Mesh Bonding Network (Mesh-BN): A bonding network to which associated equipment (e.g., cabinets, frames, racks, trays, pathways) are connected using a bonding grid, which is connected to multiple points on the common bonding network.

Primary Bonding Busbar (PBB): A busbar placed in a convenient and accessible location and bonded, by means of the telecommunications bonding conductor (TBC), to the building service grounding electrode. Previously referred to as Telecommunications Main Grounding Busbar (TMGB)

Primary Protector: A surge protection device placed on telecommunications entrance.

Rack Bonding Conductor (RBC): A bonding conductor used to connect the rack/cabinet directly to the PBB/SBB/Mesh.

Rack Bonding Busbar (RBB): A common point of connection for telecommunication equipment bonding to ground, located in an equipment rack/enclosure

Secondary Bonding Busbar (SBB):
The interface to the building telecommunications bonding system generally located in a telecommunications room(s).
A common point of connection for telecommunications system and equipment bonding to ground, located in the telecommunications room(s) or equipment room.
Previously referred to as Telecommunications Ground Bar (TGB).

Telecommunications Bonding Backbone (TBB): A conductor that interconnects the primary bonding busbar (PBB) to the secondary bonding busbar (SBB).

Telecommunications Equipment Bonding Conductor (TEBC): A conductor that connects the primary bonding busbar (PBB) or secondary bonding busbar (SBB) to equipment racks or cabinets.

Telecommunications Room (TR): An enclosed space for housing telecommunications equipment, cable terminations, and cross-connect cabling that is the recognized location of the cross-connect between the backbone and the horizontal facilities. Sometimes known as Intermediate Distribution Frame (IDF).

Unit Bonding Conductor (UBC): A bonding conductor used to connect rack/cabinet mounted equipment unit to the grounding structure (i.e., conductor, busbar) utilized in that rack/cabinet.

REFERENCE STANDARDS

References, Codes and Standards as required by Section 27 05 00 - Common Work Results for Communications and Division 01, General Requirements.

SUBMITTALS AND CLOSE-OUT SUBMITTALS

Including, but not limited to: Product Data Sheets, Shop Drawings.

General: Submit in accordance with Section 27 05 00 - Common Work Results for Communications submittal requirements.

QUALITY ASSURANCE

Conform to the quality assurance requirements of Section 27 05 00 - Common Work Results for Communications and Division 01, General Requirements.

PART 2 PRODUCTS

CONDUCTORS

Manufacturers:
Cooper B-Line.
Erico.
Panduit.
Or approved equal.

Green insulated copper for use in conduits, raceways, and enclosures.

Rated to meet installed environment. Bare copper is not permitted for use in communications installations.

Jumpers: Compression ring terminal at both ends.

Size cables per table in PART 3, using field length measurements.

GROUNDING BUSBARS

Primary Bonding Busbar (PBB):
Manufacturers:
Panduit.
Hubbell.

Erico.
CPI.
Or approved equal.
Pre-drilled copper with holes to accommodate TIA compliant lugs.
1/4-inch thick by 4-inch wide with 34-inch length.
Sized for current applications and future growth.
Insulated from its support.
Maintain a 2-inch minimum clearance from wall.

Secondary Bonding Busbar (SBB):
Manufacturers:
Panduit.
Hubbell.
Erico.
CPI.
Or approved equal.
Pre-drilled copper with holes to accommodate TIA-607 compliant lugs.
1/4-inch thick by 4-inch wide with 18-inch length.
Sized for current applications and future growth.
Insulated from its support.
Maintain a 2-inch minimum clearance from wall.

Horizontal Cabinet or Equipment Rack Busbar – 19 inches and 23 inches :
Manufacturers:
Cooper B-Line.
Panduit.
Thomas & Betts.
Or approved equal.
Provide as shown on the contract documents or as directed by Owner.
Mounts to standard 19-inch or 24-inch Rack or Frame.
Capacity: Eight 6-32 tapped lug mounting holes and four 5/16-inch mounting holes.
Size and Material: 3/4-inch by 19-inch by 0.1875-inch – Copper.

COMPRESSION LUGS

Manufacturers:
Panduit.
CPI.
Hubbell.
Erico.
Or approved equal.

Provide Grounding conductor terminations (lugs), two-hole, TIA compliant long barrel with a minimum of two crimps.

UL and CSA listed.

Sized to fit bonding conductor

Compression type.

Two holes with various hole spacings to fit the busbar.

Have a traceable feature to ensure proper die size was used to make the crimp.

Crimped according to manufacturer’s recommendation.

TAPS

Manufacturers:
Thomas & Betts.
Burndy.
Or approved equal.

Connections made with irreversible compression connectors.

UL and CSA listed.

Sized to fit bonding conductor.

Have a traceable feature to ensure proper die size was used to make the crimp.

Requires a minimum of two crimps for C Tap and H Tap, 1 crimp for I-Beam and busbar Tap.

Crimp according to manufacturer's recommendation.

PART 3 EXECUTION

SUMMARY

Work covered by this Section consists of furnishing labor, equipment, supplies, materials, and testing (unless otherwise specified) for a complete grounding (earthing) and bonding system for the communications systems.

PRIMARY BONDING BUSBAR (PBB)

Installed to maintain clearances required by applicable codes.

Listed by a Nationally Recognized Testing Laboratory (NRTL).

Minimum of 36-inches from active electronics and panelboards.

Clean the busbar prior to fastening conductors to the busbar and apply an anti-oxidant to the contact area to control corrosion and reduce contact resistance.

Locate in telecommunication entrance facility or the first room/space where the communications cabling and conduits enter the building.

Have a mounting height adjusted to accommodate overhead or underfloor cable routing.

Minimize the length of bonding conductor for telecommunications.

Provide for the shortest and straightest routing of the primary conductor.

Locate near backbone cabling and associated terminations.

Serve telecommunications equipment that is located within the same room or space.

Attachments to PBB:
Bonding Conductor: Refer to electrical drawings for tie-in to the building grounding system.
Primary Protector.
Building Steel.
Outside Plant Cables.
Backbone cables that incorporate a shield or metallic member.
Metallic pathways for telecommunications cabling located within the same room or space as the PBB.
Cable Tray.
Ladder Rack.
Conduit.
Telecommunications equipment located in the EF (e.g., multiplexer or optical fiber termination equipment).
Primary Protector Grounding Conductor: Minimum of 1-foot separation maintained between this insulated conductor and DC power cables, switchboard cable, or high frequency cables, even when placed in rigid metal conduit or EMT.
Telecommunication bonding backbone.
Telecommunication equipment bonding conductor.

SECONDARY BONDING BUSBAR (SBB)

Listed by a Nationally Recognized Testing Laboratory (NRTL).

Installed to maintain clearances required by applicable codes.

Maintain 36-inch separation from active electronics and panelboards.

Clean the busbar prior to fastening conductors to the busbar and apply an anti-oxidant to the contact area to control corrosion and reduce contact resistance.

SBB is the grounding connection point for telecommunications systems and equipment in the area served by that telecommunications room or equipment room.

Bond TBBs and other SBBs within the same space to the SBB with a conductor the same size as the TBB.

Bond where a Backbone Bonding Conductor (BBC) is required, to the SBB.

Attachments to SBB:
Building Steel.
Backbone cables that incorporates a shield or metallic member.
Metallic pathways for telecommunications cabling located within the same room or space as the SBB.
Cable Tray.
Ladder Rack.
Conduit.
Primary Protector Grounding Conductor: Minimum of 1-foot separation maintained between this insulated conductor and DC power cables, switchboard cable, or high frequency cables, even when placed in rigid metal conduit or EMT.
Telecommuting bonding backbone.

TELECOMMUNICATIONS BONDING BACKBONE (TBB)

The intended function of a TBB is to reduce or equalize potential differences between telecommunications systems.

TBB/BCC conductor size versus length:

TBB/BCC Linear Length	Conductor Size (AWG)
Less than 13-feet	6
14-20-feet	4
21-26-feet	3
27-33-feet	2
34-41-feet	1
42-52-feet	1/0
53-66-feet	2/0
67-84-feet	3/0
85-105-feet	4/0
106-125-feet	250 kcmil
126-150-feet	300 kcmil
151-175-feet	350 kcmil
176-250-feet	500 kcmil
251-300-feet	600 kcmil
Greater than 301-feet	750 kcmil

Connect to the PBB and SBB.

Size continuous copper conductor no less than 6 AWG to a maximum of 750 kcmil. Size in accordance to the conductor table, refer to Table 1.

Be consistent with the design of the telecommunications backbone cabling system.

Install and protect from physical and mechanical damage.

Install TBB conductors without splices:
Where splices are necessary, the number of splices should be a minimum and accessible and located in telecommunications spaces.
Connect joined segments using exothermic welding, irreversible compression-type connectors, or equivalent.

Permit multiple TBBs as dictated by the building size.

Do not use metallic cable shield.

When structural metal is bonded to the building's grounding electrode system it may be used in place of a TBB, a BCC or both. Before utilizing structural metal in place of a TBB or a BCC, review building plans (including record drawings as applicable) and specifications to ensure the structural metal is electrically continuous or can be made so.

BACKBONE BONDING CONDUCTOR (BBC):

Continuous copper conductor that should be sized no less than 6 AWG to a maximum of 750 kcmil. BBC, as a minimum, the same size as the largest TBB to which it is connected.

Connect the telecommunications grounding busbar(s) in the same-floor telecommunications rooms on the first, top, and every third floor in a multi-story building.

Cable shields do not satisfy requirements

TELECOMMUNICATIONS EQUIPMENT BONDING CONDUCTOR (TEBC)

Connects the PBB/SBB to equipment racks/cabinets

Continuous copper conductor sized per length of cable.

Sparate from ferrous materials by 2-inches or be bonded to the ferrous metal.

Route within cable trays or suspended 2-inches under or off the side of the cable tray or ladder rack.

Support every 3-feet.

8-inch bend radius with no less than a 90-degree bend.

May come in contact with other cable groups at a 90 degree angle only.

Cable shields do not satisy the requirement.

There may be more than one TEBC within each telecommunication room.

RACK BONDING CONDUCTOR (RBC)

Use a bonding conductor to connect the rack/cabinet directly to the PBB/SBB.

Bond metallic enclosures, including telecommunications cabinets and rack to the SBB, or PBB using a minimum sized conductor of 6 AWG.

Remove paint, oxidation, etc., from the surfaces that are being bonded.

Do not bond cabinets, racks, and other enclosures in telecommunication rooms in series. Each to have their own dedicated bonding conductor to SBB, or PBB.

ELECTRICAL DISTRIBUTION PANEL (EDP)

When located in the same room as the PBB/SBB, bond the EDP's Alternating Current Equipment Grounding (ACEG) bus (when equipped) or the enclosure to the PBB/SBB.

Using a bonding conductor for telecommunications (BCT) minimum 6 AWG to a maximum of 750 kcmil depending on the length of cable required.

Utilize the shortest, straightest route possible.

Use same size bonding conductor as TBB.

Make connections within and AC electrical panel by a qualified electrician.

CONDUCTIVE FIBER OPTIC CABLES

Bond and ground metallic components of a conductive cable that are capable of transmitting current.

LADDER RACK AND/OR CABLE TRAY

To achieve the objective of potential equalization in the TR, cable runway sections are bonded together and bonded back to the PBB/SBB.

Maintain an 8-inch bend radius on the TEBC.

Keep a 2-inch separation from other cable, power, and telecommunications.

Remove paint, oxidation, etc., from the runway surfaces that are being bonded.

Drill holes as required to accomodate the two-hole compression lug.

Apply a thin coat of antioxidant around the holes and on the surface where the lug will be in contact.

Attach straps to the runway using stainless steel hardware sized for the lug hole.

Tighten the hardware.

Wipe of excess antioxidant after installation of the lug.

LABELING

The format for the telecommunications main grounding busbar, TR-PBB, where the format for the SBBs, TR-SBB.
TR identifier is the room number for the space containing the busbar.
PBB is the portion of an identifier designating a telecommunications main grounding busbar.
SBB is the portion of the identifier designating a telecommnications grounding busbar.

Assign each telecommunications space or room an identifier unique withing the the building. Label TS with the TS identifier inside the room to be visible to someone working in that room. Use the FS format for the TS identifier.

Label should be visible and legible.

TESTING

Earth Ground Resistance Tester:
The earth ground resistance tester generates a specific test current, this current is less susceptible to the influences of stray currents on the grounding system.
This makes the ground resistance tester a more accurate testing device than a standard Volt-Ohm-multimeter.

Two-point ground continuity testing: Maximum value 100 milliohms.

Follow manufcaturers instructions on setup and how to perform the test.

Care should be taken and safety precautions in place.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES:

Conduit and other Closed Pathway System(s).

Pathway Bend Management.

Wide Base Cable Supports.

Cable Tray – General.

Cable Tray – Robust with Side Rails.

Cable Tray – Cable Runways (Ladder Type).

Cable Tray – Wire Basket.

Cable Tray – Accessories.

Device Backboxes.

Enclosures and Pullboxes.

Floor Boxes.

Flat Panel Display Wall Boxes.

Fire Rated Pathways.

Acoustically Separated Pathways.

Cable Straps.

Handholes and boxes for exterior underground cabling.

Work covered by this section consists of furnishing and installing equipment, supplies, labor, materials and testing for a complete and working system.

RELATED REQUIREMENTS

Division 01, General Requirements.

Division 26, Electrical.

Division 27, Communications.

Division 28, Electronic Safety and Security.

REFERENCE STANDARDS

References, Codes, and Standards as required by Section 27 05 00 - Common Work Results for Communications and Division 01, General Requirements.

In addition, meet the latest adopted revision of the following codes and standards:
ANSI/TIA-569 - Telecommunications Pathways and Spaces
Underwriters Laboratories, Inc. (Current Edition):
UL 1 - Flexible Metal Conduit
UL 5 - Surface Metal Raceways and Fittings
UL 6 - Electrical Rigid Metal Conduit-Steel
UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations
UL 360 - Liquid-Tight Flexible Steel Conduit
UL 467 - Grounding and Bonding Equipment
UL 514A - Metallic Outlet Boxes
UL 514B - Conduit, Tubing, and Cable Fittings
UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL 651A - Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit
UL 797 - Electrical Metallic Tubing-Steel
UL 1242 - Electrical Intermediate Metal Conduit-Steel
UL 1684 - Fiberglass Conduit Above Ground.
National Electrical Manufacturers Association (Current Edition):

NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
NEMA FB 1 - Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable.

SUBMITTALS AND CLOSEOUT SUBMITTALS

Including, but not limited to: Product Data Sheets, Shop Drawings, etc.

General:
Submit in accordance with Section 27 05 00 - Common Work Results for Communications submittal requirements.

Additional requirements specific to this Section:
Firestop design basis documentation for each type of communication penetration:
The type of building construction being penetrated (including the hourly resistance rating of floor, wall, or other partition of building construction into which firestop design will be installed) and firestop device or system proposed for use.
Plan view and elevations of raceways (conduits, cable trays, ladder racks, floor ducts, junction boxes, pull boxes, splice boxes, manholes, and associated supports).
Vertical and horizontal offsets and transitions.
Clearances for access above and to side of cable trays.
Vertical elevation of cable trays above the floor or bottom of ceiling structure.

QUALITY ASSURANCE

Conform to the quality assurance requirements of Section 27 05 00 - Common Work Results for Communications and Division 01, General Requirements.

Low voltage system cable supports and accessories must:
Be listed with the Underwriter's Laboratory or other nationally recognized testing laboratory. Non-listed equipment must be approved by engineer prior to installation.
Be stamped with the manufacturer’s name and part number for identification.

COORDINATION

Coordinate the arrangement, mounting, and support for communications support equipment with other trades.

Coordinate layout and installation of low voltage cable bundle supports with other construction elements to ensure adequate headroom, working clearance, and access. Revise locations and elevations for those indicated as required to suit field conditions and as approved by Owner's Representative.

Examine Drawings and existing conditions above ceilings and include additional supports in bid price to avoid ducts, pipes, conduits, etc. Installation in existing ceilings can be very difficult. Include extra labor time involved in bid price.

PART 2 PRODUCTS

CONDUIT AND OTHER CLOSED PATHWAY SYSTEM(S)

Manufacturers:
Conduit:
Allied.
Prime.
Wheatland.
Or approved equal.
Conduit Supports:
Allied.
Prime.
Wheatland.
Or approved equal.

Flexible Metallic Conduit is not permitted in this project for interior installation.

Material types:
Fiberglass.

Electrical Metallic Tubing.
Rigid Galvanized Steel.
Flexible Non-Metallic Conduit.

Conduit Supports:
Individual Conduit Hangers: Designed for the purpose, having a preassembled closure bolt and nut, and provisions for receiving a hanger rod.

PATHWAY BEND MANAGEMENT

Manufacturers:
Panduit Conduit Waterfall.
Bejed Cable Spillway.
STI Radius Control Modules.
Legrand.
Or approved equal.

Devices to control the bend radius must comply with National Electrical Code requirements and TIA Standards. In addition, the product must be RoHS compliant to meet environmental requirements, UL 94V-0 approved to reduce the spread of flame, and be approved by UL for use in air handling spaces.

UL Listed.

Provide at horizontal 4-inch conduits.

Provide at cable tray above equipment racks.

WIDE BASE CABLE SUPPORTS

Manufacturers:
ERICO Caddy CableCat Series.
Garvin.
ICC.
Or approved equal.

Wide base J-hooks complying with most current revision of the TIA 568 and 569 structured cabling system requirements.

Minimum size is 1-5/16-inch diameter loop for 50, 4-pair UTP or 2 strand fiber optic cable or inner duct. Provide larger size or multiple hooks where required.

Minimum 1-inch width and flared edges where cables enter and leave support.
1.3-inch diameter loop for maximum 35, 4-pair UTP.
2-inch diameter loop for maximum 50, 4-pair UTP.

Accessories:
Provide applicable accessories to independently support J-hooks from structure.
Include extender bracket for mounting multiple J-hooks on a single support, fasteners, and clamps for connecting to wall, beams, rods, dedicated support wires and C and Z Purlins as required for specific construction.

Provide cable retainers at each J-hook.

Refer to cable bundling instructions specified herein.

Finish:
Dry Locations, Above Lay-in Ceiling, Below Raised Floor – galvanized.
Wet and Damp Locations: Stainless steel.

CABLE TRAYS – GENERAL

Manufacturers:
Cooper B-Line.
PW Industries.
Chatsworth Products (CPI).
Hoffman.
Cablofil/Legrand.

WBT.
Or approved equal.

Cable Trays and Accessories:
Identified as defined in NFPA 70 and marked for intended location, application, and grounding.
Obtain cable trays and components from single manufacturer.

Sizes and Configurations: Refer to the Drawings for specific requirements for types, materials, sizes, and configurations.

Structural Performance:
Refer to manufacturer data for individual cable tray types for specific values for the following parameters:
Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
Concentrated Load: A load applied at midpoint of span and centerline of tray.
Load and Safety Factors: Applicable to both side rails and rung capacities.
Seismic Performance:
Cable trays and supports able to withstand the effects of earthquake motions determined according to ASCE/SEI 7.
Cable trays will remain in place without separation of parts when subjected to the seismic forces specified.
Component Importance Factor: 1.0.

CABLE TRAY – ROBUST WITH SIDE RAILS

Manufacturers:
Cooper B-Line.
PW Industries.
Or approved equal.

Steel or aluminum construction.

Rung Spacing: 9-inches on center.

No portion of the rungs protrude below the bottom plane of side rails.

Straight Section Lengths: 10 feet except where shorter lengths are required to facilitate tray assembly.

Width and Height: As indicated on Drawings.

Splicing Assemblies: Bolted type using serrated flange locknuts.

Splice Plate Capacity: Splices located within support span not to diminish rated loading capacity of cable tray.

Color: Black, U.O.N.

CABLE TRAY – CABLE RUNWAYS (LADDER TYPE)

Manufacturers:
Chatsworth Products (CPI).
B-Line Cooper, Inc.
Hoffman.
Cablofil/Legrand.
Or approved equal.

Ladder rack manufactured from tubular steel. Stringers (sides) will be made from 3/8-inch wide by 1-1/2-inch high tubular steel with 0.065-inch wall thickness. Cross members (rungs) will be made from 1-inch wide by 1/2-inch high tubular steel with 0.065-inch wall thickness.

Rung Spacing: 9-inches on center.

No portion of the rungs protrude below the bottom plane of side rails.

Straight Section Lengths:10 feet except where shorter lengths are required to facilitate tray assembly.

Width: As indicated on Drawings.

Splicing Assemblies: Bolted type using serrated flange locknuts.

Splice Plate Capacity: Splices located within support span not to diminish rated loading capacity of cable tray.

Color: Black, U.O.N.

CABLE TRAY – WIRE BASKET

Manufacturers:
Cablofil/Legrand.
Chatsworth Products (CPI).
B-Line Cooper, Inc.
Hoffman.
WBT.
Or approved equal.

Configuration:
Wires are formed into a standard 2-inch by 4-inch wire mesh pattern with intersecting wires welded together.
Mesh sections must have at least one bottom longitudinal wire along entire length of section.

Materials: High-strength-steel longitudinal wires with no bends.

Safety Provisions: Wire ends along wire-basket sides (flanges) rounded during manufacturing to maintain integrity of cables and installer safety.

UL Classified as an equipment ground conductor.

Straight Section Lengths: 10 feet except where shorter lengths are required to facilitate tray assembly.

Width: As indicated on Drawings.

Maximum Loads: 50 pounds per foot (74 kg/m).

Connector Assemblies:
Bolt welded to plate shaped to fit around adjoining tray wires and mating plate.
Mechanically joins adjacent tray wires to splice sections together or to create horizontal fittings.

Connector Assembly Capacity: Splices located within support span not to diminish rated loading capacity of cable tray.

Hardware and Fasteners: Zinc-plated according to ASTM B 633.

CABLE TRAY – ACCESSORIES

Compatible w/ submitted tray manufacturer.

Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

Barrier Strips: Same materials and finishes as cable tray.

Cable tray supports and connectors, including bonding jumpers, 90 bends, and radius drop-outs as recommended by cable tray manufacturer.

DEVICE BACKBOXES

Manufacturers:
RACO
Steel City.
Bowers.
Or approved equal.

Flush mounted, sheet steel construction with conduit knockout.

UL514A Listed.

Unless otherwise noted, provide:
4-11/16-inch square, 2-1/8-inch deep backbox standard for Communications and Audio-Video devices.
4-inch square, 2-1/8-inch deep backbox standard for Electronic Security devices.
Code minimum rated for the installed application.

Gang mud rings sizes as required for the applicable device.

ENCLOSURES AND PULLBOXES

Manufacturers:
Hoffman.
Cooper B-line.
Or approved equal.

FLOOR BOXES

Manufacturers:
Floor Box Type FB1:
Wiremold CRFB4 with Evolution Series Poke Thru Cover and device plate inserts as required to meet specified configurations.
Hubbell.
Or approved equal.
Floor Box Type FB2:

Floor Box Type FB1:
Floor box system must be reconfigurable after installed inside the floor.
Combination floor box to accommodate multi-trade services.
Multiple standard gang compartments separated by voltage barriers that can accommodate standard faceplate mounting brackets.
Device faceplates recessed below floor, not flush with floor.
Minimum knockouts: 3/4-inch, 1-inch, and 1-1/4-inch.
Full access cover with hinged flip-lid for cable pass-through. Finish and flange depth per Architect; floor boxes to be completely flush in closed position. Confirm final cover selection with Architect.
Nominal depth: 3-1/2-inches.
Suitable for installation within floor types as shown in the Drawings.
UL listed to match fire-rating of floor.
Gang/service configuration:

Floor Box Type FB2:
Floor box system must be reconfigurable after installed inside the floor.
Combination floor box to accommodate multi-trade services.
Multiple standard gang compartments separated by voltage barriers that can accommodate standard faceplate mounting brackets.
Device faceplates recessed below floor, not flush with floor.
Minimum knockouts: 3/4-inch, 1-inch, and 1-1/4-inch.
Full access cover with hinged flip-lid for cable pass-through. Finish and flange depth per Architect; floor boxes to be completely flush in closed position. Confirm final cover selection with Architect.
Minimum depth: 6 inches.
Suitable for installation within floor types as shown in the Drawings.
UL listed to match fire-rating of floor.
Gang/service configuration:

FLAT PANEL DISPLAY WALL BOXES

Manufacturers:
Wall Box Type WB1:
Basis of Design: FSR PWB-200 series with device plate inserts as required to meet specified configurations.
Wiremold.
Peerless.
Or approved equal.
Wall Box Type WB2:
Basis of Design: FSR PWB-200 series with device plate inserts as required to meet specified configurations.
Wiremold.

Peerless.
Or approved equal.

Wall Box Type WB1:
Combination wall box to accommodate multi-trade services.
Multiple compartments separated by voltage barriers that can accommodate either standard faceplate mounting brackets or manufacturer's device inserts.
Device faceplates recessed behind wall, not flush with wall.
Minimum knockouts: 3/4-inch and 1-inch.
Full access cover with cable pass-through. Finish per Architect.
Suitable for installation within wall types as shown in the Drawings.
UL listed to match fire-rating of floor.
Gang/service configuration:

Wall Box Type WB2:
Combination wall box to accommodate multi-trade services.
Multiple compartments separated by voltage barriers that can accommodate either standard faceplate mounting brackets or manufacturer's device inserts.
Device faceplates recessed behind wall, not flush with wall.
Minimum knockouts: 3/4-inch and 1-inch.
Full access cover with cable pass-through. Finish per Architect.
Suitable for installation within wall types as shown in the Drawings.
UL listed.
Gang/service configuration:

FIRE RATED PATHWAYS

Manufacturers:
STI EZ-path.
3M.
Hilti Speed Sleeve.
Or approved equal.

Self-closing through wall penetrations for cabling pathway, without the use of sealant, putty, foam pads, or other similar sealing means.

Meets hourly rating for the partition penetrated.

Accommodates frequent cable moves, adds, and changes.

Permits the allowable cable load to range from 0 to 100 percent visual fill.

Does not require additional action on the part of the installer to open or close the pathway device, such as, but not limited to:
Opening or closing of doors.
Twisting an inner liner.

Minimum STC rating empty or full: 45.

ACOUSTICALLY SEPARATED PATHWAYS

Manufacturers:
STI Acoustical Pathway.
Hilti Acoustic and Smoke Pathway.
Or approved equal.

Self-closing through wall penetrations for cabling pathway, without the use of sealant, putty, foam pads, or other similar sealing means.

Accommodates frequent cable moves, adds, and changes.

Permits the allowable cable load to range from 0 to 100 percent visual fill.

Does not require additional action on the part of the installer to open or close the pathway device, such as, but not limited to:
Opening or closing of doors.

Twisting an inner liner.

Minimum STC rating empty or full: 45.

CABLE STRAPS

Manufacturers:
Panduit.
Velcro.
Or approved equal.

The use of plastic tie wraps for this purpose is not acceptable.

Self-gripping, reusable, constructed of Velcro, and hook-and-loop style.

Plenum rated cable straps to be used in plenum air handling spaces.

Color: Black

PART 3 EXECUTION

SUMMARY

Work covered by this Section consists of furnishing labor, equipment, supplies, materials, and testing unless otherwise specified for a complete pathways system for the communications systems.

CONDUIT INSTALLATION

Penetrations:
Cutting or Holes:
In advance locate holes where they are proposed in the structural sections; such as ribs or beams. Obtain the approval of the structural engineer prior to drilling through structural sections.
Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted by the Owner's Information Technology as required by limited working space.
Fire Stop:
Where conduits, wire ways, and other communications raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop system that provides an effective barrier against the spread of fire, smoke, and gases as specified in Division 07, Thermal and Moisture Protection.
Completely fill and seal clearances between raceways and openings with the fire stop material.
Waterproofing: At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight as specified in Division 07, Thermal and Moisture Protection.

Conduit Size: In accordance with the NEC, but not less than 1-inch unless otherwise shown in the Contract Drawings.

Install in accordance with the construction documents, national codes, and applicable publications designated herein.

Install as recommended by the raceway manufacturer and construction documents.

Equip conduit ends with insulated bushing.

Provide pull-string in each conduit.

General installation of conduit:
In complete runs before pulling in cables or wires.
Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new undamaged material.
Assure conduit installation does not encroach into the ceiling height headroom, walkways, or doorways.
Cut square with a hacksaw, ream, remove burrs, and draw up tight.
Mechanically continuous.
Independently support conduit at 5-feet on center. No other supports allowed.
Support within 1-foot of changes of direction, and within 1-foot of each enclosure to which connected.
Close ends of empty conduit with plugs or caps at the rough-in stage to prevent entry of debris, until wires are pulled in.
Conduit installations under fume and vent hoods are prohibited.

Secure conduits to cabinets, junction boxes, pull boxes, and outlet boxes with bonding type locknuts.
Do not use aluminum conduits in wet locations.
Unless otherwise indicated on the drawings or specified herein, install conduits concealed within finished walls, floors, and ceilings.

Conduit Bends:
Make bends only with manufacturer approved tools or fittings.
Do not use standard conduit bending machines.
Conduit hickey benders may be used for slight offsets, and for straightening stubbed out conduits.
Bending of conduits with a pipe tee or vise is prohibited.

Layout and Homeruns:
Deviations: Make only where necessary to avoid interferences and only after Drawings showing the proposed deviations have been submitted approved by the Owner Information Technology Team.

CONCEALED WORK INSTALLATION

In Concrete:
Conduit: Rigid steel, IMC or EMT.
Do not install EMT in concrete slabs that are in contact with soil, gravel, or vapor barriers.
Install conduit through concrete beams only when the following occurs:
Where shown on the Structural Drawings.
As approved by the Designer prior to construction, and after submittal of Drawing showing location, size, and position of each penetration.
Installation of conduit in concrete that is less than 3 inches thick is prohibited.
Conduit outside diameter larger than 1/4 of the slab thickness is prohibited.
Space between conduits in slabs: Approximately six conduit diameters apart, except one conduit diameter at conduit crossings.
Install conduits approximately in the center of the slab so that there will be a minimum of 3/4-inch of concrete around the conduits.

Conduit for Division 27 cabling:
Different conduit types mixed indiscriminately in the same system is prohibited.

Align and run conduit parallel or perpendicular to the building lines.

Connect recessed lighting fixtures to conduit runs with maximum 6 feet of flexible metal conduit extending from a junction box to the fixture.

Tightening set screws with pliers is prohibited.

EXPOSED WORK INSTALLATION

Unless otherwise indicated on the Drawings, exposed conduit is only permitted in mechanical and electrical rooms.

Conduit for division 27 cabling:
Different conduit types mixed indiscriminately in the system is prohibited.

Align and run conduit parallel or perpendicular to the building lines.

Install horizontal runs close to the ceiling or beams and secure with conduit straps.

Support for horizontal or vertical runs at a maximum of 8-foot intervals.

Only use Surface Metal Raceways where shown.

Painting:

Paint exposed conduit as specified in Division 09, Finishes.
Refer to Division 09, Finishes for preparation, paint type, and exact color.
Paint legends, using 2-inch high black numerals and letters, showing the cable voltage rating.
Provide legends where conduits pass through walls and floors at a maximum of 20-foot intervals.

EXPANSION JOINTS

Conduits 3 inches and larger secured to the building structure on opposite sides of a building expansion joint, require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.

Provide conduits smaller than 3 inches with junction boxes on both sides of the expansion joint. Connect conduits to junction boxes with sufficient slack of flexible non-metallic conduit to produce 5-inch vertical drop midway between the ends.

Install expansion and deflection couplings at seismic and structural joints.

Seismic Areas:
In seismic areas, provide conduits rigidly secured to the building structure on opposite sides of a building expansion joint with junction boxes on both sides of the joint.
Connect conduits to junction boxes with 15 inches of slack flexible conduit.
Flexible Conduit: Copper green ground bonding jumper installed.

CONDUIT SUPPORTS, INSTALLATION

Safe working load not to exceed 1/4 of proof test load of fastening devices.

Use pipe straps or individual conduit hangers for supporting individual conduits. Maximum distance between supports is 8-foot on center.

Support multiple conduit runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and 200 pounds. Attach each conduit with U-bolts or other approved fasteners.

Support conduit independently of junction boxes, pull boxes, fixtures, suspended ceiling T-bars, angle supports, and similar items.

Fasteners and Supports in Solid Masonry and Concrete:
New Construction: Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
Existing Construction:
Steel expansion anchors not less than 1/4-inch bolt size and not less than 1-1/8-inch embedment.
Power set fasteners not less than 1/4-inch diameter with depth of penetration not less than 3 inches.
Use vibration and shock resistant anchors and fasteners for attaching to concrete ceilings.

Hollow Masonry:
Toggle bolts are permitted.

Bolts supported only by plaster or gypsum wallboard are not acceptable.

Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.

Attachment by wood plugs, raw plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.

Do not use chain, wire, or perforate strap to support or fasten conduit.

Spring steel type supports or fasteners are prohibited for uses except: horizontal and vertical supports/fasteners within walls.

Vertical Supports:
Vertical Conduit require riser clamps and supports in accordance with the NEC and as shown on Drawings.
Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

BOX INSTALLATION

Boxes for Concealed Conduits:
Flush mounted.
Provide raised covers for boxes to suit the wall or ceiling, construction, and finish.

Install additional boxes where needed to prevent damage to cables and wires during pulling in operations.

Remove only knockouts as required and plug unused openings.

Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.

Pull Boxes:
Provide enclosure and pull boxes as shown in the construction documents and as required by BICSI TDMM and NFPA 70.
Measure and provide additional conduit offsets required by Contractor not shown in Drawings with properly sized pull boxes.
Pull Box Sizing:

Minimum Trade Size Conduit	Width	Length	Depth	Each Additional Conduit Increase (Width)
3/4-inch	4-inch	12-inch	3-inch	2-inch
1-inch	4-inch	16-inch	3-inch	2-inch
1-1/4-inch	6-inch	20-inch	3-inch	3-inch
1-1/2-inch	8-inch	27-inch	4-inch	4-inch
2-inch	8-inch	36-inch	4-inch	5-inch
2-1/2-inch	10-inch	42-inch	5-inch	6-inch
3-inch	12-inch	48-inch	5-inch	8-inch
3-1/2-inch	12-inch	54-inch	6-inch	6-inch
4-inch	15-inch	60-inch	8-inch	8-inch

COMMUNICATION SYSTEM CONDUIT

Minimum conduit size of 1-inch, but not less than the size shown on the Drawings.

Equip conduit ends with insulated bushings.

4-inch conduits within buildings include pull boxes after every two 90 degree bends. Size boxes per the NEC.

Vertical conduits/sleeves through closets floors terminate not less than 3 inches below the floor and not less than 12inches below the ceiling of the floor below.

Terminate conduit runs to/from a backboard in a closet or interstitial space at the top or bottom of the backboard.

Conduits enter communication closets next to the wall and flush with the backboard.

Where drilling is necessary for vertical conduits, locate holes so as not to affect structural sections such as ribs or beams.

Seal empty conduits located in communication closets or on backboards with a standard non-hardening duct seal compound to prevent the entrance of moisture and gases and to meet fire resistance requirements.
Conduit runs contain no more than 2 quarter turns (90 degree bends) between pull boxes/backboards.
Minimum radius of communication conduit bends as follows (special long radius):

Sizes of Conduit Trade Size	Radius of Conduit Bends
3/4	6-inches
1	6-inch
1-1/4	7-1/5-inch
1-1/2	9-inch
2	12-inch
2-1/2	25-inch
3	30-inch
3-1/2	36-inch
4	40-inch

CABLE TRAY INSTALLATION

Install cable trays according to NEMA VE 2-2000 and manufacturer recommendations.

Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

Install cable trays so that the tray is accessible from an 8-foot ladder for cable installation and splices are accessible for inspection and adjustment.

Remove burrs and sharp edges from cable trays.

Provide insulated bushings at exposed cut edges.

Fasten cable tray supports to building structure and install seismic restraints.

Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 pounds.

Comply with requirements in Division 26, Electrical.

Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

Support bus assembly to prevent twisting from eccentric loading.

Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

Locate and install supports according to NEMA VE 2. Do not install more than one cable tray splice between supports.

Make changes in direction and elevation using manufacturer's recommended fittings.

Make cable tray connections using manufacturer's recommended fittings.

Seal penetrations through fire and smoke barriers. Comply with requirements in Division 07, Thermal and Moisture Protection.

Install cable tray with enough workspace to permit access for installing cables.

Install warning signs in visible locations on or near cable trays after cable tray installation.

Provide Radius Tray drop-out at drop locations that exceed a 6-inch drop.

Provide Cable Tray Sleeves where the cable tray penetrates a wall.

Application, unless otherwise noted:
Robust with Side Rails: Located overhead within Telecommunications Rooms.
Wire-Basket Tray: Located between Telecommunications Rooms and work area outlets.
Ladder-Type Cable Runway: Vertical transitions within Telecommunications Rooms.

Cable Tray Radius Drops: Provide wherever cable is to drop from one section of cable tray to another lower section of cable tray or where cable is to drop from cable tray to equipment racks/frames.

Obtain cable trays and components from single manufacturer.

Sizes and Configurations: Refer to the Drawings for specific requirements for types, materials, sizes, and configurations.

CABLE TRAY GROUNDING

Ground cable trays per Section 27 05 26 - Grounding and Bonding for Communications Systems.

Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Division 26, Electrical.

Bond cable trays with communications cable together with splice plates listed for grounding purposes or with listed bonding jumpers.

Bond cable trays with control conductors together with splice plates listed for grounding purposes or with listed bonding jumpers.

Ground cable trays following the NFPA 70 table 392.7(B) for conductor sizes. Field modified cable trays conform to the minimum Metal Area Requirements as specified in Table 392.7(B) of NFPA 70.

Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, Size of Equipment Grounding Conductors.

Provide cable tray grounding kits across cable tray splices.

CABLE INSTALLATION

Install cables only when each cable tray run has been completed and inspected.

Fasten cables on vertical runs to cable trays every 18 inches, using specified hook and loop cable straps. Plastic wire-ties are not permitted for communications use.

Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure no more than 72 inches.

Pathway cabling fill to not exceed a maximum of 40 percent, or per manufacturer's recommendations.

Provide multiple support and pathway systems where required cable count exceeds 40 percent fill.

Unless otherwise noted, group cabling in separate supports and pathways by the following systems:
Voice and Data, Intercom and IP Video Surveillance Systems
Analog Video Surveillance and SMATV/CATV Systems
Access Control and Intrusion Systems
Audio-Visual Systems
Distributed Antenna Systems
Building Automation Systems
Lighting Control Systems
Motorized Shade Systems
Fire Alarm Systems

Install cabling in enclosed pathways (i.e. conduits) in garages, semi-enclosed areas and exterior areas. Open pathways (i.e. wide base cable supports, bridle rings, cable tray) are prohibited in these areas unless specifically shown in contract documents.

CABLE STRAPS

Provide hook and loop cables straps in telecommunications rooms and open cable pathways (cable tray). Provide for strapping groups of cables to raceway and for controlling/managing patch cables.

Quantity:
Provide in sufficient quantity to strap cable bundles at intervals specific to the type of cable bundle. For the purposes of determining the quantity of straps to provide, the number of cables in a cable bundle and the intervals at which straps applied are as follows:
Bundle size (use to determine strap quantity):
For Patch Cables: Maximum of 25 patch cables per cable bundle with straps applied at 1-foot intervals.
For horizontal cabling: Maximum of 25 station cables per cable bundle with straps applied at 3-foot intervals.
For Backbone Cables: Maximum of 4 backbone cables per cable bundle with straps applied at 3-foot intervals.

Bundling (use to determine strap quantity):
Bundle cables by application (patch, horizontal, backbone) and by cable type (Category X, MM Fiber, SM Fiber, etc.).
Do not intermix cable applications and types within a bundle.

CONNECTIONS

Connect pathways to cable trays according to requirements in NEMA VE 2-2000 and NEMA FG 1-1993 where applicable.

FIELD QUALITY CONTROL

Perform the following tests and inspections, with the assistance of a factory-authorized service representative if necessary:

After installing cable trays and after cabling has been energized, survey for compliance with requirements.

Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.

Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by physical barriers or are installed in separate cable trays. Barriers are required between different voltage types.

Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.

Remove dust deposits, industrial process materials, trash of description, and blockage of tray ventilation.

Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and re-torque in suspect areas.

Check for improperly sized or installed bonding jumpers.

Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.

Perform visual and mechanical checks for adequacy of cable tray grounding; verify that takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 Ohm.

Provide test and inspection reports.

PROTECTION

Protect installed cable trays and cables.

Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction.

Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.

Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION

PART 1 GENERAL

SECTION INCLUDES

Fire alarm system design and installation, including all components, wiring, and conduit.

Transmitters for communication with supervising station.

Circuits from protected premises to supervising station, including conduit.

Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

Maintenance of fire alarm system under contract for specified warranty period.

RELATED REQUIREMENTS

Section 07 84 00 - Firestopping: Materials and methods for work to be performed by this installer.

REFERENCE STANDARDS

36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

ADA Standards - 2010 ADA Standards for Accessible Design.

IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.

NFPA 70 - National Electrical Code.

NFPA 72 - National Fire Alarm and Signaling Code.

NFPA 101 - Life Safety Code.

CONTRACTOR DESIGN

The fire alarm system is Contractor designed and Contractor built.

Equipment shown on the contract drawings indicates the general nature of the fire alarm system and provides coordination with the architectural design, but does not show all the components required for a complete system. Provide a complete fire alarm and communications system as needed to meet applicable codes and requirements under this section.

Review various sets of drawings for initiating and notification devices, and add devices if needed to comply with the requirements of NFPA 72.

Raceway, routing, and wiring for field devices are not shown on the drawings except for a few specific design requirements.

The contractor-designed fire alarm system will be reviewed and approved by the authorities having jurisdiction.

The contractor's shop drawing will be the design documents for the fire alarm system installation. Any changes required during construction shall be addressed and updated on the contractors shop drawings.

The Contractor-designed shop drawings will be the record drawing set at the project completion. All changes implemented during construction shall be documented, updated, and submitted as the as-built record drawing set.

SUBMITTALS

See Section 28 05 00 - Common Work Results for Electronic Safety and Security, for submittal procedures.

Proposal Documents: Submit the following with cost/time proposal:
NFPA 72 "Record of Completion", filled out to the extent known at the time.
Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
Certification by Contractor that the system design will comply with Contract Documents.
Proposed maintenance contract.

Drawings must be prepared AutoCAD or equivalent.
Architect will provide floor plan drawings for Contractor's use; verify all dimensions on Architect-provided drawings.

Evidence of designer qualifications.

Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
Copy (if any) of list of data required by authority having jurisdiction.
NFPA 72 "Record of Completion", filled out to the extent known at the time.
Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
System zone boundaries and interfaces to fire safety systems.
Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
List of all devices on each signaling line circuit, with spare capacity indicated.
Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
Detailed drawing of graphic annunciator(s).
Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
Certification by Contractor that the system design complies with Contract Documents.
Do not show existing components to be removed.

Evidence of installer qualifications.

Evidence of instructor qualifications; training lesson plan outline.

Evidence of maintenance contractor qualifications, if different from installer.

Inspection and Test Reports:
Submit inspection and test plan prior to closeout demonstration.
Submit documentation of satisfactory inspections and tests.
Submit NFPA 72 "Inspection and Test Form," filled out.

Operating and Maintenance Data: See Section 01 78 00 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
Original copy of NFPA 72 with portions that are not relevant to this project neatly crossed out by hand; label with project name and date.
Complete set of specified design documents, as approved by authority having jurisdiction.
Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
Contact information for firm that will be providing contract maintenance and trouble call-back service.
List of recommended spare parts, tools, and instruments for testing.
Replacement parts list with current prices, and source of supply.
Detailed troubleshooting guide and large scale input/output matrix.
Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

Project Record Documents: See Section 01 78 00 for additional requirements; have one set available during closeout demonstration:
Complete set of floor plans showing actual installed locations of components, conduit, and zones.
"As installed" wiring and schematic diagrams, with final terminal identifications.
"As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

Closeout Documents:

Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
Certificate of Occupancy.
Maintenance contract.
Report on training results.

Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
See Section 01 60 00 - Product Requirements, for additional provisions.
Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
In addition to the items in quantities indicated in PART 2, furnish the following:
All tools, software, and documentation necessary to modify the fire alarm system using Owner's personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.
One copy, on CD-ROM, of all software not resident in read-only-memory.
Extra Fuses: Two for each installed fuse; store inside applicable control cabinet.
Printer Paper: ____.
Replacement Printer Ribbons: ____.

QUALITY ASSURANCE

Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to Owner upon completion.

Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
Installer Personnel: At least 2 years of experience installing fire alarm systems.
Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
Contract maintenance office located within 100 miles of project site.
Certified in the State in which the Project is located as fire alarm installer.

Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

SEQUENCE OF OPERATION

The system alarm operation subsequent to the alarm activation of manual station, automatic initiating device, or sprinkler flow/pressure switch is to be as follows:
Audible alarm indicating appliances sound a digitized tone until silenced by the alarm silence switch at the control panel.
Visual alarm indicating appliances (xenon strobes) display a continuous pattern until extinguished by the alarm silence switch.
Doors normally held open by door control devices release. Signal door lock systems to unlock.
A supervised signal notifies an approved central station to activate.
Combination fire/smoke dampers de-energizes to normally closed position.

Alarm activation of elevator lobby, hoistway, or machine room smoke or heat detector in addition to the operations listed above, cause the elevator cab to be recalled according to the following sequence:
If the alarmed detector is on another floor other than the preferred level of egress, recall elevator cab to the preferred level of egress.
If the alarmed detector is on the main egress level, the elevator cabs recalled to the predetermined alternate recall level as determined by the local authority having jurisdiction.
The activation of heat detector in an elevator hoistway or machine room automatically disconnect power to the elevator motor via base-mounted contacts activating the elevator feeder shunt-trip circuit breaker. Refer to drawings.

Control panel has a dedicated supervisory service indicator and a dedicated supervisory service acknowledge switch.

The activation of standpipe or sprinkler valve tamper switch activates the system supervisory service audible signal and illuminates the indicator at the control panel.
Activating the supervisory service acknowledge switch will silence the supervisory audible signal while maintaining the supervisory serviced LED on indicating the tamper contact is still in the off-normal state.
Restoring the valve to the normal position cause the supervisory service indicator to extinguish thus indicating restoration to normal position.

The activation of sprinkler pre-action system pressure or low air switch activate the system supervisory service audible signal and illuminate the indicator at the control panel.
Activating the supervisory service acknowledge switch will silence the supervisory audible signal while maintaining the supervisory service indicator on indicating the pressure/air contact is still in the off-normal state.
Restoring the air pressure to the normal causes the supervisory service indicator to extinguish thus indicating restoration to normal position.

Immediately display alarm and trouble conditions on the control panel front alphanumeric display and of remote annunciators. If more alarms or troubles are in the system the operator may scroll to display new alarms.

Alarm list key that will allow the operator to display alarms, troubles, and supervisory service conditions with the time of occurrence.

In normal operation, fire alarm system close combination fire/smoke dampers when corresponding fan system is OFF. Fire alarm system open combination fire/smoke dampers when corresponding fan system is ON.

WARRANTY

See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

MANUFACTURERS

Fire Alarm Control Units and Accessories:
Siemens Building Technologies, Inc.
Provide control units made by the same manufacturer.

Initiating Devices and Notification Appliances:
Siemens Building Technologies, Inc.
Same manufacturer as control units.
Provide initiating devices and notification appliances made by the same manufacturer, where possible.

Substitutions: See Section 01 60 00 - Product Requirements.
For other acceptable manufacturers of control units specified, submit product data showing equivalent features and compliance with Contract Documents.

For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with Contract Documents.

FIRE ALARM SYSTEM

Fire Alarm System: Provide a new automatic fire detection and alarm system:
Provide all components necessary, regardless of whether shown in Contract Documents or not.
Protected Premises: Entire building shown on drawings.
Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
ADA Standards.
The requirements of the State Fire Marshal.
The requirements of the local authority having jurisdiction .
Applicable local codes.
Contract Documents (drawings and specifications).
NFPA 101.
NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
Program notification zones and voice messages as directed by Owner.
Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
Fire Alarm Control Unit: New, located at .
Combined Systems: Do not combine fire alarm system with other non-fire systems.

Supervising Stations and Fire Department Connections:
Public Fire Department Notification: By on-premises supervising station.
On-Premises Supervising Station: None.
Remote Supervising Station: UL-listed central station under contract to facility.
Remote Supervising Station: Coordinate with Chemeketa Community College, responsible for _____.
Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.
Auxiliary Connection Type: Local energy.

Circuits:
Initiating Device Circuits (IDC): Class B, Style A.
Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
Signaling Line Circuits (SLC) Between Buildings: Class A, Style 2.
Notification Appliance Circuits (NAC): Class B, Style W.

Spare Capacity:
Initiating Device Circuits: Minimum 25 percent spare capacity.
Notification Appliance Circuits: Minimum 25 percent spare capacity.
Speaker Amplifiers: Minimum 25 percent spare capacity.
Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

Power Sources:
Primary: Dedicated branch circuits of the facility power distribution system.
Secondary: Storage batteries.
Capacity: Sufficient to operate entire system for period specified by NFPA 72.
Each Computer System: Provide uninterruptible power supply (UPS).

EXISTING COMPONENTS

Existing Fire Alarm System: Remove existing system completely after new system is fully operational and tested.

Clearly label components that are "Not In Service."

Remove unused existing components and materials from site and dispose of properly.

FIRE SAFETY SYSTEMS INTERFACES

Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
Sprinkler water control valves.
Dry-pipe sprinkler system pressure.
Dry-pipe sprinkler valve room low temperature.
Chute interlocks and controls.

Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
Sprinkler water flow.
Total flooding suppression system activation.
Duct smoke detectors.

Doors:
Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 08 71 00.
Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Section 08 71 00.
Overhead Coiling Fire Doors: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 08 33 23.

COMPONENTS

General:
Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

Master Control Unit: _____.

Initiating Devices:
Addressable Systems:
Addressable Devices: Individually identifiable by addressable fire alarm control unit.
Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
Smoke Detectors: _____.
Provide 1 extra.
Duct Smoke Detectors: _____.
Provide 1 extra.
Projected Beam Type Smoke Detector.

Notification Appliances:
Bells: _____.
Provide 1 extra.
Combination Horn/Strobes: _____.
Provide ___ extra.

Electromagnetic Door Holders.

Electronic Water Flow Bell.

Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.

Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.

Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.
Signaling Line Circuits: Provide surge protection at each point where circuit exits or enters a building, rated to protect applicable equipment.

Locks and Keys: Deliver keys to Owner.
Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type
Provide a different standard lock and key for each key operated alarm initiating device; provide 25 keys of each type.

Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
Frame: Stainless steel or aluminum with polycarbonate or glass cover.
Provide one for each control unit where operations are to be performed.
Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
Provide extra copy with operation and maintenance data submittal.

Storage Cabinet for Spare Parts and Tools: Steel with baked enamel finish, size appropriate to quantity of parts and tools.
Padlock eye and hasp for lock furnished by Owner.
Locate as directed by Owner.

PART 3 EXECUTION

INSTALLATION

Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

Obtain Owner's approval of locations of devices, before installation.

Install instruction cards and labels.

All components and devices shall be installed in an accessible and maintainable location.

LABELING

Label alarm initiating devices with 1/2-inch by 1-inch lamicoid nameplates, indicating control panel point designation. Locate nameplates in the vicinity of the device as approved by the Owner.

Provide Brady type wire markers to identify conductors at each junction or terminal. Use numbers indicated on the wiring diagrams.

INSPECTION AND TESTING FOR COMPLETION

Notify Owner 7 days prior to beginning completion inspections and tests.

Owner will provide the services of an independent fire alarm engineer or technician to observe all tests.

Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

Provide all tools, software, and supplies required to accomplish inspection and testing.

Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.

Record all system operations and malfunctions.
If a malfunction occurs, start diagnostic period over after correction of malfunction.
Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

OWNER PERSONNEL INSTRUCTION

Provide the following instruction to designated Owner personnel:
Hands-On Instruction: On-site, using operational system.
Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
Factory Instruction: At control unit manufacturer's training facility.

Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
Initial Training: 1 session pre-closeout.

Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
Initial Training: 1 session pre-closeout.

Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

Provide means of evaluation of trainees suitable to type of training given; report results to Owner.

CLOSEOUT

Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
Be prepared to conduct any of the required tests.
Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
Have authorized technical representative of control unit manufacturer present during demonstration.
Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
Repeat demonstration until successful.

Occupancy of the project will not occur prior to Substantial Completion.

Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
Specified diagnostic period without malfunction has been completed.
Approved operating and maintenance data has been delivered.
Spare parts, extra materials, and tools have been delivered.
All aspects of operation have been demonstrated to Owner.
Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
Occupancy permit has been granted.
Specified pre-closeout instruction is complete.

EXTRA STOCK/SPARE PARTS

Provide the following equipment to be turned over to the Owner with the operation and maintenance manuals.
Two photoelectric smoke detector heads.
One addressable dry contact modules.
Two horns.
Two horns/strobes.
One manual pull station.
One complete set of fuses to match panel counts.

END OF SECTION

PART 1 - GENERAL

SECTION INCLUDES
Chain link fencing and gates of zinc coated steel including hardware and gate operators.

QUALITY ASSURANCE
Manufacturer: Company specializing in commercial quality chain link fencing and accessories.

REFERENCES
Zinc coating of products fabricated from rolled, pressed, and forged steel shapes, plates, bars, and strips: ASTM A 123.
Installation of chain link fence: ASTM F 567
Hot-dipped zinc coated welded and seamless pipe: ASTM A 428.

PRODUCT DATA
Submit product data and manufacturer's installation instructions in accordance with Section 01 33 00.

DELIVERY, STORAGE, AND HANDLING
Protect against damage.
Store products above ground.

COORDINATION
Coordinate with other trades affecting and affected by work of this section.

PART 2 - PRODUCTS

MANUFACTURERS
Allied, Anchor Fence, US Steel, or accepted substitute.

MATERIALS
Framework: Galvanized steel pipe conforming to ASTM A 120, schedule 40, one piece, without joints.
Fabric: Galvanized steel wire fabric conforming to Fed. Spec. RR-F-191, type I.

CONCRETE MIX
As specified in Section 03 30 00.

COMPONENTS
Line Posts:
1.90 inch diameter steel pipe.
Corner and Terminal Posts:
2.88 inches diameter steel pipe.
Gate Posts:
3.50 inches diameter steel pipe.
Top Rail and Brace:
1.66 inch diameter steel pipe, plain end, sleeve coupled.
Gate Frame:
Cantilever type; 1.90 inch diameter steel pipe for welded fabrication. Provide braces and truss rods to prevent sagging.
Fabric:
2 inch diamond mesh steel wire, interwoven, 9 gauge, top selvage twisted tight, bottom end selvage knuckle end closed.
Caps:
Galvanized cast steel, sized to post dimension, set screw retained.
Fittings:
Galvanized steel sleeves, bands, clips, rail ends, tension bars, fasteners and fittings.
Tension Wire:
Single strand galvanized steel, 6 gauge.

Gate Hardware:
Galvanized steel roller guide assemblies, one-piece track and top rail, solid rubber tire double steel wheel carrier, latching hasp designed for use with a padlock, other hardware necessary for complete installation.

SITE OBSCURING SLATS
Type: Polyvinyl chloride (PVC) or polyethylene (PE), UV resistant, rectangular cross section, 95% obscuring or match existing.
Color: Integral color selected by Architect from manufacturer's standard color line.
Weave into and fasten securely to fence fabric.

PART 3 - EXECUTION

EXAMINATION
Verify that surfaces prepared by other trades are accurately graded, compacted, and otherwise properly prepared.
Prior to starting work, notify General Contractor of defects requiring correction.
Do not start work until conditions are satisfactory.

PREPARATION
If field measurements differ slightly from Drawing dimensions modify work as required for accurate fit.
If measurements differ substantially notify Architect prior to starting work.

INSTALLATION
General: Fence height as shown on Drawings.
Posts:
Space line posts at intervals not exceeding 10 feet, equally spaced over length of fence segment.
Set posts plumb in concrete footings with top of footings level with finish grade. Slope top for water runoff.
Provide top rail through line post tops and splice with 7 inch long rail sleeves.
Brace each gate and corner post back to adjacent line post with horizontal center brace and bottom brace rails.
Fabric:
Stretch fabric between terminal posts or at intervals of 100 feet maximum.
Position bottom of fabric 1 inch maximum above finish grade.
Fasten fabric to top rail, line posts, braces, and bottom tension wire with wire ties spaced at maximum 15 inches on center.
Attach fabric to end, corner and gate posts with tension bars and tension bar clips.
Accessories:
Install bottom tension wire stretched taut between terminal posts.
Gate:
Install gate with fabric to match fence.

PRODUCT CLEANING AND REPAIRING
Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this section. Remove debris from project site upon work completion or sooner, if directed.

PROTECTION
Carefully maintain bench marks, monuments, and other reference points.
If disturbed or destroyed, replace as directed.
Protect other work against damage and discoloration caused by work of this section.

END OF SECTION

CHEMEKETA COMMUNITY COLLEGE
YAMHILL VALLEY CAMPUS DHS TI

PROJECT DIRECTORY

OWNER:
CHEMEKETA COMMUNITY COLLEGE
PO BOX 14007
SALEM, OR 97309-7070
PHONE: 503-399-5157

ARCHITECT:
FACET ARCHITECTS
3095 RIVER ROAD N
SALEM, OREGON 97303
PHONE: (503) 390-0281

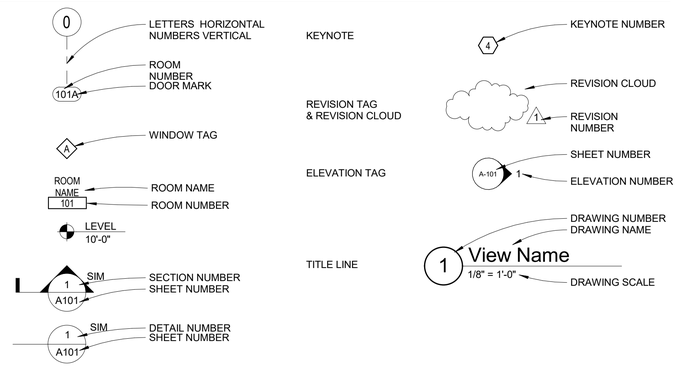
STRUCTURAL ENGINEER:
MSC ENGINEERS INC
3470 PIPENEDN PL NE, SUITE 120
SALEM, OREGON 97301
PHONE: (503) 581-0048

MEP ENGINEER:
PAE CONSULTING ENGINEERS INC
522 W 5TH AVE, SUITE 1500
PORTLAND, OREGON 97204
PHONE: (503) 226-2921

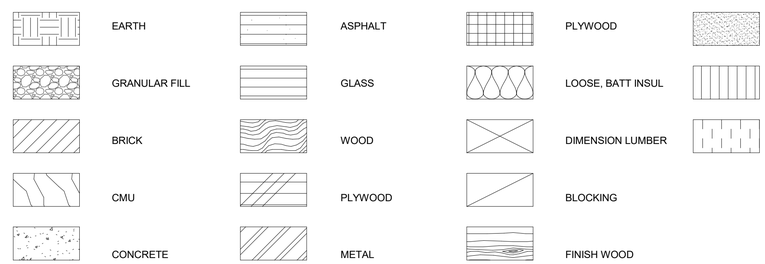
PHASING LEGEND

- EXISTING WALL TO REMAIN
- EXISTING WALL TO BE DEMOLISHED
- NEW WALL
- EXISTING DOOR TO REMAIN
- EXISTING DOOR AND FRAME TO BE DEMOLISHED
- NEW DOOR AND FRAME

SYMBOLS LEGEND



MATERIAL REFERENCE



CODE SUMMARY

GOVERNING BUILDING CODE: OSSC 2022 (IBC 2021)

THIS PROJECT COMPRISES A 35,000 SF INTERIOR REMODEL FOR A EXIST OFFICE TENANT INCLUDING NEW VESTIBUE, OPENINGS, AND FENCING.

ZONING CODE

PLANNING ZONE	C3- GENERAL COMMERCIAL

EXISTING USE AND OCCUPANCY TO REMAIN.
EXISTING PARKING TO BE REDUCED BY 8 SPACES. 4 ADA SPACES WILL BE RELOCATED TO BE CLOSER TO NEW ENTRY.

BUILDING CODE

OCCUPANCY GROUP	B
CONSTRUCTION TYPE	II-B
INTERIOR TI	FULLY FIRE SPRINKLERED
ALLOWABLE BUILDING AREA	
B OCC BASIC ALLOWABLE AREA	= 92,000 SF
TOTAL FIRST FLOOR ACTUAL AREA	= 77,007 SF
OCCUPANT LOAD - DHS TENANT	
BUSINESS AREAS (21227 SF/150)	= 142
CONCENTRATED (521 SF/7)	= 74
UNCONCENTRATED (2157 SF/15)	= 144
STORAGE AREAS (1133 SF/300)	= 4
TOTAL OCCUPANT LOAD:	= 364 OCC
MEANS OF EGRESS	
EXITS REQUIRED:	2
EXITS PROVIDED:	13
EXIT WIDTH REQUIRED: 0.2 x 364	= 72.8 IN
EXIT WIDTH PROVIDED: # EXITSxWIDTH	= 768.0 IN
PLUMBING FIXTURES	
OCCUPANCY GROUP B:	= 364 OCC
WATER CLOSETS REQUIRED:	9
WATER CLOSETS PROVIDED:	24.67
LAVATORIES REQUIRED:	6
LAVATORIES PROVIDED:	21

DEFERRED SUBMITTALS:
- WINDOW ENGINEERING
- SUSPENDED CEILING SEISMIC ANCHORAGE
- SEISMIC AND VIBRATION ENGINEERING FOR MECHANICAL SYSTEMS

ITEMS REQUIRING SEPARATE PERMITS - DESIGN-BUILD BY CONTRACTOR:
- FIRE ALARM DESIGN
- FIRE PROTECTION DESIGN/ SPRINKLERS
- FIRE PROTECTION EQUIPMENT AND PIPING SEISMIC ANCHORAGE
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KEY PLAN

ABBREVIATIONS

(REFER TO CONSUTANT DRAWINGS FOR ADDITIONAL ABBREVIATIONS)

AB	ANCHOR BOLT
ABBR	ABBREVIATION
ACST	ACOUSTIC
ADJ	ADJUSTABLE, ADJUST
AFF	ABOVE FINISHED FLOOR
ALUM	ALUMINUM
ANOD	ANODIZED
APPROX	APPROXIMATELY
ASPH	ASPHALT
BD	BOARD
BLDG	BUILDING
BLKG	BLOCKING
BM	BENCH MARK, BEAM
BOT	BOTTOM
BUR	BUILT-UP ROOFING
CAB	CABINET
CB	CATCH BASIN, CORNER BEAD
CG	CORNER GUARD
CHBD	CHALKBOARD
CI	CAST IRON
CJ	CONTROL JOINT
CLG	CEILING
CLR	CLEAR, CLEARANCE
CMU	CONCRETE MASONRY UNIT
COL	COLUMN
CONC	CONCRETE
CONSTR	CONSTRUCTION
CONT	CONTINUOUS, CONTINUE
CONTR	CONTRACTOR
CNTR	COUNTER
CRS	COURSE, COURSES
CSK	COUNTERSINK, COUNTERSUNK
CW	COLD WATER
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DIM	DIMENSION
DIV	DIVIDE, DIVIDED, DIVISION
DR	DOOR
DS	DOWNSPOUT
DTL	DETAIL
DWG	DRAWING
E	EAST
EA	EACH
EF	EXHAUST FAN
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRIC, ELECTRICAL
ELEV	ELEVATOR
ENCL	ENCLOSURE
EQ	EQUAL
EQUIP	EQUIPMENT
EW	EACH WAY
EXIST	EXISTING
EXP B	EXPANSION BOLT
EXT	EXTERIOR
FD	FLOOR DRAIN
FDTN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FH	FIRE HYDRANT
FHWS	FLATHEAD WOOD SCREW
FIN	FINISH, FINISHED
FIN FLR	FINISHED FLOOR
FL	FLOOR
FLASH	FLASHING
FTG	FOOTING
FOS	FACE OF STUD
GA	GAGE
GALV	GALVANIZED
GB	GRAB BAR
GL	GLASS
GLB	GLU-LAM BEAM
GYP BD	GYPSUM BOARD
HB	HOSE BIBB
HCP	HANDICAP, HOLLOW CORE
HDR	HEADER
HDW	HARDWARE
HC	HOLLOW CORE
HORIZ	HORIZONTAL
HS	HOLLOW STEEL, HIGH STRENGTH
HT	HEIGHT
HVAC	HEATING VENTILATING AIR CONDITIONING
HW	HOT WATER
INSUL	INSULATE, INSULATED, INSULATION
INT	INTERIOR
INV	INVERT
JAN	JANITOR
J-BOX	JUNCTION BOX
JST	JOIST
JT	JOINT
KD	KNOCKED DOWN
LAM	LAMINATE
LAV	LAVATORY
LS	LANDSCAPING
LT	LIGHT
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MECH	MECHANICAL
MFR	MANUFACTURER
MH	MANHOLE
MI	MIRROR
MIN	MINIMUM
MISC	MISCELLANEOUS
MO	MASONRY OPENING
MT	MOUNT
MTL	METAL
N	NORTH
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NO	NUMBER
NTS	NOT TO SCALE
OA	OVERALL OUTSIDE AIR
OBS	OBSCURE
OC	ON CENTER
OCEW	ON CENTER EACH WAY
OD	OUTSIDE DIAMETER
OFOI	OWNER FURNISHED-OWNER INSTALLED
OPP	OPPOSITE
PAF	POWDER ACUATED FASTNER
PBD	PARTICLE BOARD
PL	PROPERTY LINE, PLATE
PLAM	PLASTIC LAMINATE
PLBG	PLUMBING
PLYWD	PLYWOOD
PNL	PANEL
PR	PAIR
PRKG	PARKING
PTD	PAPER TOWEL DISPENSER
PTN	PARTITION
PT	POINT
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
QUAL	QUALITY
R	RADIUS, RISER
RC	RESILIENT CHANNEL
RD	ROOF DRAIN
RECEP	RECEPTACLE
REF	REFERENCE, REFRIGERATOR
REINF	REINFORCE, REINFORCEMENT
REQD	REQUIRED
REV	REVISION, REVISED
RHWS	ROUND HEAD WOOD SCREW
RM	ROOM
RO	ROUGH OPENING
ROW	RIGHT OF WAY
S	SOUTH
SC	SOLID CORE
SCR	SCREW
SD	SOAP DISPENSER, SMOKE DETECTOR, STORM DRAIN
SF	SQUARE FOOT
SHTHG	SHEATHING
SHT	SHEET
SIM	SIMILAR
SPEC	SPECIFICATION, SPECIFIED
SPKR	SPEAKER
SQ	SQUARE
SSK	SERVICE SINK
SST	STAINLESS STEEL
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRUC	STRUCTURE, STRUCTURAL
SUSP	SUSPENDED
T	TEMPERED, TREAD
TEL	TELEPHONE
T&G	TONGUE & GROOVE
THK	THICK, THICKNESS, THICKENED
TOC	TOP OF CURB
TPD	TOILET PAPER DISPENSER
TYP	TYPICAL
ULMT	UNDERLAYMENT
UON	UNLESS OTHERWISE NOTED
UR	URINAL
VCT	VINYL COMPOSITION TILE
VERT	VERTICAL
VNR	VENEER
VTR	VENT THROUGH ROOF
WAINS	WAINSCOT
W	WEST, WIDE, WIDTH
WC	WATER CLOSET
WD	WOOD
WDW	WINDOW
WH	WATER HEATER
W/O	WITHOUT
WP	WATERPROOFING
WT	WEIGHT
WWF	WELDED WIRE

SYMBOLS USED AS ABBREVIATIONS

@	AT
℄	CENTERLINE
°	DEGREE
±	PLUS/MINUS

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368 NE NORTON LN
MCMINNINVILLE, OR 97128

consultants:

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: MP
checked by: AF

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TITLE SHEET

sheet: G-001

of:

GENERAL NOTES

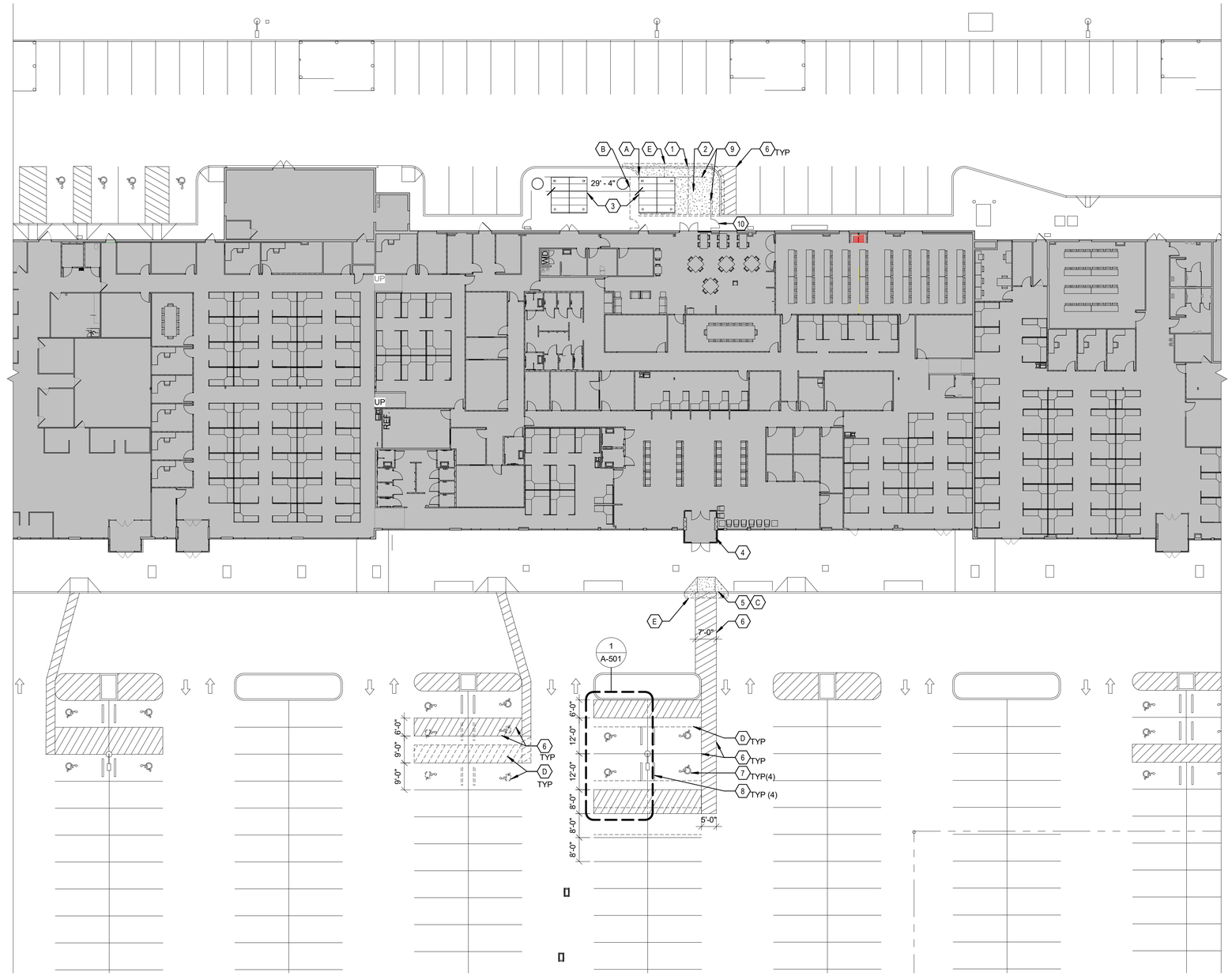
1. PATCH EXISTING AC PAVING WHERE AFFECTED BY NEW WORK. ALL EDGES TO BE CLEAN SAWCUTS.

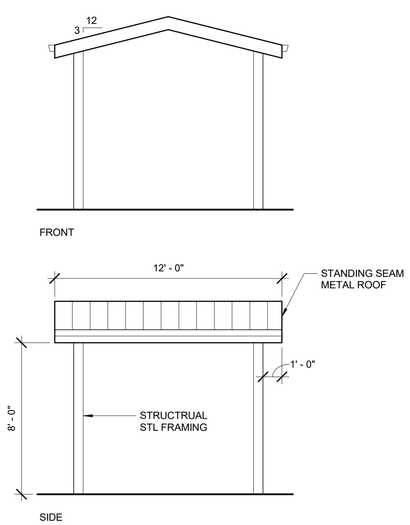
DEMOLITION NOTES

- (A) SAWCUT & REMOVE PORTION OF CURB AS REQ'D FOR NEW WORK
- (B) REMOVE PORTION OF FENCE AND GATE
- (C) SAWCUT & REMOVE PORTION OF EXIST CONC WALKWAY & CURB FOR NEW ACCESSIBLE RAMP
- (D) REMOVE EXIST STRIPING
- (E) SAWCUT & REMOVE PORTION OF AC PAVING

CONSTRUCTION NOTES - NEW WORK

- (1) NEW TYPE 'C' CONC CURB
- (2) NEW 4" CONC WALKWAY OVER 6" CRUSHED ROCK BASE
- (3) DESIGN-BUILD NON COMBUSTIBLE PERGOLA STRUCTURE - STRUCTURE AND FOUNDATION TO BE SEPARATE PERMIT. CONNECT DOWNSPOUTS TO EXIST STORM, PATCH/REPAIR CONC & ASPHALT AS REQD, SEE DTL 2/A-100
- (4) NEW BUILDING VESTIBULE
- (5) ADA CURB RAMP
- (6) 4" WIDE PAINTED STRIPE
- (7) PAINTED SYMBOL
- (8) WHEEL STOP
- (9) 6' H CHAIN LINK FENCING W/ PRIVACY SLATS. SEE DTLS X/A-XXX
- (10) 4' W CHAINLINK GATE W/ PRIVACY SLATS. SEE DTLS X/A-XXX





2 PERGOLA ELEVATIONS
1/4" = 1'-0"

SITE PLAN
1" = 20'-0"

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SITE PLAN

sheet: A-100

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GENERAL NOTES - CONSTRUCTION PHASING

THIS PROJECT IS TO BE COMPLETED IN TWO PHASES.

PHASE 1: DEMOLITION & CONSTRUCTION OF INTERIOR SPACE BETWEEN GRIDS 19 & 23. REMAINDER OF FLOOR AREA BETWEEN GRIDS 7 & 19 WILL REMAIN OCCUPIED. MAINTAIN ALL EGRESS PATHS & BLDG SYSTEMS FOR THIS AREA.

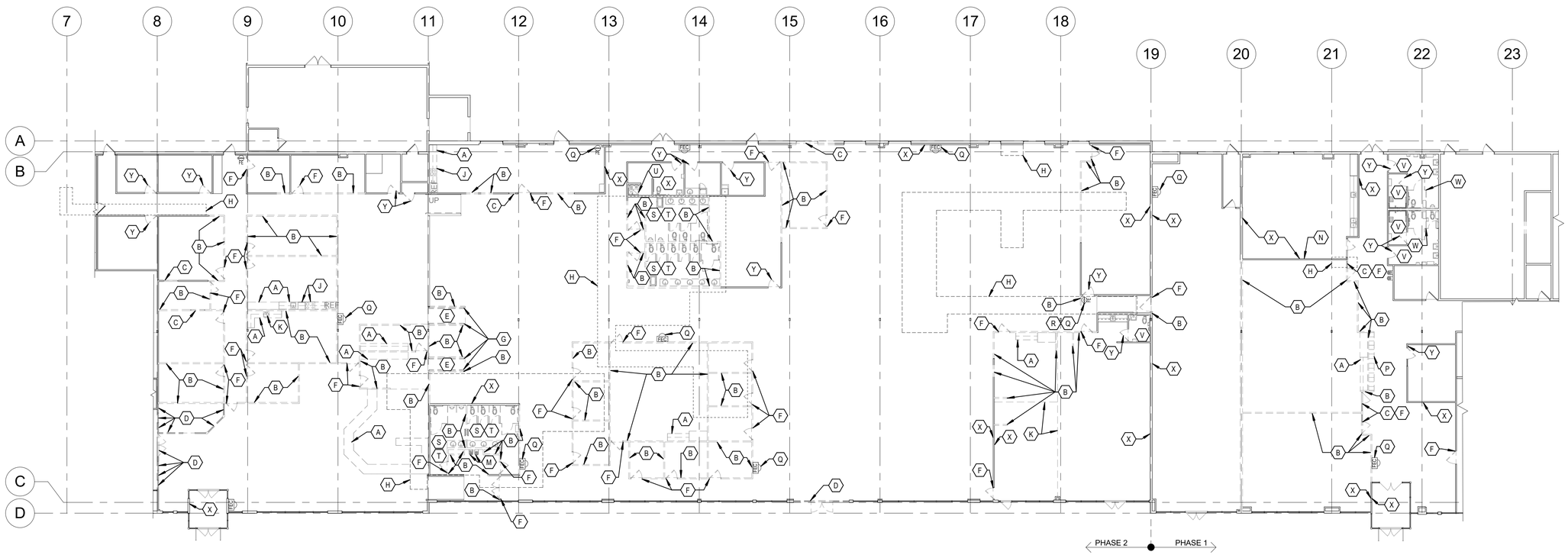
PHASE 2: DEMOLITION & CONSTRUCTION OF INTERIOR & EXTERIOR SPACE BETWEEN GRIDS 7 & 19, INCLUDING SITEWORK. FLOOR AREA BETWEEN GRIDS 19 & 23 WILL BE OCCUPIED. MAINTAIN ALL EGRESS PATHS AND BUILDING SYSTEMS FOR THIS AREA.

GENERAL NOTES - DEMOLITION

1. REMOVE ALL EXISTING FLOORING AND BASE UON.
2. AT REMAINING EXISTING DOORS, REMOVE DOOR HARDWARE AS IDENTIFIED IN DOOR SCHEDULE, PREP FOR NEW.
3. REMOVE ALL EXISTING WINDOW COVERINGS/VALANCES.
4. REMOVE ALL EXISTING PAPER TOWEL DISPENSERS, TISSUE DISPENSERS, AND CUP DISPENSERS WHERE CASEWORK IS REMOVED.
5. REMOVE ALL EXIST INTERIOR SIGNAGE & CORNER GUARDS.
6. REFER TO REFLECTED CEILING PLANS, PLUMBING, MECHANICAL, & ELECTRICAL DRAWINGS FOR ADDTIONAL DEMO WORK.
7. COORDINATE W/ OWNER FOR WORK IN NEIGHBORING TENANT SPACE.
8. EXISTING SLAB IS 5" UNREINFORCED CONCRETE.

CONSTRUCTION NOTES- DEMOLITION

- (A) REMOVE EXISTING CASEWORK, UPPERS AND LOWERS
- (B) REMOVE EXISTING WALL OR REMOVE PORTION OF WALL
- (C) REMOVE EXISTING WINDOWS/FRAME ASSEMBLY
- (D) REMOVE EXISTING PORTION OF STOREFRONT ASSEMBLY
- (E) REMOVE EXISTING RAMP, LEVEL TO LOWEST GRADE
- (F) REMOVE EXIST DOOR/FRAME ASSEMBLY
- (G) REMOVE EXIST HANDRAILS
- (H) SAWCUT & REMOVE CONC SLAB AS REQ'D FOR NEW WORK
- (J) REMOVE EXIST APPLIANCES, SALVAGE TO OWNER
- (K) REMOVE EXIST OPERABLE PARTITION ASSEMBLY
- (L) REMOVE EXIST TOILET ACCESSORIES
- (M) REMOVE DRINKING FOUNTAIN
- (N) REMOVE MIRRORS/ADHESIVE, ENTIRE WALL
- (P) REMOVE EXIST LOCKERS
- (Q) REMOVE EXIST FEC/FE & SALVAGE FOR REINSTALLATION
- (R) REMOVE FIRST AID KIT BOX & SALVAGE FOR REINSTALLATION
- (S) REMOVE ALL FIXTURES, TOILET PARTITIONS, TOILET ACCESSORIES AND CASEWORK.
- (T) REMOVE EXIST WALL TILE & SUBSTRATE
- (U) REMOVE FIBERGLASS SHOWER SURROUND. SALVAGE CURTAIN ROD & CURTAIN FOR REINSTALLATION.
- (V) REMOVE & REINSTALL TOILET ACCESSORIES FOR NEW WALL & FLOORING FINISHES.
- (W) REMOVE EXIST TOILET PARTITIONS
- (X) REMOVE PORTION OF GYP FOR NEW WORK. PATCH/REPAIR TO MATCH ADJ SURFACES
- (Y) REMOVE EXIST DOOR, EXIST FRAME TO REMAIN



DEMOLITION PLAN
1/16" = 1'-0"

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DEMOLITION FLOOR PLAN

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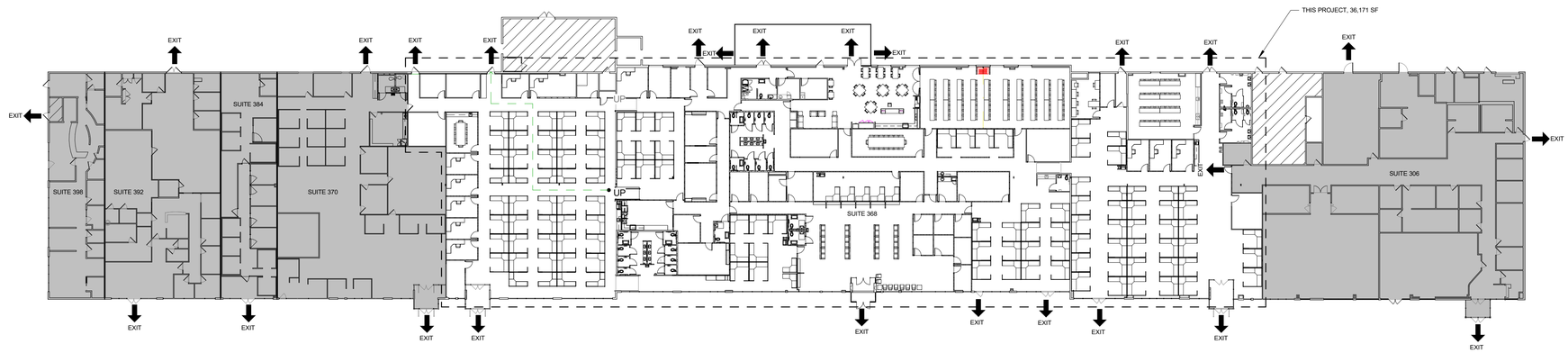
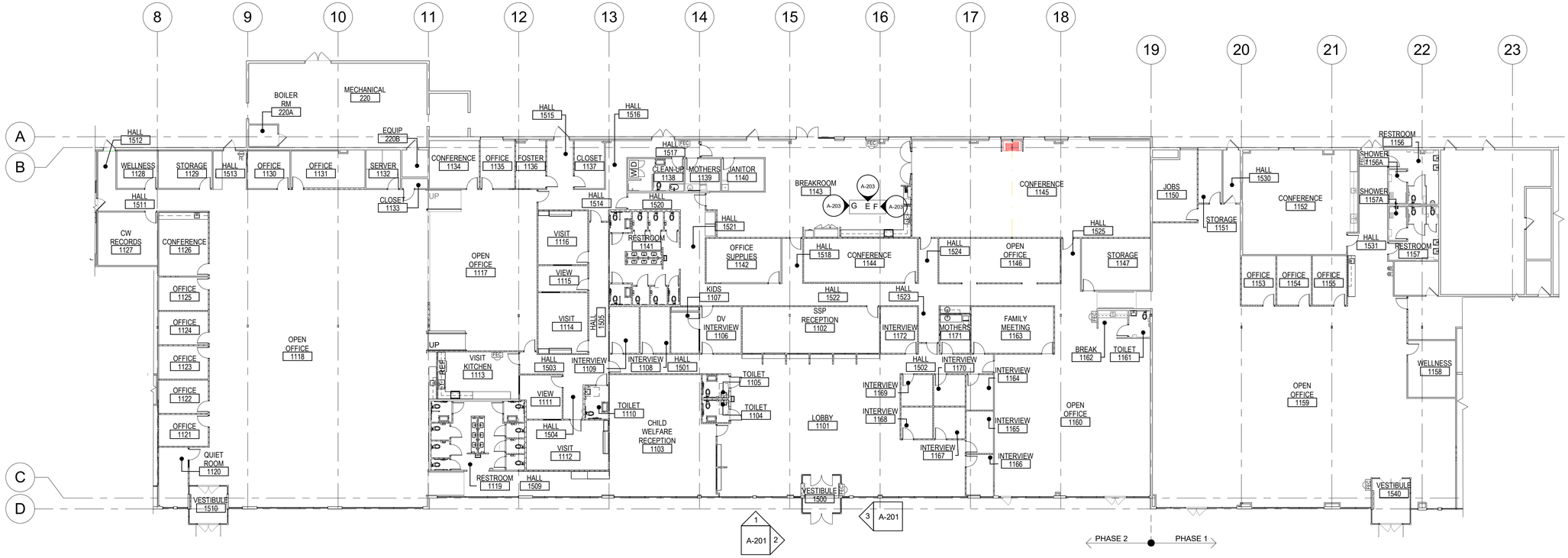


EGRESS PLAN
1" = 30'-0"



FLOOR PLAN - NEW WORK
1/16" = 1'-0"

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OVERALL FLOOR PLAN - NEW WORK & EGRESS PLAN

sheet: A-102

of:

DOOR SCHEDULE

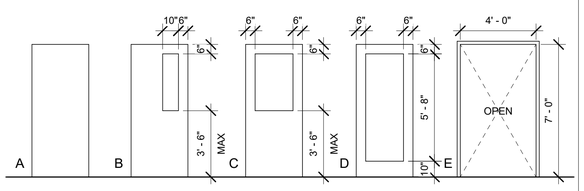
DOOR MARK	SIZE			DOOR				FRAME			RATING	HARDWARE	REMARKS
	W	HT	THK	TYPE	CONST	FINISH	GLASS	CONST	FINISH	ELEVATION/ DETAILS			
1102A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	2.0	NOTE 2
1103A	3'-0"	7'-0"	1 3/4"	B	SC	WT	5/16" LS	HS	ME		--	1.0	NOTE 1
1104A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		--	4.0	NOTE 1, 2, 4
1105A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		--	4.0	NOTE 1, 2, 4
1106A	3'-0"	7'-0"	1 3/4"	A	SC	WT		HS	ME		--	3.0	NOTE 1, 2
1106B	3'-0"	7'-0"	1 3/4"	A	SC	WT		HS	ME		--	1.0	NOTE 1
1107A	3'-0"	7'-0"	1 3/4"	D	SC	WT	5/16" LS	HS	ME		--	5.0	
1108A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	1.0	NOTE 1
1109A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	1.0	NOTE 1
1110A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		--	6.1	NOTE 2
1111A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		--	1.0	NOTE 1
1112A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	5.0	
1113A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1114A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1115A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		--	1.0	NOTE 1
1116A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1117A	3'-0"	7'-0"	1 3/4"	B	SC	WT	1/4" T	HS	ME		--	3.0	NOTE 1, 2
1119A	2'-8"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.1	NOTE 2
1119B	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.3	
1119C	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.3	
1119D	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.1	NOTE 2
1119E	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.1	NOTE 2
1119F	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.3	
1119G	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.3	
1119H	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.3	
1120A	3'-0"	7'-0"	1 3/4"	A	SC	WT		HS	ME		-	2.0	NOTE 2
1121A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1122A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1123A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1124A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1125A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1126A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	7.1	NOTE 7
1128A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	7.2	NOTE 2, 7
1129A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	7.2	NOTE 2, 7
1130A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1131A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	5.0	
1132A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	8.0	NOTE 7
1133A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	8.0	NOTE 7
1134A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	2.0	NOTE 2
1135A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1136A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1137A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		--	5.0	
1138A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.2	NOTE 2,7
1139A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.2	NOTE 2,7
1140A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	8.0	NOTE 7
1141A	2'-8"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.1	NOTE 2
1141B	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.3	
1141C	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.3	
1141D	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.1	NOTE 2
1141E	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.1	NOTE 2
1141F	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.3	
1141G	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.3	
1141H	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.3	
1142A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	7.2	NOTE 2,7
1143A	6'-0"	7'-0"	1 3/4"	DD	AL	AN	1" T/IN	AL	AN			9.0	NOTE 1, 2, 6
1143B	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	5.0	
1143C	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	2.0	NOTE 2
1144A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	2.0	NOTE 2
1145A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	2.0	NOTE 2
1145B	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1145C	6'-0"	7'-0"	1 3/4"	CC	SC	WT	1/4" T	HS	ME		---	10.0	
1146A	4'-0"	7'-0"	0"	E	-	-	-	HS	ME		-	--	NOTE 3
1146B	4'-0"	7'-0"	0"	E	-	-	-	HS	ME		-	--	NOTE 3
1147A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	7.2	NOTE 2, 7
1150A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	2.0	NOTE 2
1151A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		--	2.0	NOTE 2
1152A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	7.2	NOTE 2,7
1153A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1154A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1155A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1156A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.4	NOTE 7
1156B	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	7.2	NOTE 2,7
1157A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.4	NOTE 7
1157B	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	7.2	NOTE 2, 7
1158A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	7.2	NOTE 2, 7
1159A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		--	11.0	
1161A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		-	6.2	NOTE 2,7
1163A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	3.0	NOTE 1, 2
1163B	3'-0"	7'-0"	1 3/4"	B	SC	WT	1/4" T	HS	ME		--	1.0	NOTE 1
1164A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	1.0	NOTE 1
1165A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	1.0	NOTE 1
1166A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	3.0	NOTE 1, 2
1167A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	1.0	NOTE 1
1168A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	1.0	NOTE 1
1169A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	1.0	NOTE 1
1170A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	1.0	NOTE 1
1171A	3'-0"	7'-0"	1 3/4"	A	SC	WT	-	HS	ME		--	3.0	NOTE 1, 2
1172A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	1.0	NOTE 1
1500A	6'-0"	7'-0"	1 3/4"	DD	AL	AN	1" T/IN	AL	AN			12.0	NOTE 2
1500B	6'-0"	7'-0"	1 3/4"	DD	AL	AN	1" T/IN	AL	AN			12.0	NOTE 2
1501A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	3.0	NOTE 1, 2
1502A	3'-0"	7'-0"	1 3/4"	B	SC	WT	1/4" T	HS	ME		-	3.0	NOTE 1, 2
1505A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	5.0	
1510A	6'-0"	7'-0"	1 3/4"	DD	AL	AN	1" T/IN	AL	AN			13.0	NOTE 5
1514A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	1.0	NOTE 1
1517A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	3.0	NOTE 1, 2
1520A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		-	1.0	NOTE 1
1523A	3'-0"	7'-0"	1 3/4"	C	SC	WT	1/4" T	HS	ME		--	3.0	NOTE 1, 2
1530A	6'-0"	7'-0"	1 3/4"	B	HS	ME	1" T/IN	HS	ME			14.0	NOTE 2, 5
1540A	6'-0"	7'-0"	1 3/4"	DD	AL	AN	1" T/IN	AL	AN			13.0	NOTE 5

GENERAL NOTES

1. ALL NEW WALLS TO BE 3-5/8" STL STUDS @ 24" OC W/ (1) LAYER GYP BD EA SIDE, UON. SEE DTL 1/A-502.
2. REPAIR OR REPLACE GYP BD AT WALLS WHERE DEMOLITION HAS OCCURRED.
3. APPLIANCES TO BE CFCI. REFER TO APPLIANCE PACKAGE.
4. AT AREAS WHERE SLAB HAS BEEN REMOVED, PROVIDE NEW CONC SLAB, MATCH EXIST THICKNESS, ON VAPOR RETARDER ON 6" COMPACTED ROCK BASE, SEE DTL 5/ A-502
5. INTERIOR DIMENSIONS ARE TO FACE OF NEW STUD OR FACE OF EXISTING FINISH, UON.
6. SEE SHEET A-103 FOR DOOR SCHEDULE
7. SEE SHEET A-201 FOR WINDOW SHEDULE
8. PROVIDE NEW INTERIOR SIGNAGE AT ALL NEW & EXIST DOORS, SEE SHEET A-505
9. COORDINATE W/ OWNER FOR WORK IN NEIGHBORING TENANT SPACES

CONSTRUCTION NOTES

1. ALIGN NEW FACE OF FINISH WITH EXISTING FACE OF FINISH
2. NEW CASEWORK
3. INFILL WALL OPENING TO MATCH EXIST THICKNESS, MATCH ADJ WALL FINISH AND TEXTURE
4. OFOI COPIER
5. OFOI SYSTEMS FURNITURE, PROVIDE CABLING/POWER RUNS & TERMINATIONS. SYSTEM FURN WHIPS & POWER POLES OFCI
6. 10'-0" LONG MARKER BOARD
7. NEW ROLLER SHADES AT NEW/ EXIST WINDOWS. PROVIDE INDIVIDUAL SHADES BETWEEN EA VERT MULLION & AT EACH DOOR PANEL
8. FURR OUT WALL W/ STL STUDS & (1) LAYER GYP BD AS REQD FOR NEW WORK
9. 6" STL STUDS



DOOR TYPES

TYPE

SEE DOOR TYPES

CONSTRUCTION

SC = SOLID CORE WOOD
AL = ALUMINUM
HS = HOLLOW STEEL

FINISH

WT = WOOD TRANSPARENT
ME = METAL ENAMEL
AN = ANODIZED ALUMINUM

GLASS

T = TEMPERED
LS = LAMINATED SAFETY
T/IN = TEMPERED INSULATING

ELEVATION

SEE FRAME ELEVATIONS

RATING

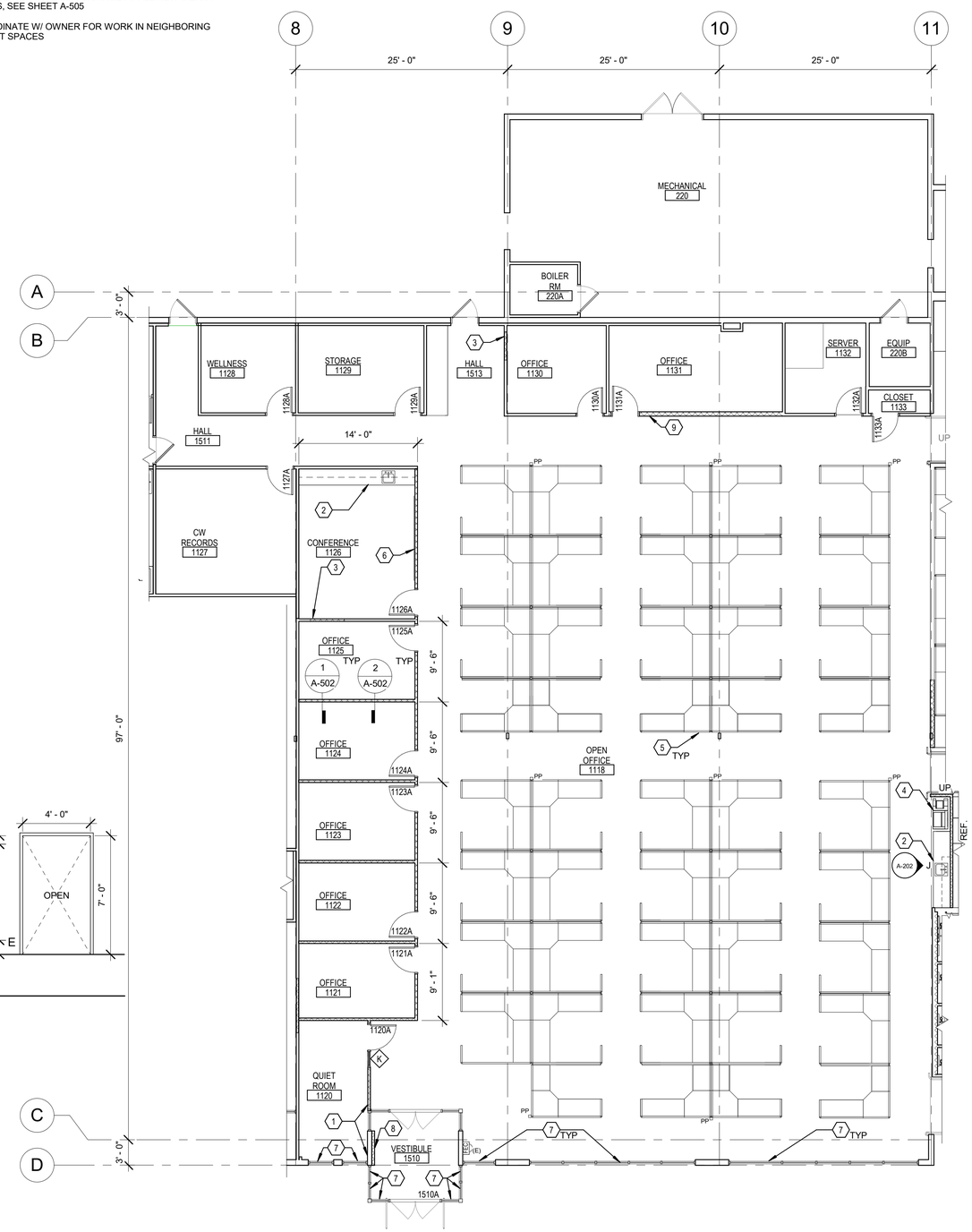
20, 25, 60, 90 MINUTES
FIRE RATING IN MINUTES

HARDWARE

NUMBER REFERS TO HARDWARE GROUP IN HARDWARE SCHEDULE

REMARKS

NOTE 1: CARD READER
NOTE 2: AUTO DOOR OPERATOR
NOTE 3: FRAME ONLY
NOTE 4: PROVIDE REMOTE BUZZ-IN FROM EA RECEPTION WINDOW IN 1102 AND 1103
NOTE 5: EXIST DOOR/ FRAME ASSEMBLY TO REMAIN. PROVIDE NEW CARD READER & ASSOCIATED COMPONENTS
NOTE 6: 4" MULLION AT HEAD
NOTE 7: EXIST FRAME TO REMAIN. PROVIDE NEW DOOR & HARDWARE AS SPECIFIED



NEW WORK FLOOR PLAN - AREA A
1/8" = 1'-0"

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STATE OF OREGON

PERMIT SET

project:
CCC - YVC CAMPUS
BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: MP
checked by: AF

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NEW WORK FLOOR PLAN - AREA A

sheet: A-103

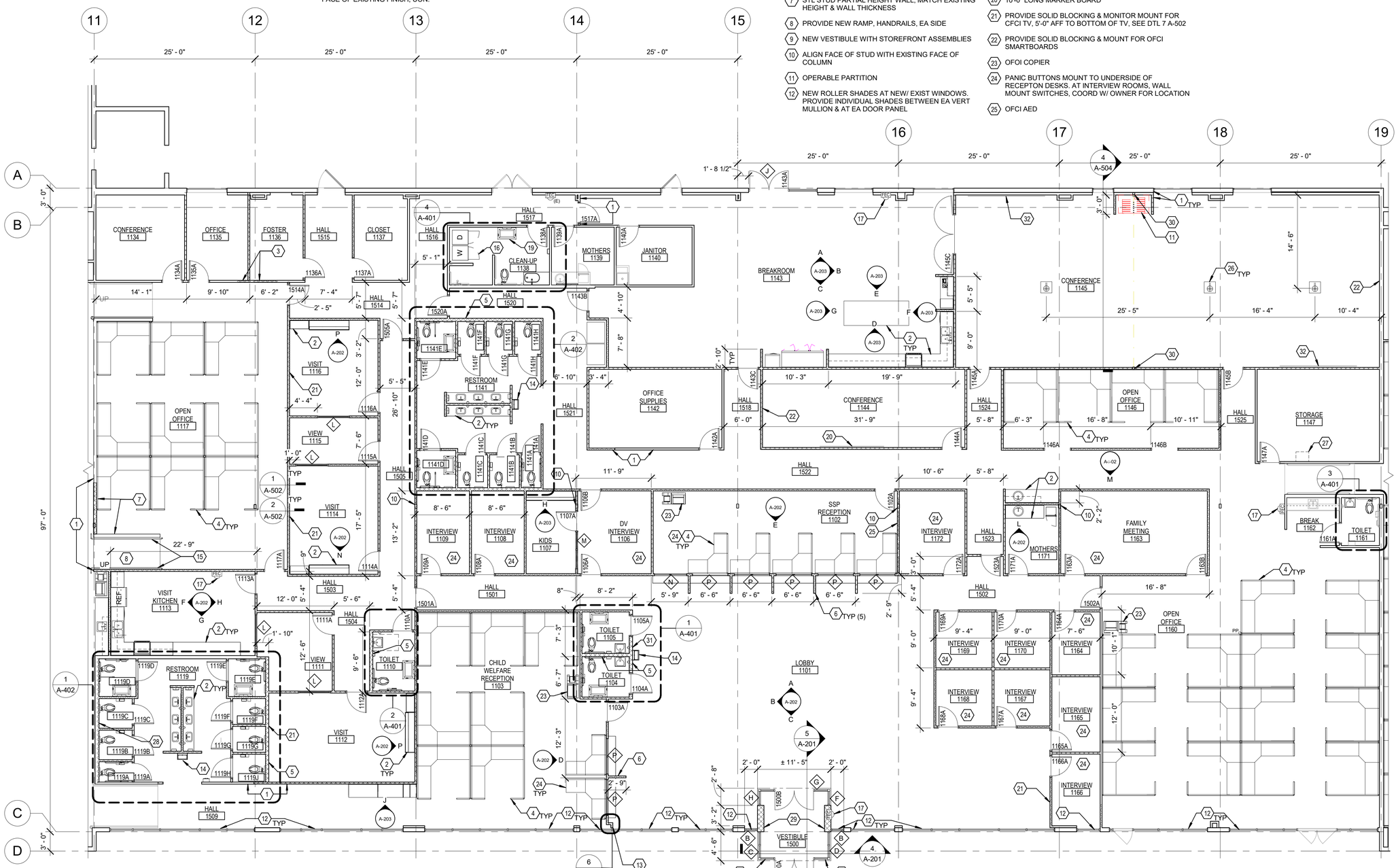
of:

GENERAL NOTES

1. ALL NEW WALLS TO BE 3-5/8" STL STUDS @ 24" OC W/ (1) LAYER GYP BD EA SIDE, UON. SEE DTL 1/A-502.
2. REPAIR OR REPLACE GYP BD AT WALLS WHERE DEMOLITION HAS OCCURRED.
3. APPLIANCES TO BE CFCI. REFER TO APPLIANCE PACKAGE.
4. AT AREAS WHERE SLAB HAS BEEN REMOVED, PROVIDE NEW CONC SLAB, MATCH EXIST THICKNESS, ON VAPOR RETARDER ON 6" COMPACTED ROCK BASE, SEE DTL 5/ A-502
5. INTERIOR DIMENSIONS ARE TO FACE OF NEW STUD OR FACE OF EXISTING FINISH, UON.
6. SEE SHEET A-103 FOR DOOR SCHEDULE
7. SEE SHEET A-201 FOR WINDOW SHEDULE
8. PROVIDE NEW INTERIOR SIGNAGE AT ALL NEW & EXIST DOORS, SEE SHEET A-505
9. COORDINATE W/ OWNER FOR WORK IN NEIGHBORING TENANT SPACES

CONSTRUCTION NOTES

1. ALIGN NEW FACE OF FINISH WITH EXISTING FACE OF FINISH
2. NEW CASEWORK
3. INFILL WALL OPENING TO MATCH EXIST THICKNESS. MATCH ADJ FINISH AND TEXTURE
4. OFOI SYSTEMS FURNITURE, PROVIDE CABLING/POWER RUNS & TERMINATIONS. SYSTEM FURN WHIPS & POWER POLES OFCI
5. 6" STL STUDS
6. 6'-0" H PRIVACY WALL
7. STL STUD PARTIAL HEIGHT WALL, MATCH EXISTING HEIGHT & WALL THICKNESS
8. PROVIDE NEW RAMP, HANDRAILS, EA SIDE
9. NEW VESTIBULE WITH STOREFRONT ASSEMBLIES
10. ALIGN FACE OF STUD WITH EXISTING FACE OF COLUMN
11. OPERABLE PARTITION
12. NEW ROLLER SHADES AT NEW/ EXIST WINDOWS. PROVIDE INDIVIDUAL SHADES BETWEEN EA VERT MULLION & AT EA DOOR PANEL
13. ALIGN CENTER OF WALL WALL WITH CENTER OF EXISTING MULLION
14. NEW BOTTLE FILLER
15. NEW HANDRAIL
16. NEW CFCI WASHER & DRYER UNITS
17. RELOCATE EXIST FE/FEC
18. FIRE ACCESS KEY BOX PER CITY STANDARD, SURFACE MT
19. BABY CHANGING STATION
20. 10'-0" LONG MARKER BOARD
21. PROVIDE SOLID BLOCKING & MONITOR MOUNT FOR CFCI TV, 5'-0" AFF TO BOTTOM OF TV, SEE DTL 7 A-502
22. PROVIDE SOLID BLOCKING & MOUNT FOR OFCI SMARTBOARDS
23. OFOI COPIER
24. PANIC BUTTONS MOUNT TO UNDERSIDE OF RECEPTON DESKS. AT INTERVIEW ROOMS, WALL MOUNT SWITCHES, COORD W/ OWNER FOR LOCATION
25. OFCI AED
26. FLOOR BOX, SEE DTL 4/ A-502
27. IT RACK, WALL MOUNT PROVIDE FRT BACKING
28. FURR OUT WALL W/ STL STUDS & (1) LAYER GYP BD AS REQD FOR NEW WORK
29. 12" STL STUDS W/R-38 BATT INSUL
30. TS COLUMN SUPPORT FOR OPERABLE PARTITION W/ OVHD STL BEAM
31. WALL MOUNT CUP DISPENSER
32. 12'-0" LONG MARKER BOARD



NEW WORK FLOOR PLAN - AREA B
1/8" = 1'-0"

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368 NE NORTON LN
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consultants:

revisions:

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NEW WORK FLOOR PLAN - AREA B

sheet: A-104

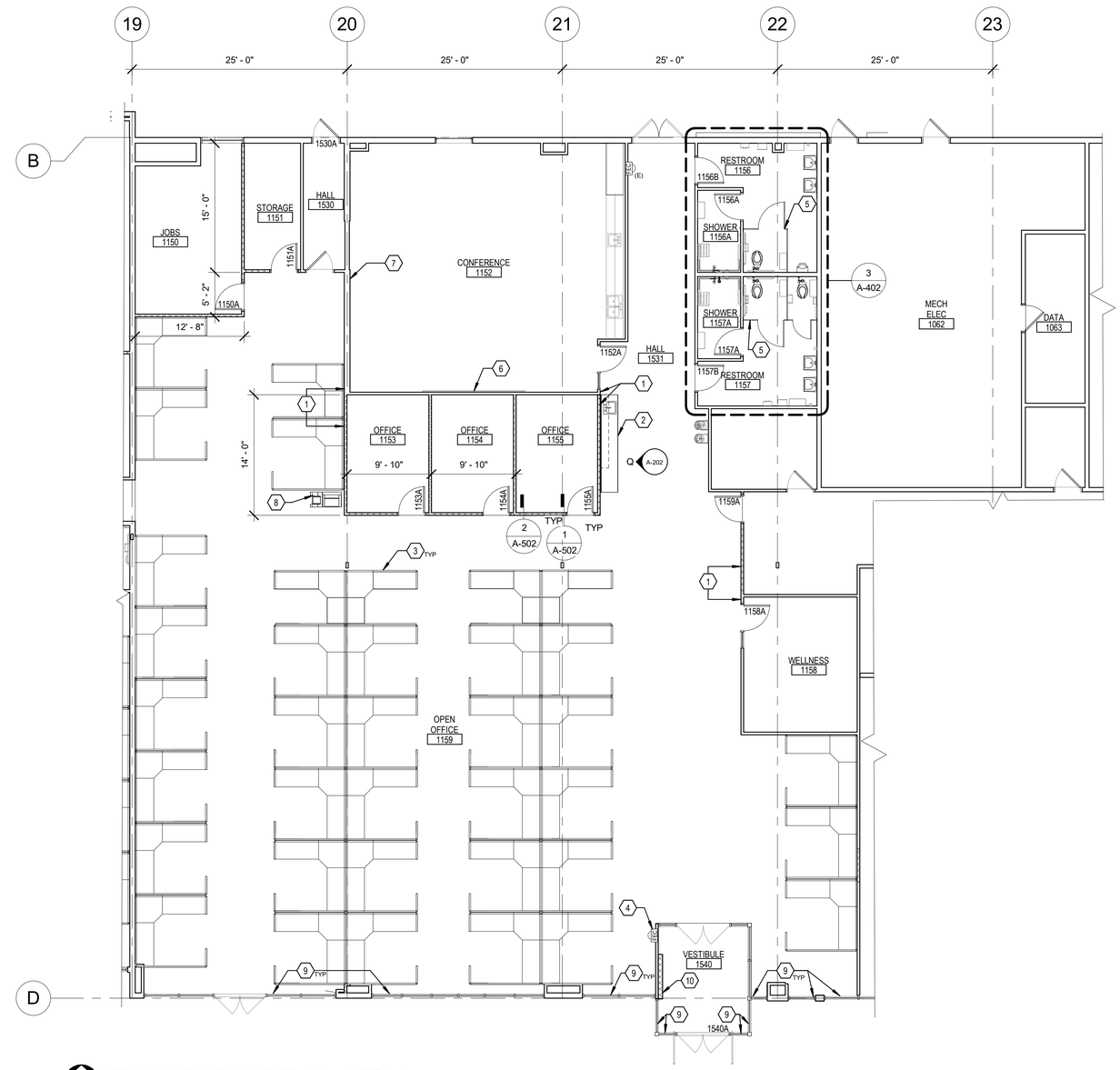
of:

GENERAL NOTES

1. ALL NEW WALLS TO BE 3-5/8" STL STUDS @ 24" OC W/ (1) LAYER GYP BD EA SIDE, UON. SEE DTL 1/A-502.
2. REPAIR OR REPLACE GYP BD AT WALLS WHERE DEMOLITION HAS OCCURRED.
3. APPLIANCES TO BE CFCI. REFER TO APPLIANCE PACKAGE.
4. AT AREAS WHERE SLAB HAS BEEN REMOVED, PROVIDE NEW CONC SLAB, MATCH EXIST THICKNESS, ON VAPOR RETARDER ON 6" COMPACTED ROCK BASE, SEE DTL 5/ A-502
5. INTERIOR DIMENSIONS ARE TO FACE OF NEW STUD OR FACE OF EXISTING FINISH, UON.
6. SEE SHEET A-103 FOR DOOR SCHEDULE
7. SEE SHEET A-201 FOR WINDOW SHEDULE
8. PROVIDE NEW INTERIOR SIGNAGE AT ALL NEW & EXIST DOORS, SEE SHEET A-505
9. COORDINATE W/ OWNER FOR WORK IN NEIGHBORING TENANT SPACES

CONSTRUCTION NOTES

1. ALIGN NEW FACE OF FINISH WITH EXISTING FACE OF FINISH
2. NEW CASEWORK
3. OFOI SYSTEMS FURNITURE, PROVIDE CABLING/POWER RUNS & TERMINATIONS. SYSTEM FURN WHIPS & POWER POLES OFCI
4. RELOCATE EXIST FE/FEC
5. NEW TOILET PARTITIONS
6. 12'-0" LONG MARKER BOARD
7. PROVIDE SOLID BLOCKING & MOUNT FOR OFCI SMARTBOARDS
8. OFCI COPIER
9. NEW ROLLER SHADES AT NEW/ EXIST WINDOWS. PROVIDE INDIVIDUAL SHADES BETWEEN EA VERT MULLION & AT EA DOOR PANEL
10. FURR OUT WALL W/ STL STUDS & (1) LAYER GYP BD AS REQD FOR NEW WORK



NEW WORK FLOOR PLAN - AREA C
1/8" = 1'-0"

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NEW WORK FLOOR PLAN - AREA C

sheet: A-105

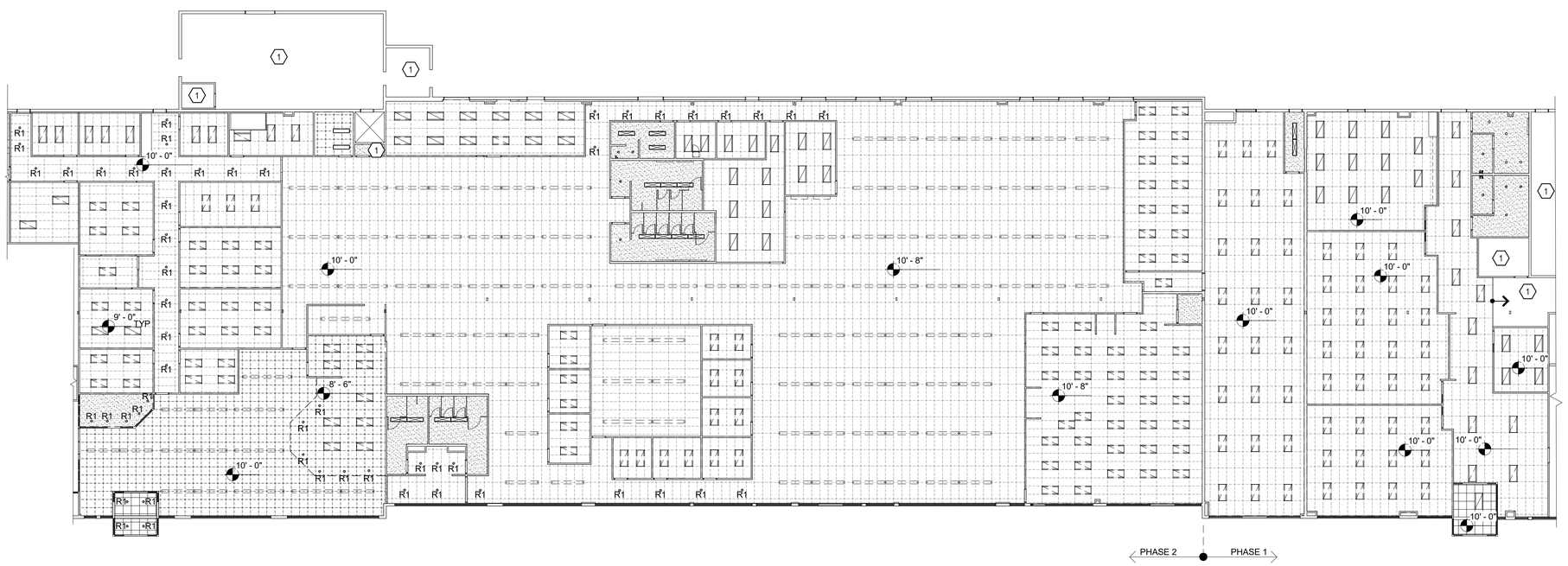
of:

CEILING GENERAL NOTES-DEMOLITION

1. REMOVE ALL CEILINGS & LIGHT FIXTURES, UON

CEILING CONSTRUCTION NOTES-DEMOLITION

1 EXIST CEILING & LIGHT FIXTURE TO REMAIN



RCP - DEMOLITON
1/16" = 1'-0"

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REFLECTED CEILING PLAN - DEMOLITION

sheet: A-106

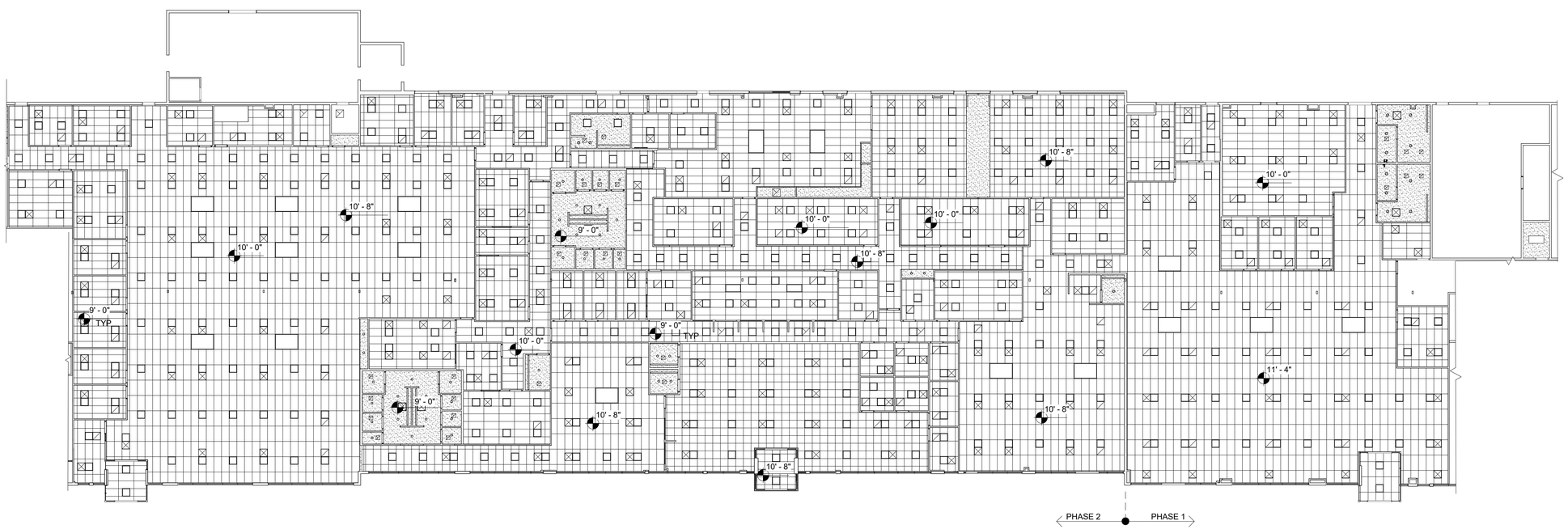
of:

CEILING GENERAL NOTES

1. CENTER LAY IN CEILING GRID WITHIN ROOM UNLESS OTHERWISE NOTED.
2. REFER TO ELECTRICAL DRAWINGS & SPECIFICATIONS FOR LIGHT FIXTURE TYPES
3. RELOCATE SPRINKLER HEADS AT CENTER OF CEILING TILES.
4. ALL ROOMS TO HAVE 9'-0" HIGH CEILINGS UON
5. HVAC DIFFUSERS SHOWN FOR REFERENCE ONLY. REFER TO MECHANICAL DRAWINGS DIFFUSER GRILLE TYPES AND LOCATIONS.
6. CENTER LIGHT FIXTURE IN ROOM/SPACE UON.
7. ALIGN FIXTURES WITH GRID AS SHOWN.

CEILING CONSTRUCTION NOTES

1 GYP BD SOFFIT, CP-1



OVERALL RCP - NEW WORK
1/16" = 1'-0"

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OVERALL REFLECTED CEILING PLAN

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of:

CEILING LEGEND

	EXIST GYP BD CLG		NEW LED LINEAR SEE RCP FOR SIZE		NEW SIMULATED SKYLIGHT 72X48
	NEW 2X2 SUSP CLG		NEW 2X2 LED RECESSED TROFFER		NEW SIMULATED SKYLIGHT 24X48
	NEW 2X4 SUSP CLG		NEW RECESSED CAN LIGHT		EMERGENCY EXIT LIGHT
	NEW GYP BD CLG				

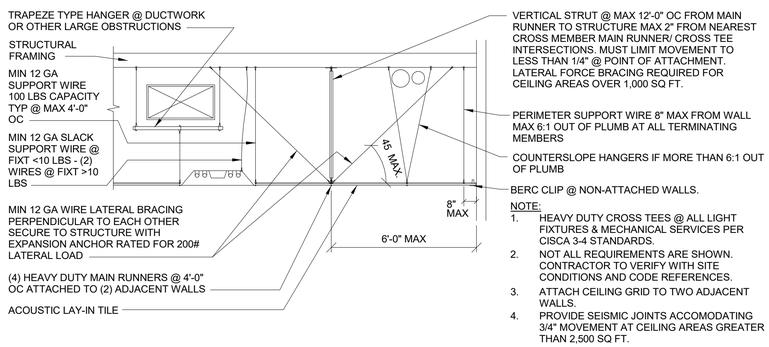
CEILING GENERAL NOTES

1. CENTER LAY IN CEILING GRID WITHIN ROOM UNLESS OTHERWISE NOTED.
2. REFER TO ELECTRICAL DRAWINGS & SPECIFICATIONS FOR LIGHT FIXTURE TYPES
3. RELOCATE SPRINKLER HEADS AT CENTER OF CEILING TILES.
4. ALL ROOMS TO HAVE 9'-0" HIGH CEILINGS UON
5. HVAC DIFFUSERS SHOWN FOR REFERENCE ONLY. REFER TO MECHANICAL DRAWINGS DIFFUSER GRILLE TYPES AND LOCATIONS.
6. CENTER LIGHT FIXTURE IN ROOM/SPACE UON.
7. ALIGN FIXTURES WITH GRID AS SHOWN.

CEILING CONSTRUCTION NOTES

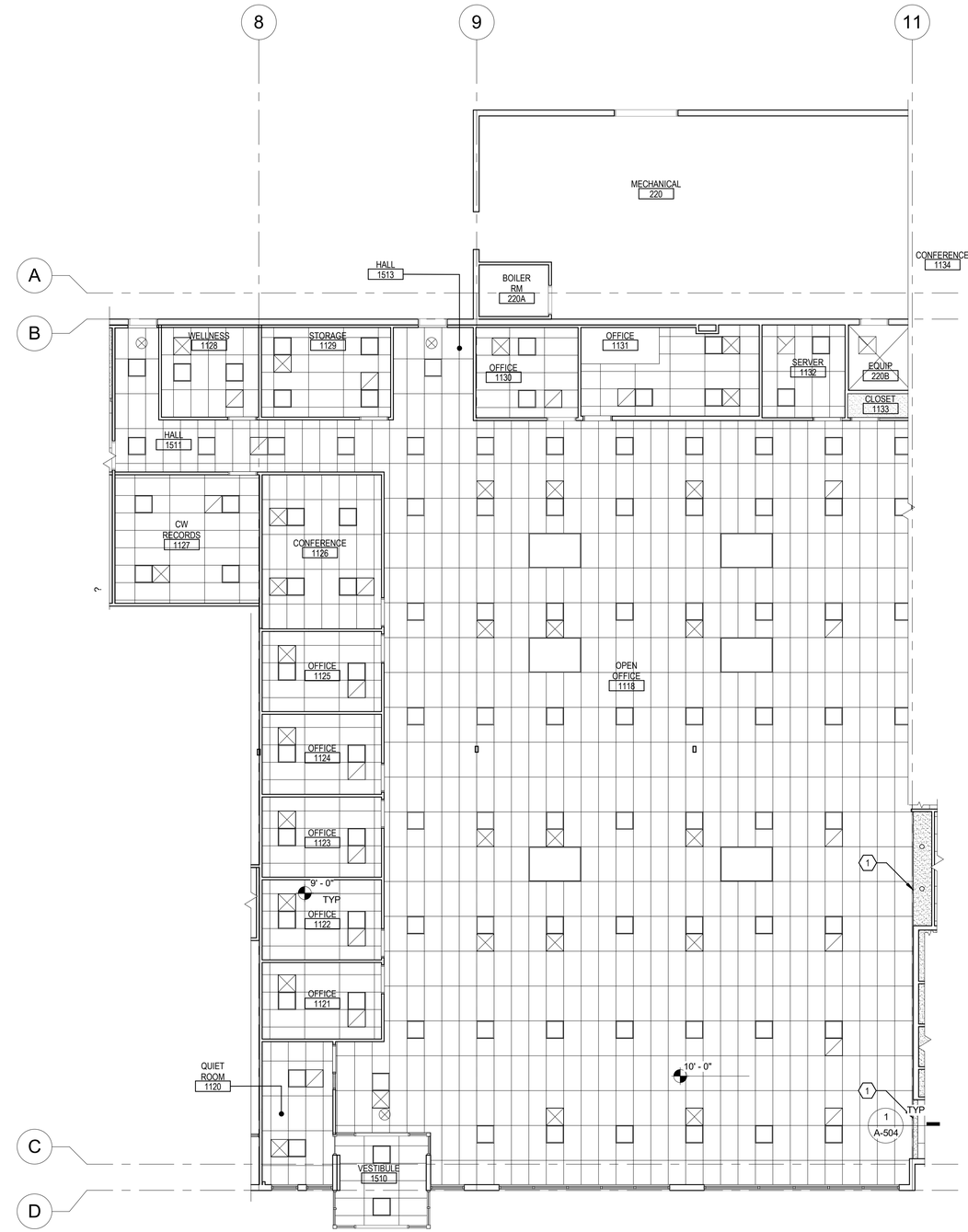
1 GYP BD SOFFIT, CP-1

CONSTRUCT SUSPENDED CEILINGS IN ACCORDANCE WITH NORTHWEST WALL & CEILING BUREAU - TECHNICAL BULLETIN 401.



NOTE:
1. HEAVY DUTY CROSS TEES @ ALL LIGHT FIXTURES & MECHANICAL SERVICES PER CISCA 3-4 STANDARDS.
2. NOT ALL REQUIREMENTS ARE SHOWN. CONTRACTOR TO VERIFY WITH SITE CONDITIONS AND CODE REFERENCES.
3. ATTACH CEILING GRID TO TWO ADJACENT WALLS.
4. PROVIDE SEISMIC JOINTS ACCOMODATING 3/4" MOVEMENT AT CEILING AREAS GREATER THAN 2,500 SQ FT.

1 SUSPENDED CEILING DETAIL
1/2" = 1'-0"



REFLECTED CEILING PLAN - AREA A
1/8" = 1'-0"

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3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED ARCHITECT ANGELA M. FLORES SALEM, OREGON STATE OF OREGON

PERMIT SET

project:
CCC - YVC CAMPUS
BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:

revisions:

	Description	Date

date: 04/25/25
project: 00524
drawn by: MP
checked by: AF

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REFLECTED CEILING PLAN - AREA A

sheet: A-108

of:

CEILING LEGEND

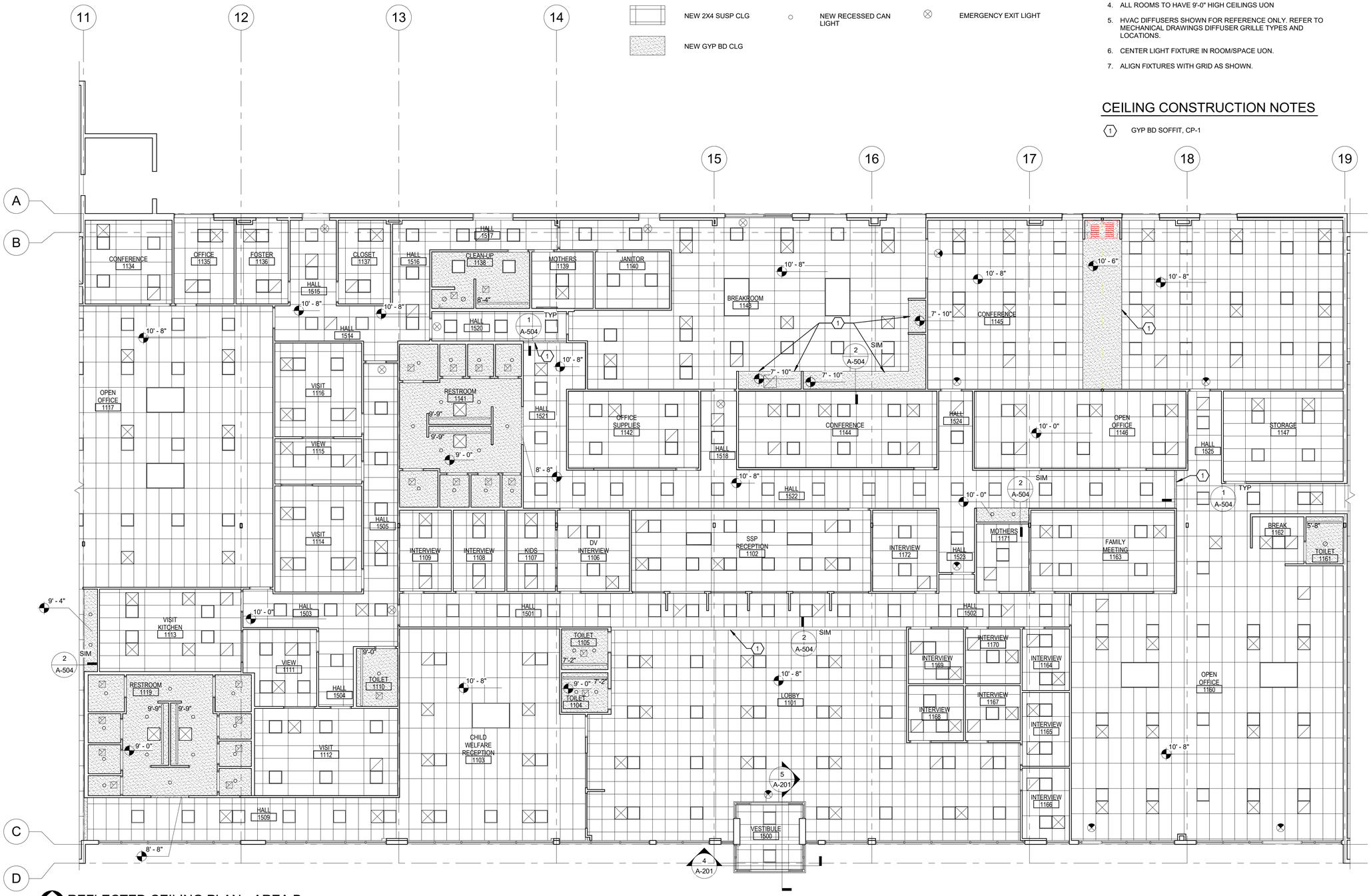
EXIST GYP BD CLG	NEW LED LINEAR SEE RCP FOR SIZE	NEW SIMULATED SKYLIGHT 72X48
NEW 2X2 SUSP CLG	NEW 2X2 LED RECESSED TROFFER	NEW SIMULATED SKYLIGHT 24X48
NEW 2X4 SUSP CLG	NEW RECESSED CAN LIGHT	EMERGENCY EXIT LIGHT
NEW GYP BD CLG		

CEILING GENERAL NOTES

1. CENTER LAY IN CEILING GRID WITHIN ROOM UNLESS OTHERWISE NOTED.
2. REFER TO ELECTRICAL DRAWINGS & SPECIFICATIONS FOR LIGHT FIXTURE TYPES
3. RELOCATE SPRINKLER HEADS AT CENTER OF CEILING TILES.
4. ALL ROOMS TO HAVE 9'-0" HIGH CEILINGS UON
5. HVAC DIFFUSERS SHOWN FOR REFERENCE ONLY. REFER TO MECHANICAL DRAWINGS DIFFUSER GRILLE TYPES AND LOCATIONS.
6. CENTER LIGHT FIXTURE IN ROOM/SPACE UON.
7. ALIGN FIXTURES WITH GRID AS SHOWN.

CEILING CONSTRUCTION NOTES

1 GYP BD SOFFIT, CP-1



REFLECTED CEILING PLAN - AREA B
1/8" = 1'-0"

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project: 00524
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REFLECTED CEILING PLAN - AREA B

sheet: A-109

of:

CEILING LEGEND

EXIST GYP BD CLG	NEW LED LINEAR SEE RCP FOR SIZE	NEW SIMULATED SKYLIGHT 72X48
NEW 2X2 SUSP CLG	NEW 2X2 LED RECESSED TROFFER	NEW SIMULATED SKYLIGHT 24X48
NEW 2X4 SUSP CLG	NEW RECESSED CAN LIGHT	EMERGENCY EXIT LIGHT
NEW GYP BD CLG		

CEILING GENERAL NOTES

1. CENTER LAY IN CEILING GRID WITHIN ROOM UNLESS OTHERWISE NOTED.
2. REFER TO ELECTRICAL DRAWINGS & SPECIFICATIONS FOR LIGHT FIXTURE TYPES
3. RELOCATE SPRINKLER HEADS AT CENTER OF CEILING TILES.
4. ALL ROOMS TO HAVE 9'-0" HIGH CEILINGS UON
5. HVAC DIFFUSERS SHOWN FOR REFERENCE ONLY. REFER TO MECHANICAL DRAWINGS DIFFUSER GRILLE TYPES AND LOCATIONS.
6. CENTER LIGHT FIXTURE IN ROOM/SPACE UON.
7. ALIGN FIXTURES WITH GRID AS SHOWN.

CEILING CONSTRUCTION NOTES

1 GYP BD SOFFIT, CP-1

REFLECTED CEILING PLAN - AREA C
1/8" = 1'-0"

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project: 00524
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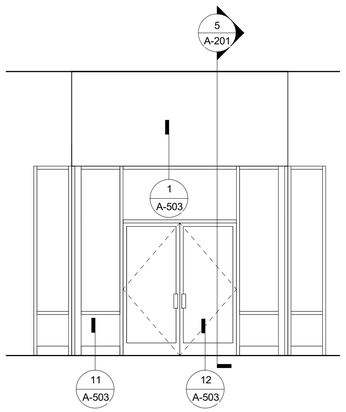
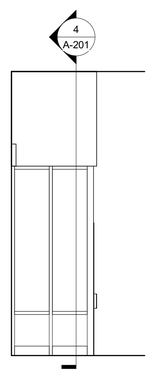
REFLECTED CEILING PLAN - AREA C

sheet: A-110

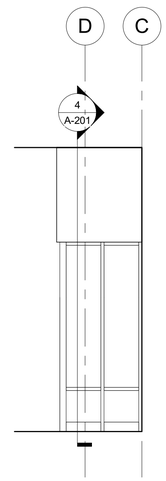
of:



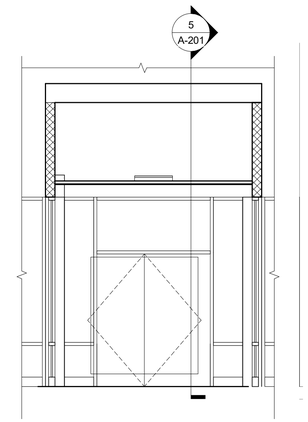
1 EXT VESTIBULE ELEVATION
1/4" = 1'-0"



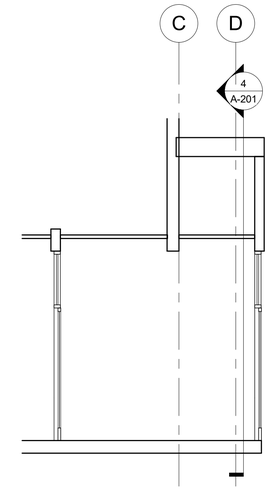
2 EXT VEST. ELEVATION
1/4" = 1'-0"



3 EXT VEST. ELEVATION
1/4" = 1'-0"



4 VESTIBULE SECTION
1/4" = 1'-0"



5 VESTIBULE SECTION
1/4" = 1'-0"

WINDOW SCHEDULE

MARK	SIZE		OPERATION TYPE	FRAME TYPE	FRAME FINISH	FRAME ELEVATIONS	GLAZING			REMARKS
	WIDTH	HEIGHT					THICKNESS	TYPE	COLOR	
A	11'-1"	10'-0"	F	AL	AN		1"	T/IN	CO	NOTE 4
B	2'-0"	10'-0"	F	AL	AN		1"	T/IN	CO	NOTE 3, 4
C	4'-4"	10'-0"	F	AL	AN		1"	T/IN	CO	NOTE 4
D	4'-4"	10'-0"	F	AL	AN		1"	T/IN	CO	NOTE 4
F	2'-6"	10'-0"	F	AL	AN		1"	T/IN	CO	NOTE 4
G	11'-1"	10'-0"	F	AL	AN		1"	T/IN	CO	NOTE 4
H	2'-6"	10'-0"	F	AL	AN		1"	T/IN	CO	NOTE 4
J	10'-8"	7'-4"	F	AL	AN		1"	T/IN	CO	NOTE 2, 3, 4
K	5'-2	7'-2"	F	HS	ME		5/16"	LS	C	NOTE 1,3
L	5'-0"	4'-0"	F	HS	ME		5/16"	LS	RF	
M	9'-0"	7'-2"	F	HS	ME		5/16"	LS	C	NOTE 1
N	5'-0"	4'-4"	F	AL	AN		5/16"	LS	C	NOTE 3, 5
P	5'-6"	4'-4"	F	AL	AN		5/16"	LS	C	NOTE 3, 5

OPERATION TYPE

F = FIXED

FRAME MATERIAL

HS= HOLLOW STEEL
FL= FRAMELESS GLASS
AL= ALUMINUM

FRAME FINISH

ME = METAL ENAMEL
FF= FACTORY FINISH
AN= ANODIZED ALUMINUM

FRAME ELEVATION

SEE FRAME ELEVATIONS

GLASS THICKNESS

NUMBER REFERS TO OVERALL GLAZING THICKNESS

GLASS TYPE

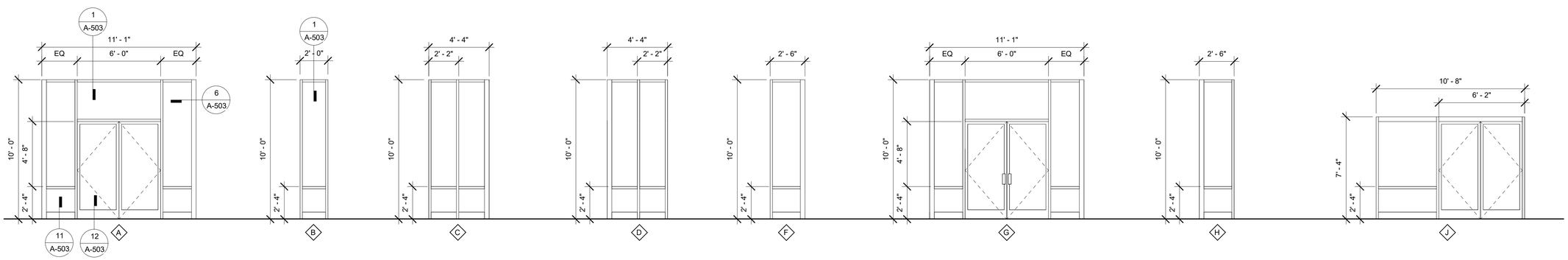
T = TEMPERED
LS = LAMINATED SAFETY
T/IN= TEMPERED/ INSULATED

GLASS COLOR

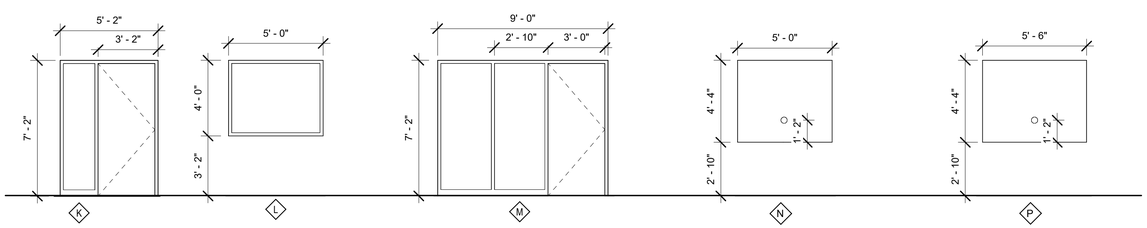
C = CLEAR
RF = ONE WAY MIRROR COATED
CO= LOW E COATED

REMARKS

NOTE 1: 4" FRAME AT SILL
NOTE 2: 4" FRAME AT HEAD
NOTE 3: NEW ROLLER SHADES
NOTE 4: 6" BOTTOM RAIL AT WINDOWS
NOTE 5: 1" ANOD ALUM TRACK ALL AROUND, RECESSED



EXTERIOR & VESTIBULE ELEVATIONS
1/4" = 1'-0"



INTERIOR WINDOW ELEVATIONS
1/4" = 1'-0"

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revisions:

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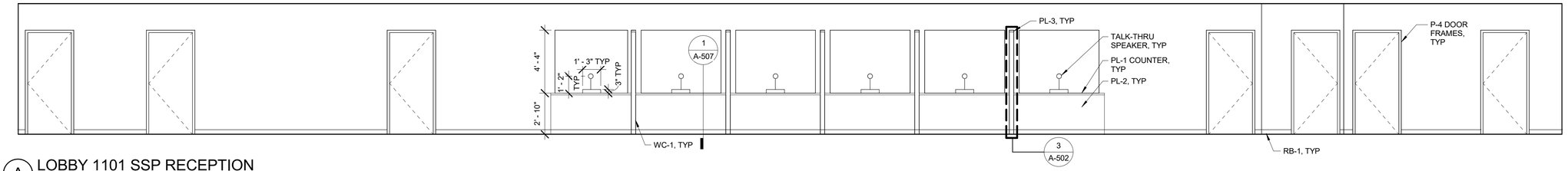
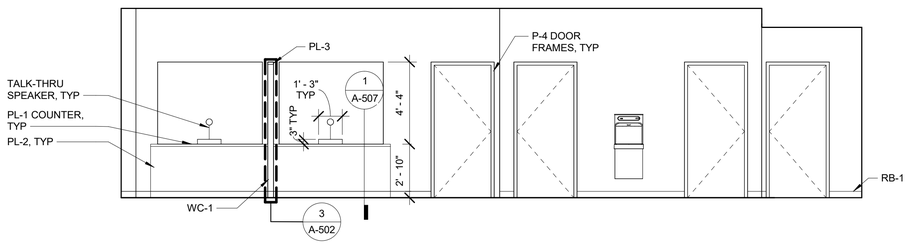
EXT ELEVATIONS & WINDOW SCHEDULE

sheet: A-201

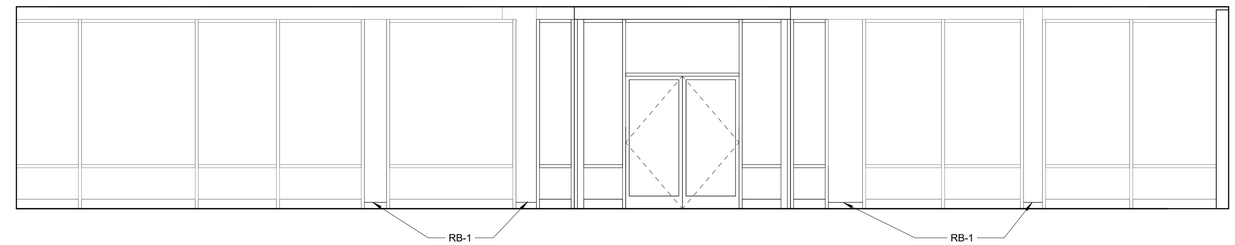
of:



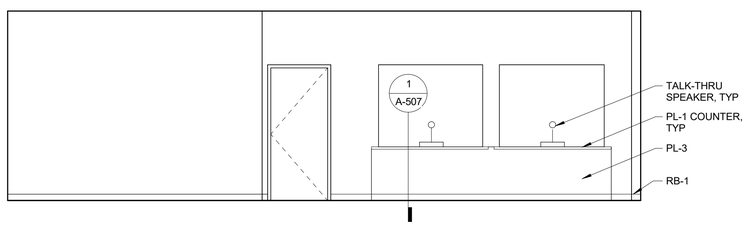
A LOBBY 1101 SSP RECEPTION
1/4" = 1'-0"



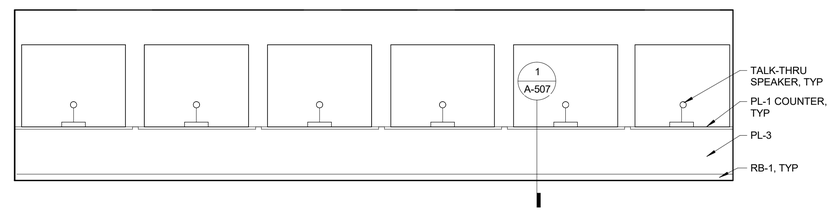
B LOBBY 1101 CHILD WELFARE RECEPTION
1/4" = 1'-0"



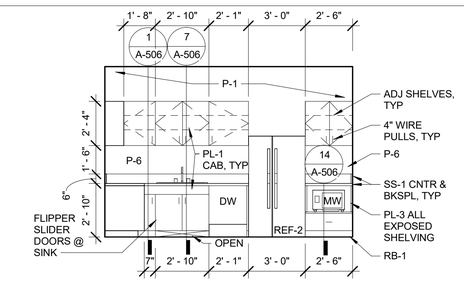
C LOBBY 1101
1/4" = 1'-0"



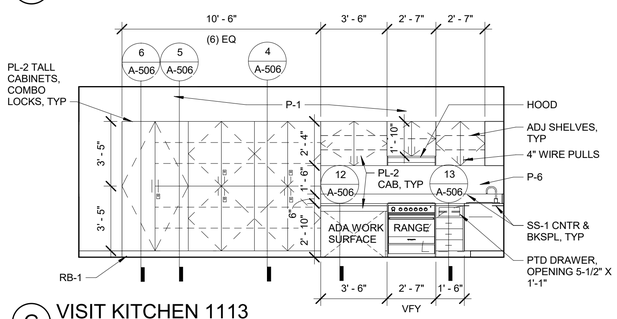
D CHILD WELFARE RECEPTION 1103
1/4" = 1'-0"



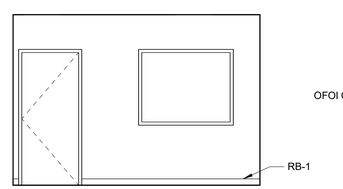
E SSP RECEPTION 1102
1/4" = 1'-0"



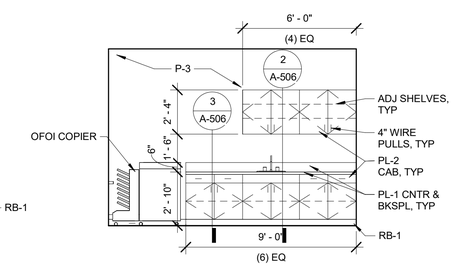
F VISIT KITCHEN 1113
1/4" = 1'-0"



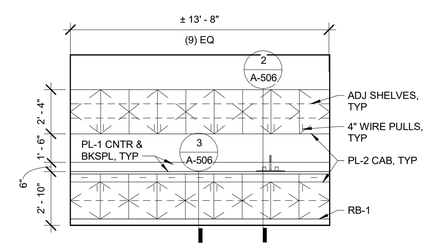
G VISIT KITCHEN 1113
1/4" = 1'-0"



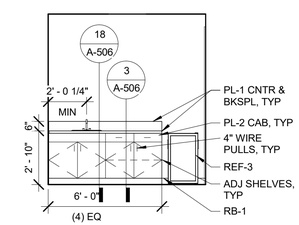
H VISIT KITCHEN 1113
1/4" = 1'-0"



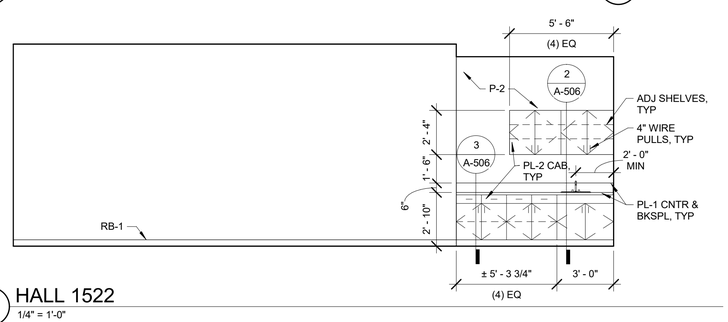
J OPEN OFFICE 1118
1/4" = 1'-0"



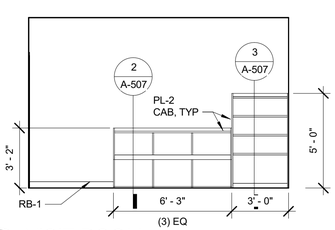
K CONFERENCE 1126
1/4" = 1'-0"



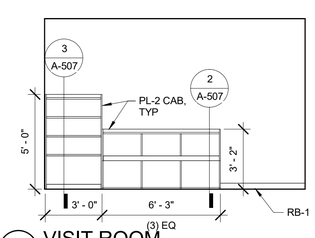
L MOTHERS 1171
1/4" = 1'-0"



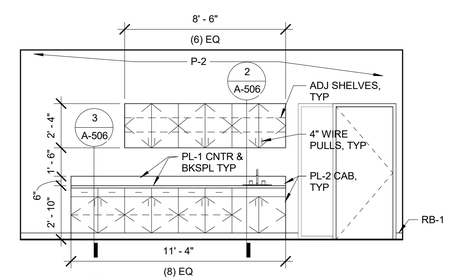
M HALL 1522
1/4" = 1'-0"



N VISIT ROOM
1/4" = 1'-0"



P VISIT ROOM
1/4" = 1'-0"



Q HALL 1531
1/4" = 1'-0"

GENERAL NOTES

1. ALL APLIANCES AND EQUIPMENT TO BE CFCI, UON. SEE OWNER APPLIANCE PACKAGE

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INTERIOR ELEVATIONS

sheet: A-202
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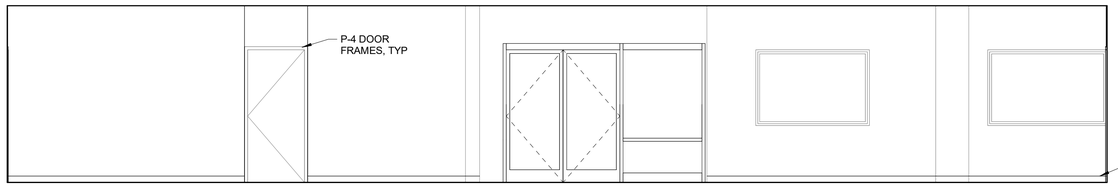
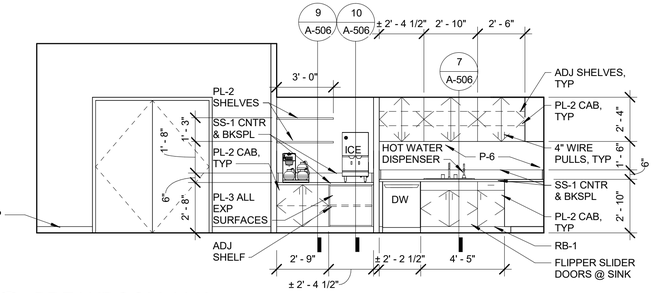


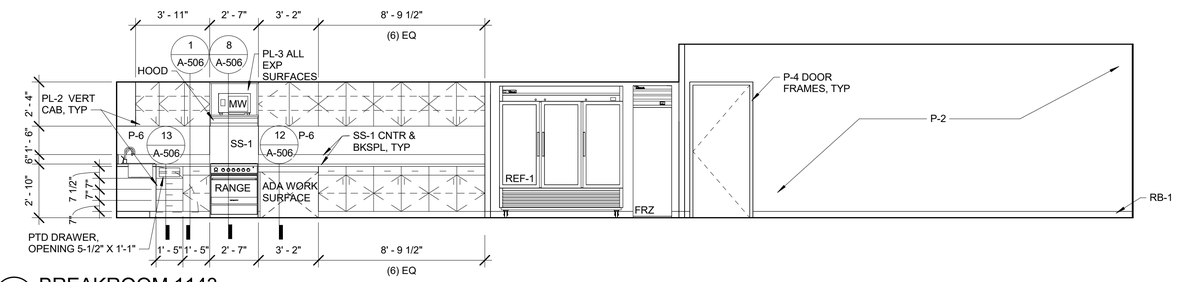
A BREAKROOM 1143
1/4" = 1'-0"



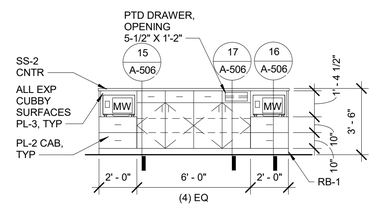
B BREAKROOM 1143
1/4" = 1'-0"

GENERAL NOTES

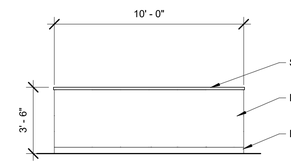
1. ALL APLIANCES AND EQUIPMENT TO BE CFCI, UON. SEE OWNER APPLIANCE PACKAGE



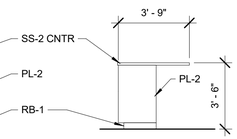
C BREAKROOM 1143
1/4" = 1'-0"



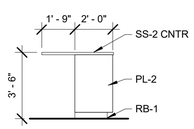
D BREAKROOM ISLAND
1/4" = 1'-0"



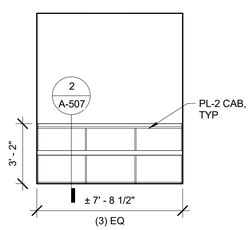
E BREAKROOM ISLAND
1/4" = 1'-0"



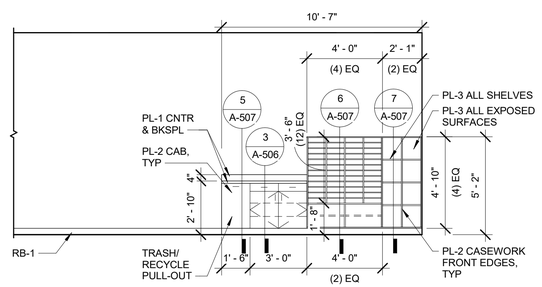
F BREAKROOM ISLAND
1/4" = 1'-0"



G BREAKROOM ISLAND
1/4" = 1'-0"



H KIDS 1107
1/4" = 1'-0"



J HALL 1509 MAILBOXES
1/4" = 1'-0"

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3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED ARCHITECT
ANGELA M. FLORES
SALEM, OREGON
STATE OF OREGON

PERMIT SET

project:
CCC - YVC CAMPUS
BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: MC/MP
checked by: AF

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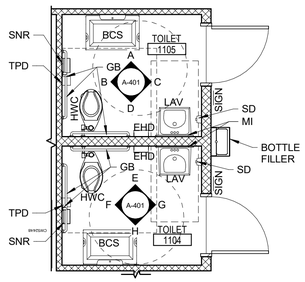
INTERIOR
ELEVATIONS

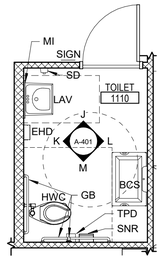
sheet: A-203
of:

LARGE SCALE GENERAL NOTES

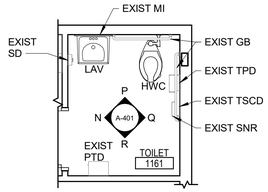
1. REFER TO FIXTURE MOUNTING HEIGHTS FOR ACCESSORIES/ FIXTURES
2. SEE SPECIFICATION SECTION 102813 FOR LIST OF TOILET ACCESSORIES, PROVIDE BACKING TYPICAL
3. T-1 FLOOR TILE, TYP
4. TS-1 AT FLOOR TO WALL TILE, TYP
5. TS-2 AT WALL TILE EGDE, TYP



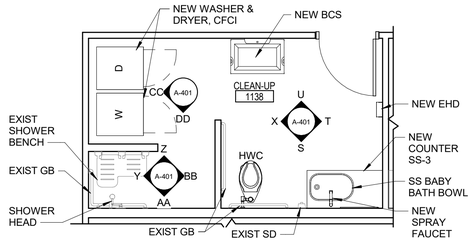
1 TOILET 1104 & 1105
1/4" = 1'-0"



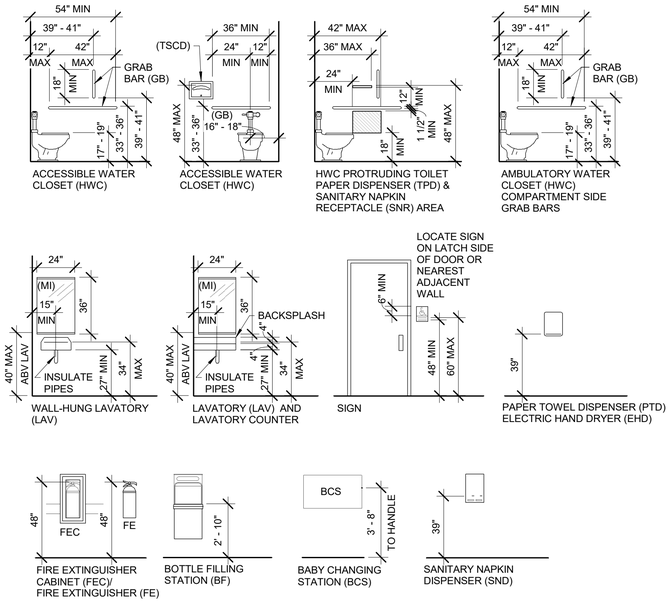
2 TOILET 1110
1/4" = 1'-0"



3 TOILET 1161
1/4" = 1'-0" FINISHES ONLY

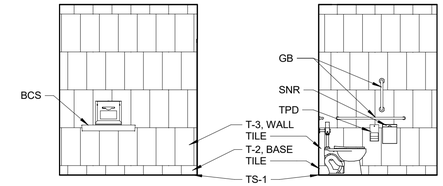


4 CLEAN-UP 1138
1/4" = 1'-0"



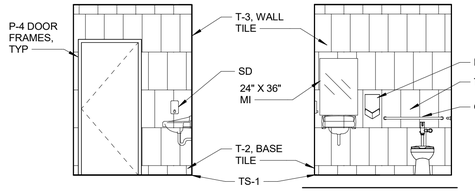
5 FIXTURE MOUNTING HEIGHTS
1/4" = 1'-0"

TYPICAL UNLESS OTHERWISE NOTED
ALL DIMENSIONS ARE CLEAR FINISH



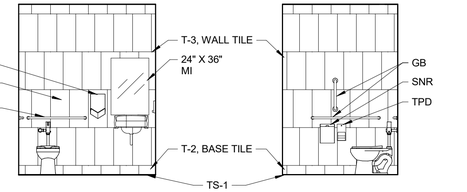
A TOILET 1105
1/4" = 1'-0"

B TOILET 1105
1/4" = 1'-0"



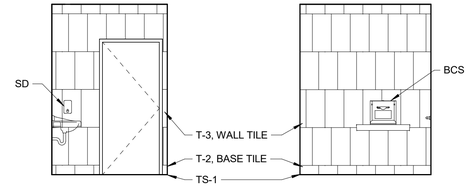
C TOILET 1105
1/4" = 1'-0"

D TOILET 1105
1/4" = 1'-0"



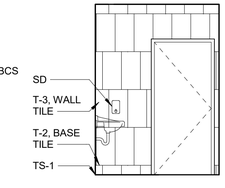
E TOILET 1104
1/4" = 1'-0"

F TOILET 1104
1/4" = 1'-0"

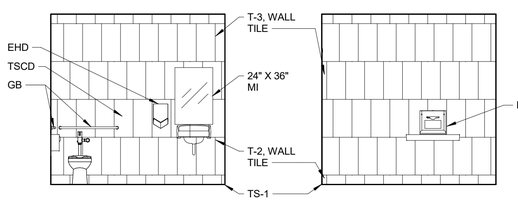


G TOILET 1104
1/4" = 1'-0"

H TOILET 1104
1/4" = 1'-0"

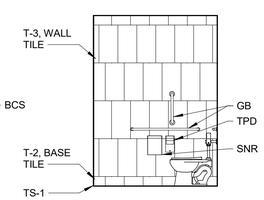


J TOILET 1110
1/4" = 1'-0"

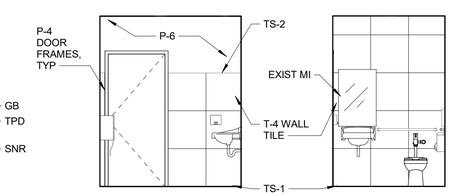


K TOILET 1110
1/4" = 1'-0"

L TOILET 1110
1/4" = 1'-0"

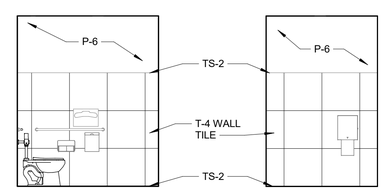


M TOILET 1110
1/4" = 1'-0"



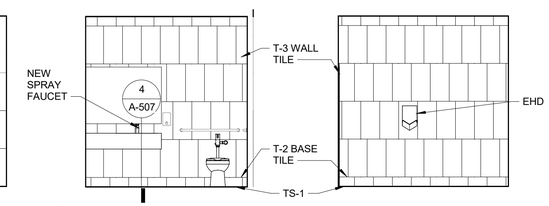
N TOILET 1161
1/4" = 1'-0"

P TOILET 1161
1/4" = 1'-0"



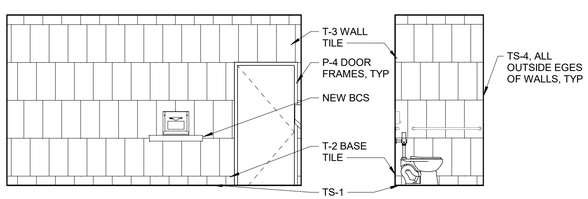
Q TOILET 1161
1/4" = 1'-0"

R TOILET 1161
1/4" = 1'-0"



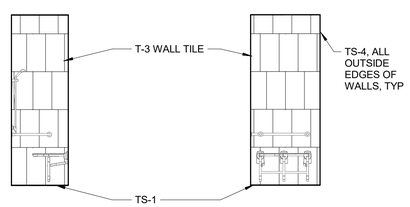
S CLEAN-UP 1138
1/4" = 1'-0"

T CLEAN-UP 1138
1/4" = 1'-0"



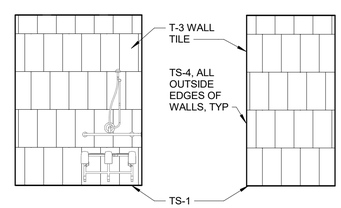
U CLEAN-UP 1138
1/4" = 1'-0"

X CLEAN-UP 1138
1/4" = 1'-0"



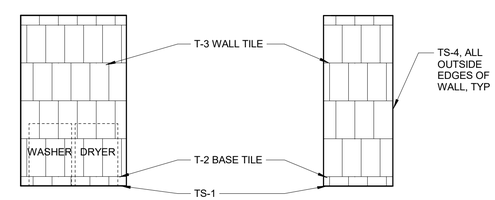
Y CLEAN-UP 1138
1/4" = 1'-0"

Z CLEAN-UP 1138
1/4" = 1'-0"



AA CLEAN-UP 1138
1/4" = 1'-0"

BB CLEAN-UP 1138
1/4" = 1'-0"



CC CLEAN-UP 1138 W&D
1/4" = 1'-0"

DD CLEAN-UP 1138
1/4" = 1'-0"

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REGISTERED ARCHITECT ANGELA M. FLORES SALEM, OREGON STATE OF OREGON

PERMIT SET

project:
CCC - YVC CAMPUS
BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: MP
checked by: AF

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LARGE SCALE PLANS

sheet: A-401

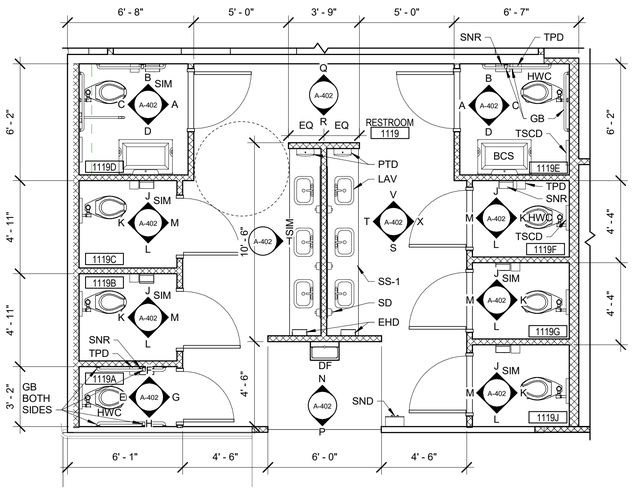
of:

LARGE SCALE GENERAL NOTES

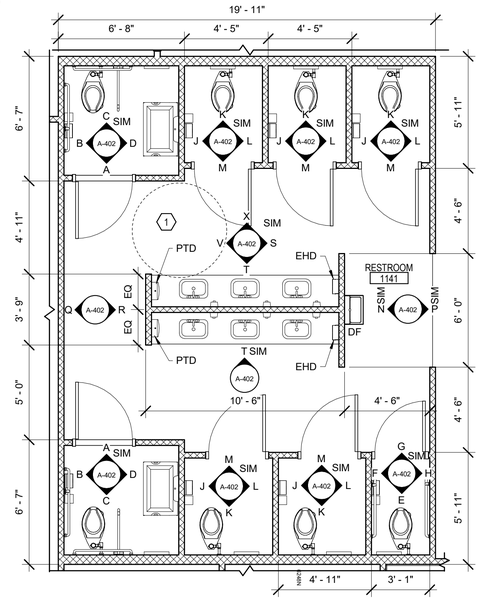
1. REFER TO FIXTURE MOUNTING HEIGHTS FOR ACCESSORIES/ FIXTURES
2. SEE SPECIFICATION SECTION 102813 FOR LIST OF TOILET ACCESSORIES, PROVIDE BACKING TYPICAL
3. T-1 FLOOR TILE, TYP
4. TS-1 AT FLOOR TO WALL TILE, TYP
5. TS-2 AT WALL TILE EGDE, TYP

LARGES SCALE CONSTRUCTION NOTES

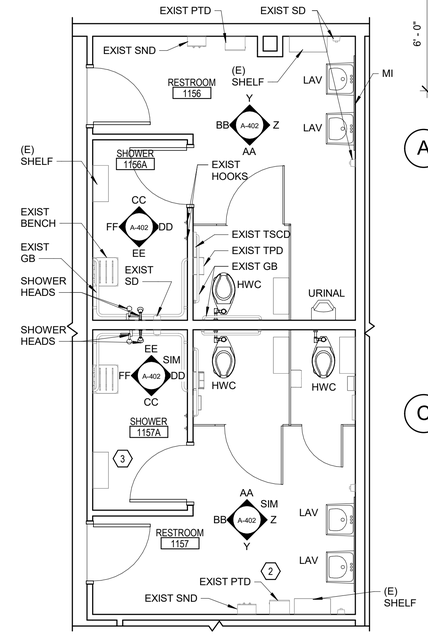
1. REFER TO RESTROOM 1119 FOR SIMILAR ELEVATIONS/NOTES
2. REFER TO RESTROOM 1156 FOR SIMILAR ELEVATIONS/NOTES
3. REFER TO SHOWER 1156A FOR SIMILAR ELEVATIONS/NOTES



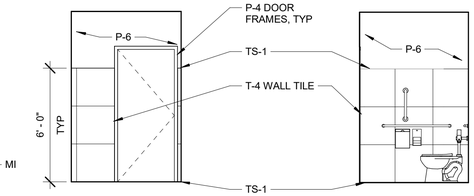
1 RESTROOM 1119
1/4" = 1'-0"



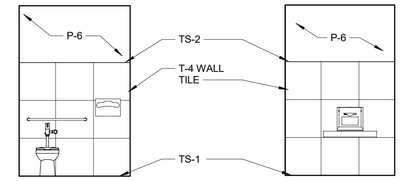
2 RESTROOM 1141
1/4" = 1'-0"



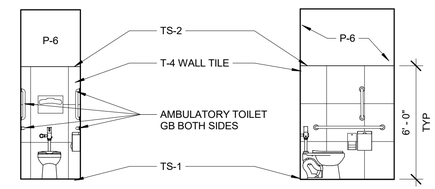
3 RESTROOM 1156 & 1157
1/4" = 1'-0"



A ADA TOILET ROOM
1/4" = 1'-0"



B ADA TOILET ROOM
1/4" = 1'-0"

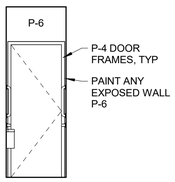


C ADA TOILET ROOM
1/4" = 1'-0"

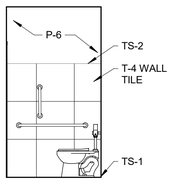
D ADA TOILET ROOM
1/4" = 1'-0"

E AMBULATORY TOILET
1/4" = 1'-0"

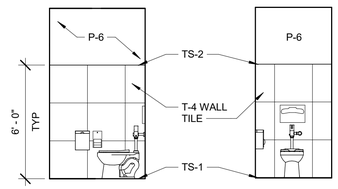
F AMBULATORY TOILET
1/4" = 1'-0"



G AMBULATORY TOILET
1/4" = 1'-0"

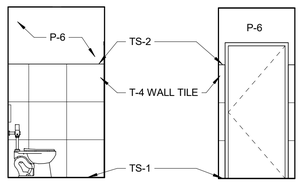


H AMBULATORY TOILET
1/4" = 1'-0"



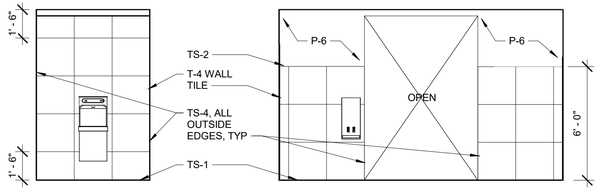
J TOILET ROOM
1/4" = 1'-0"

K TOILET ROOM
1/4" = 1'-0"



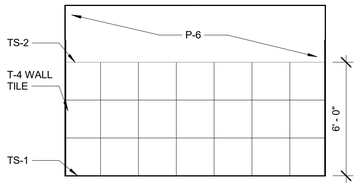
L TOILET ROOM
1/4" = 1'-0"

M TOILET ROOM
1/4" = 1'-0"

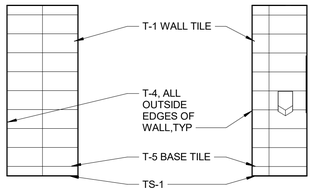


N STAFF RESTROOM
1/4" = 1'-0"

P STAFF RESTROOM
1/4" = 1'-0"

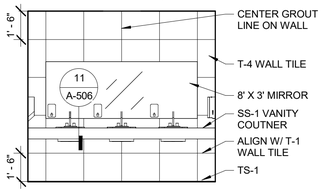


Q STAFF RESTROOM
1/4" = 1'-0"

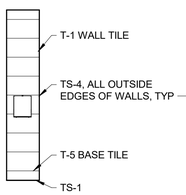


R STAFF RESTROOM
1/4" = 1'-0"

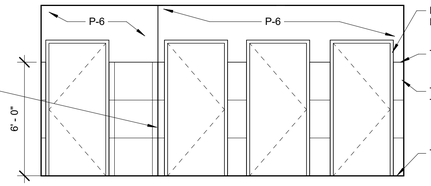
S STAFF RESTROOM
1/4" = 1'-0"



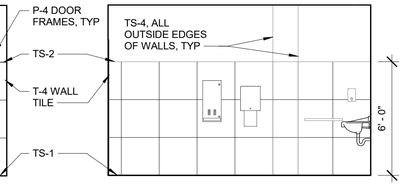
T STAFF RESTROOM VANITY
1/4" = 1'-0"



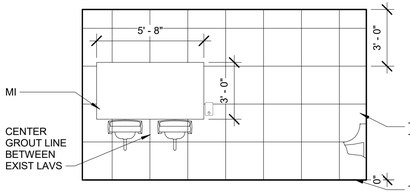
V STAFF RESTROOM
1/4" = 1'-0"



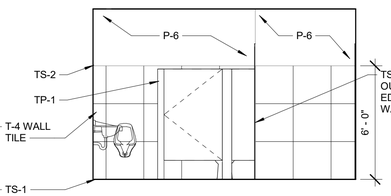
X STAFF RESTROOM
1/4" = 1'-0"



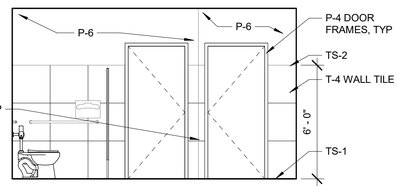
Y RESTROOM 1156
1/4" = 1'-0"



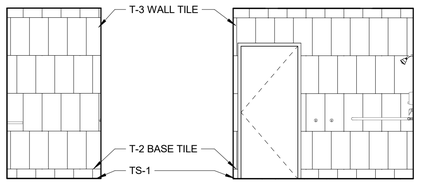
Z RESTROOM 1156
1/4" = 1'-0"



AA RESTROOM 1156
1/4" = 1'-0"

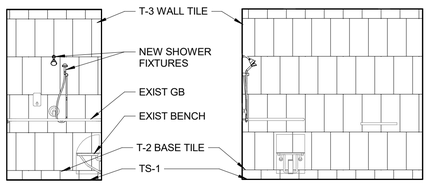


BB RESTROOM 1156
1/4" = 1'-0"



CC SHOWER 1156A
1/4" = 1'-0"

DD SHOWER 1156A
1/4" = 1'-0"



EE SHOWER 1156A
1/4" = 1'-0"

FF SHOWER 1156A
1/4" = 1'-0"

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3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED ARCHITECT
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SALEM, OREGON
STATE OF OREGON

PERMIT SET

project:
CCC - YVC CAMPUS
BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: MP
checked by: AF

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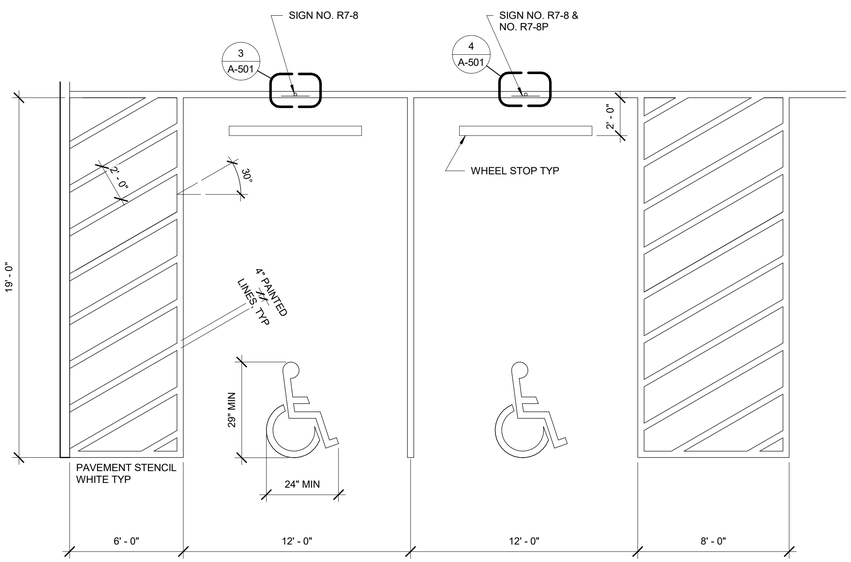
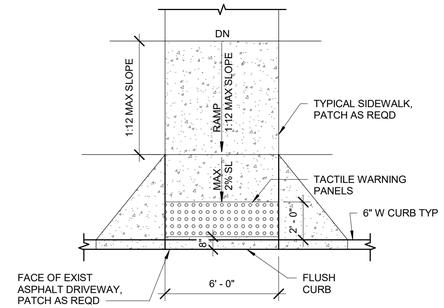
LARGE SCALE PLANS

sheet: A-402

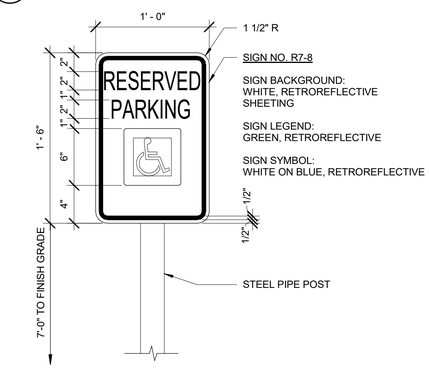
of:



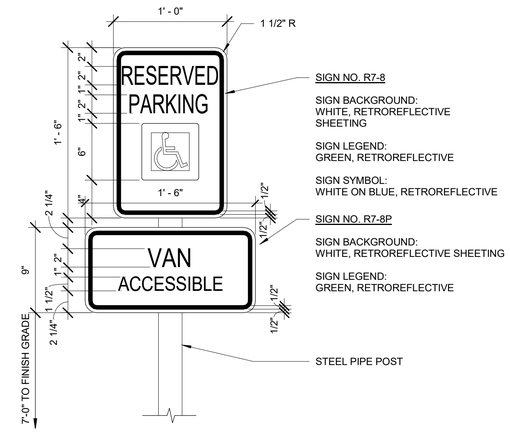
1 ACCESSIBLE PAINTED STRIPING & ADA CURB RAMP
1/4" = 1'-0"



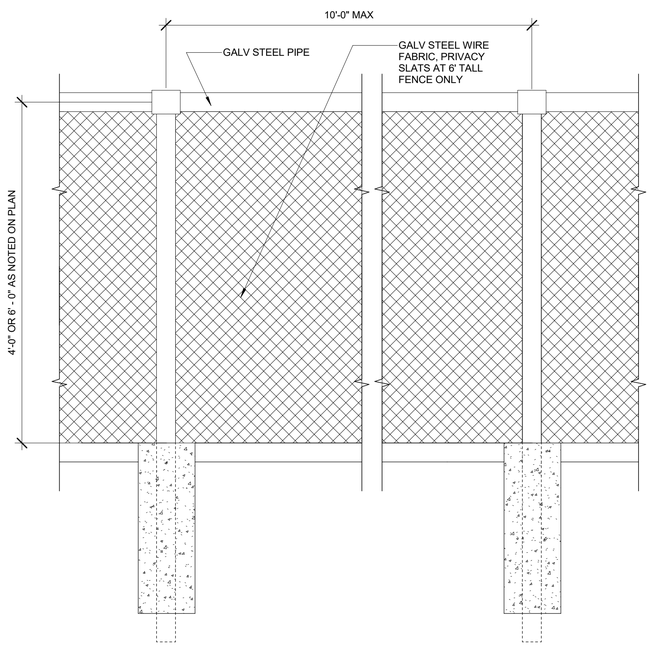
2 CURB RAMP DETAIL
1/4" = 1'-0"



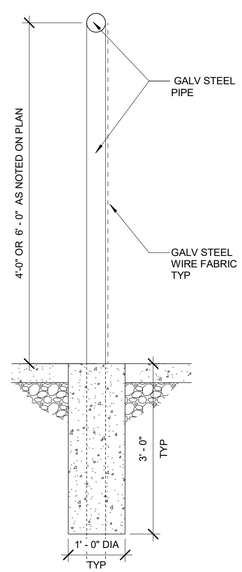
3 ACCESSIBLE PARKING SIGN R7-8
1 1/2" = 1'-0"



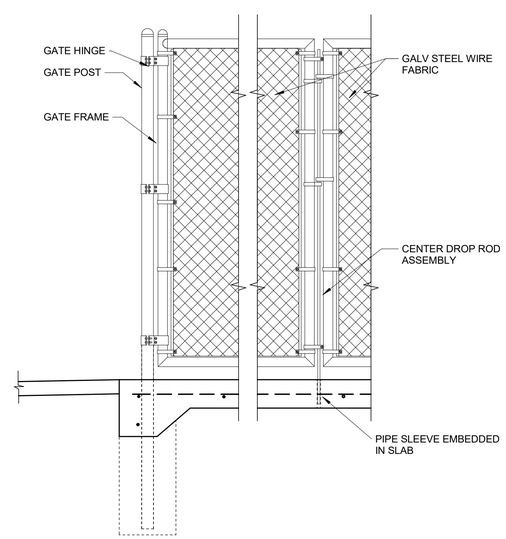
4 ACCESSIBLE PARKING SIGN R7-8 + R7-8P
1 1/2" = 1'-0"



5 FENCE ELEVATION DETAIL
3/4" = 1'-0"



6 FENCE SECTION DETAIL
3/4" = 1'-0"



7 SWING GATE ELEVATION
3/4" = 1'-0"

FACET
ARCHITECTS
Formerly Carlson Veit Junge Architects
3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED ARCHITECT
ANGELA M. FLORES
SALEM, OREGON
STATE OF OREGON

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SITE DETAILS

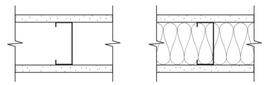
sheet: A-501
of:

GA FILE NO. WP 1072	GENERIC	1 HOUR FIRE	45 to 49 STC SOUND

GYPSUM WALLBOARD, STEEL STUDS

Fire Design:
One layer 5/8″ type X gypsum wallboard or gypsum veneer base applied parallel or at right angles to each side of 3-5/8″, 18 mil steel studs 24″ o.c. with 1″ Type S screws 8″ o.c. at vertical joints and 12″ o.c. at floor and ceiling runners and intermediate studs.
Joints staggered 24″ on each side and on opposite sides. **(NLB)**

Sound Design:
Sound tested with 3-1/2″ glass fiber friction fit in stud cavity.



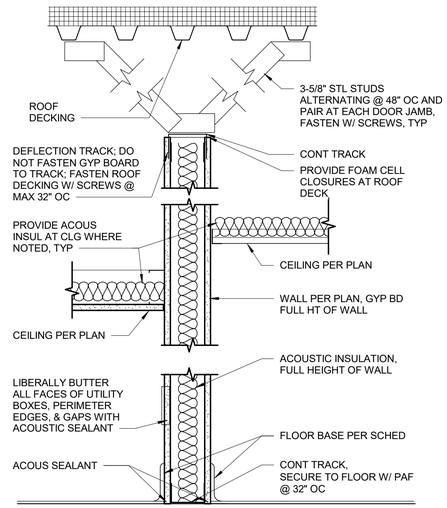
Thickness: 4-7/8″ (Fire and Sound)

Approx. Weight: 6 psf (Fire)
6.2 psf (Sound)

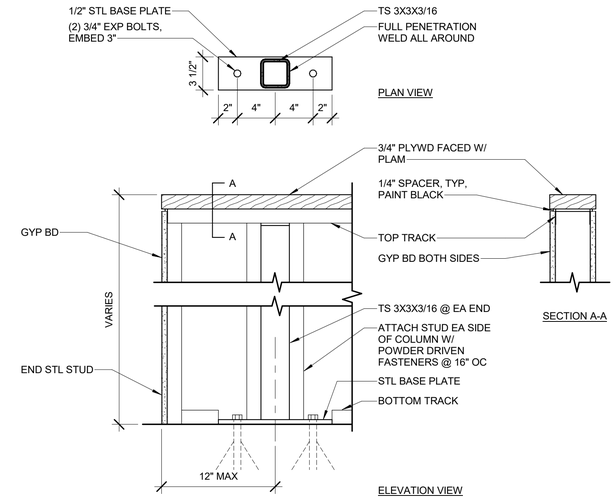
Fire Test: See WP 1350
(FM WP-45, 6-19-68,
OSU T-1770, 8-61,
ULC 79T484, 9T500,79T497, 8-12-81,
ULC Design W415)

Sound Test: RAL TL11-074, 3-23-11

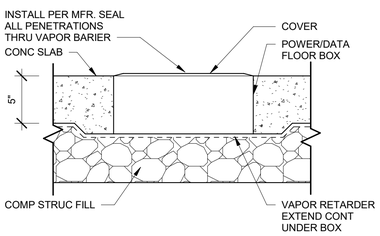
1 TYPICAL WALL DETAIL
3" = 1'-0"



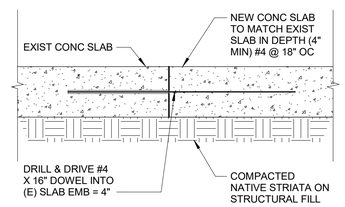
2 TYP WALL 1
1 1/2" = 1'-0"



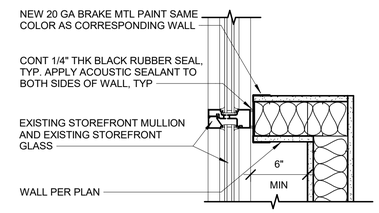
3 PARTIAL HEIGHT WALL
1 1/2" = 1'-0"



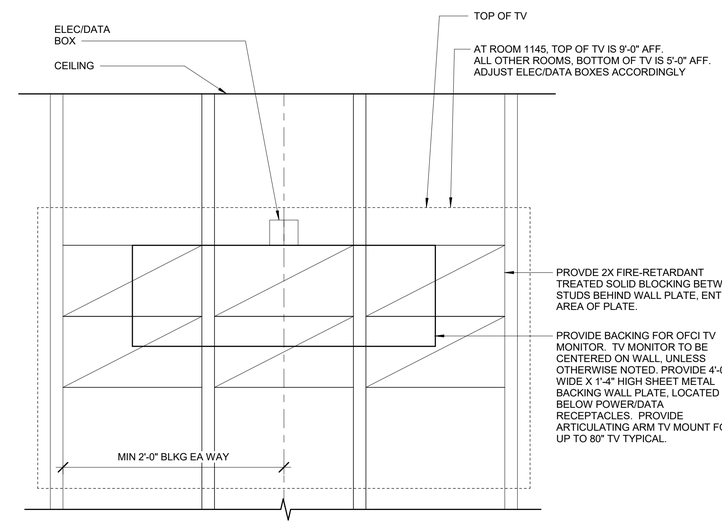
4 FLOOR BOX
1 1/2" = 1'-0"



5 CONC SLAB INFILL
1" = 1'-0"



6 WALL AT EXIST MULLION
1 1/2" = 1'-0"



7 TV MOUNT DIAGRAM
1" = 1'-0"

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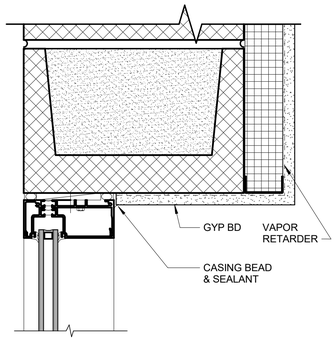
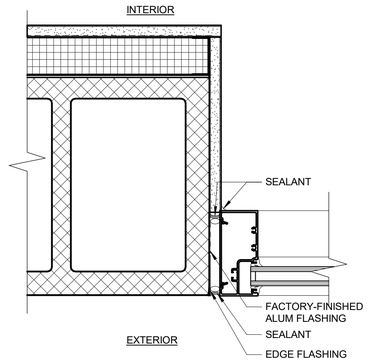
WALL AND FLOOR DETAILS

sheet: A-502

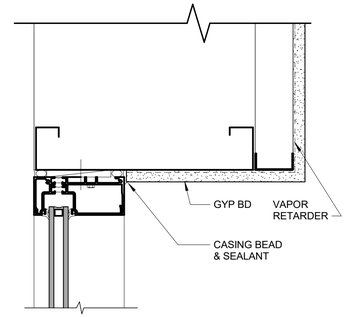
of:



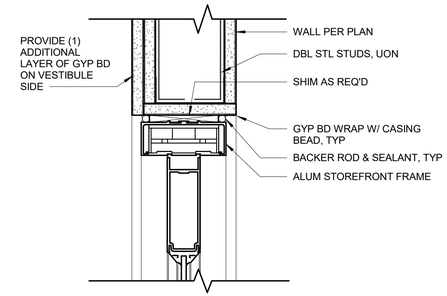
1 STOREFRONT HEAD @ STUCCO
3" = 1'-0"



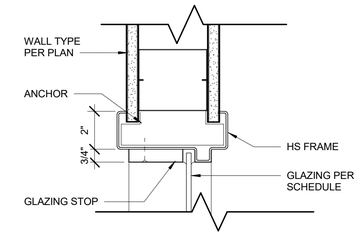
2 STOREFROM JAMB @ STUCCO
3" = 1'-0"



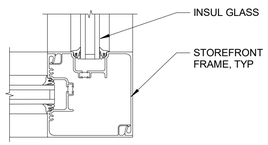
3 STOREFROM HEAD 4"
3" = 1'-0"



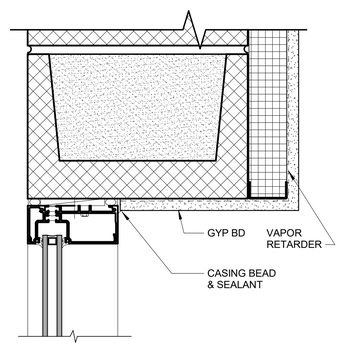
4 STOREFRONT INT HEAD/JAMB SIM
3" = 1'-0"



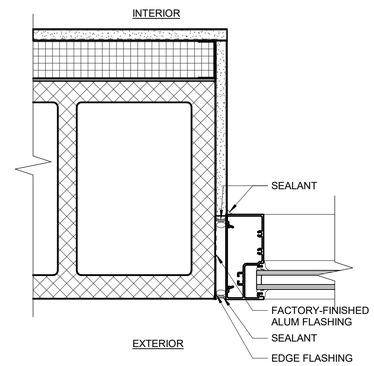
5 INT HS WINDOW - HEAD/JAMB SIM
3" = 1'-0"



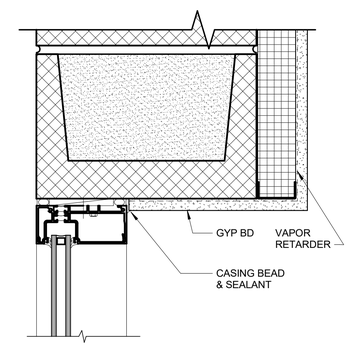
6 STOREFRONT JAMB @ VESTIBULE CORNER
3" = 1'-0"



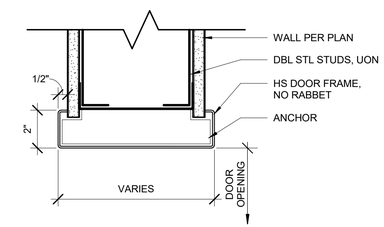
7 STOREFRONT HEAD @ VESTIBULE
3" = 1'-0"



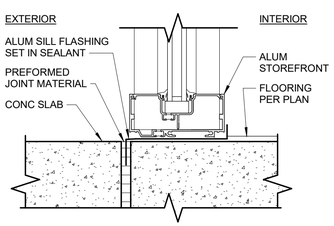
8 STOREFRONT JAMB @ CMU
3" = 1'-0"



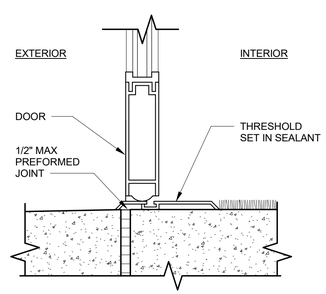
9 STOREFRONT HEAD @ VESTIBULE INT VEST
3" = 1'-0"



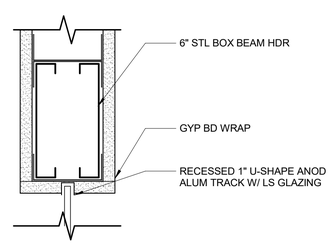
10 DOOR FRAME HEAD/JAMB SIM
3" = 1'-0"



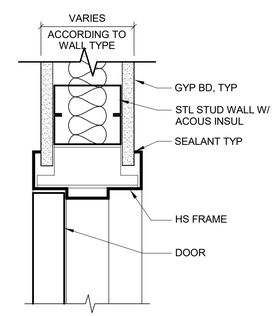
11 STOREFRONT SILL
3" = 1'-0"



12 STOREFRONT DOOR SILL
3" = 1'-0"



13 RECEPTION WINDOW HEAD/ JAMB
3" = 1'-0"



14 HS DOOR/ HEAD JAMB SIM
3" = 1'-0"

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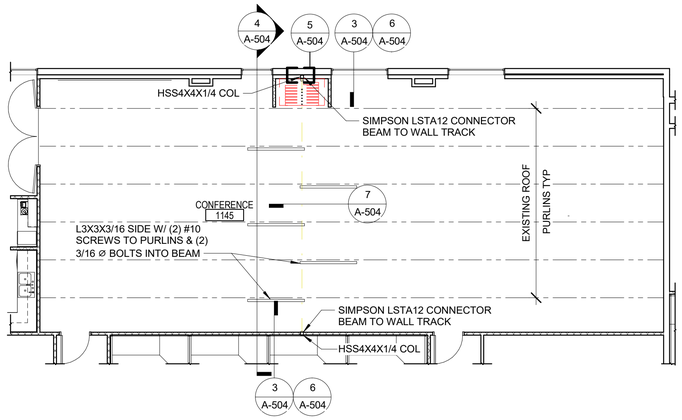
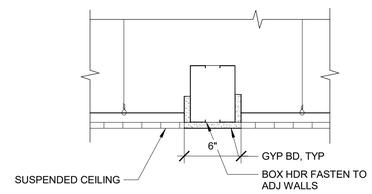
DOOR & WINDOW DTLS

sheet: A-503

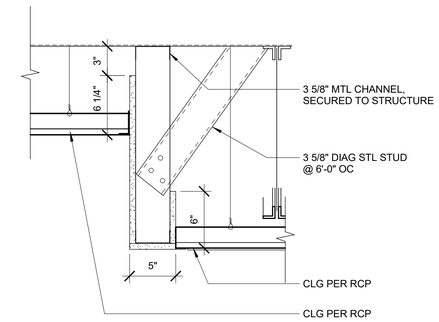
of:



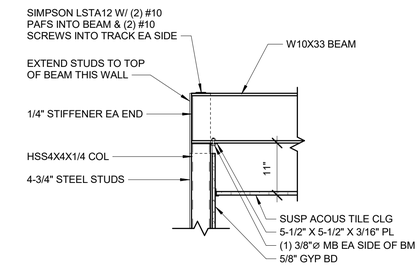
FRAMING PLAN
1/8" = 1'-0"



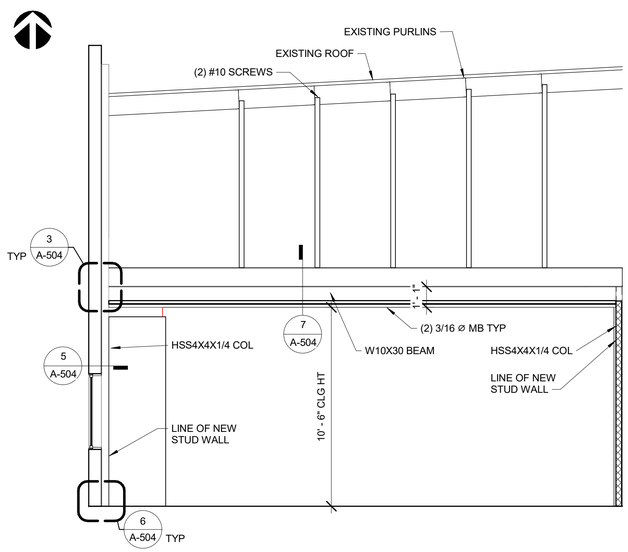
1 BULKHEAD DETAIL
1 1/2" = 1'-0"



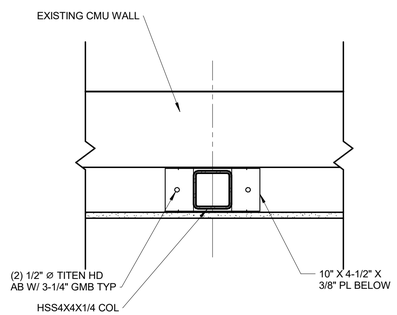
2 CLG SOFFIT DETAIL
1 1/2" = 1'-0"



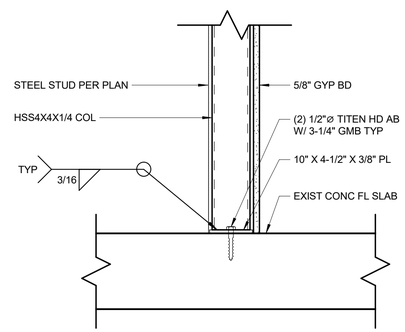
3 COLUMN / BEAM CONNECTION
3/4" = 1'-0"



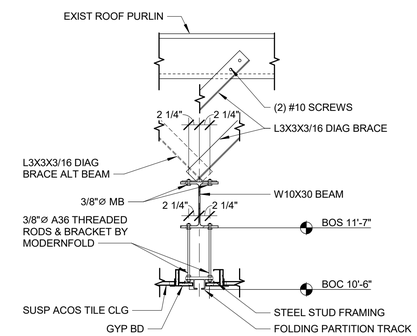
4 FRAMING SECTION
1/4" = 1'-0"



5 COLUMN PLAN
1 1/2" = 1'-0"



6 COLUMN BASE
1 1/2" = 1'-0"



7 BEAM SECTION
3/4" = 1'-0"

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checked by: Checker

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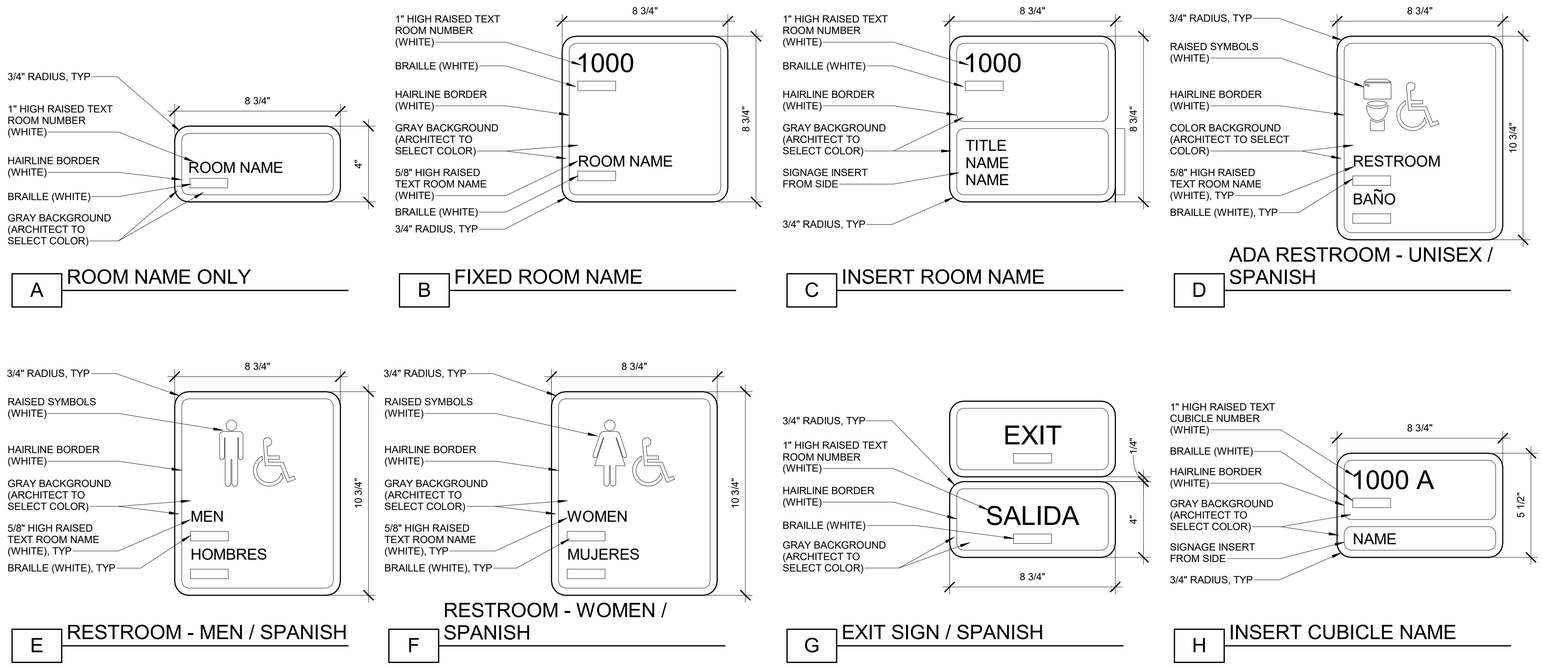
INTERIOR DETAILS

sheet: A-504

of:



1 INTERIOR SIGNAGE DETAIL
3" = 1'-0"

FIRST FLOOR ROOM SIGNANGE 1 OF 2

RM NUMBER	ROOM	SIGN TYPE
1101	LOBBY	NONE
1102	SSP RECEPTION	B, H(6)
1103	CHILD WELFARE RECEPTION	H(9)
1104	TOILET	D
1105	TOILET	D
1106	DV INTERVIEW	C
1107	KIDS	NONE
1108	INTERVIEW	C
1109	INTERVIEW	C
1110	TOILET	D
1111	VIEW	NONE
1112	VISIT	B
1113	VISIT KITCHEN	B
1114	VISIT	B
1115	VIEW	NONE
1116	VISIT	B
1117	OPEN OFFICE	B, H(9)
1118	OPEN OFFICE	H(44)
1119	RESTROOM	D
1119A		NONE
1119B		NONE
1119C		NONE
1119D		D
1119E		D
1119F		NONE
1119G		NONE
1119J		NONE
1120	QUIET ROOM	B
1121	OFFICE	C
1122	OFFICE	C
1123	OFFICE	C
1124	OFFICE	C
1125	OFFICE	C
1126	CONFERENCE	C
1127	CW RECORDS	B
1128	WELLNESS	B
1129	STORAGE	B
1130	OFFICE	C
1131	OFFICE	C
1132	SERVER	A
1133	CLOSET	NONE
1134	CONFERENCE	C
1135	OFFICE	C
1136	FOSTER	C
1137	CLOSET	NONE
1138	CLEAN-UP	D
1139	MOTHERS	B
1140	JANITOR	A
1141	RESTROOM	D
1141A		NONE
1141B		NONE
1141C		NONE
1141D		D
1141E		D
1141F		NONE
1141G		NONE
1141H		NONE
1142	OFFICE SUPPLIES	B
1143	BREAKROOM	B(3), G
1144	CONFERENCE	C
1145	CONFERENCE	C(3), G(3)
1146	OPEN OFFICE	H(4)
1147	STORAGE	B
1150	JOBS	B
1151	STORAGE	B
1152	CONFERENCE	C
1153	OFFICE	C
1154	OFFICE	C
1155	OFFICE	C
1156	RESTROOM	E
1156A	SHOWER	NONE
1157	RESTROOM	F
1157A	SHOWER	NONE
1158	WELLNESS	B
1159	OPEN OFFICE	H(37)
1160	OPEN OFFICE	H(14), G(2)
1161	TOILET	D
1162	BREAK	NONE
1163	FAMILY MEETING	B(2)
1164	INTERVIEW	C
1165	INTERVIEW	C
1166	INTERVIEW	C
1167	INTERVIEW	C
1169	INTERVIEW	C
1170	INTERVIEW	C
1171	MOTHERS	B
1172	INTERVIEW	C

FIRST FLOOR ROOM SIGNANGE 2 OF 2

RM NUMBER	ROOM	SIGN TYPE
1500	VESTIBULE	G(2)
1501	HALL	G
1502	HALL	G
1503	HALL	NONE
1504	HALL	NONE
1505	HALL	NONE
1509	HALL	NONE
1510	VESTIBULE	G(2)
1511	HALL	NONE
1512	HALL	G
1513	HALL	G
1514	HALL	C
1515	HALL	G
1516	HALL	NONE
1517	HALL	G
1518	HALL	NONE
1520	HALL	G
1521	HALL	NONE
1522	HALL	NONE
1523	HALL	G
1524	HALL	NONE
1525	HALL	NONE
1530	HALL	G(2)
1531	HALL	G
1540	VESTIBULE	G(2)

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SALEM, OREGON
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CCC - YVC CAMPUS
BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: Author
checked by: Checker

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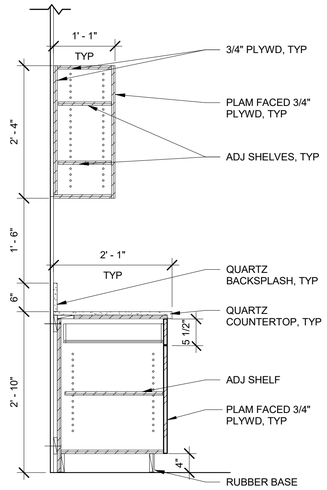
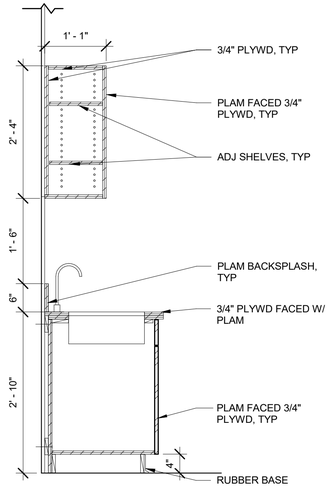
SIGNAGE DETAILS

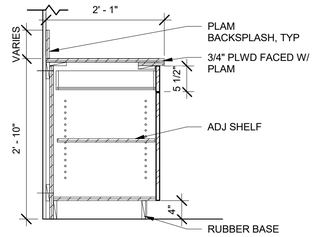
sheet: A-505
of:



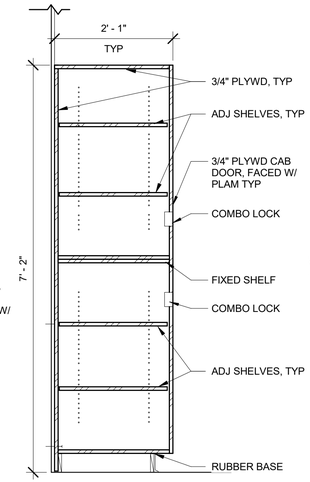
1 TYPICAL CASEWORK SS
3/4" = 1'-0"



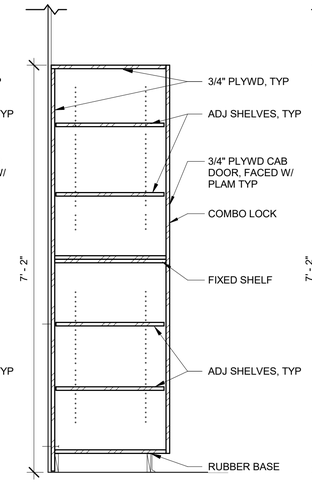
2 OPEN OFFICE CASEWORK
3/4" = 1'-0"



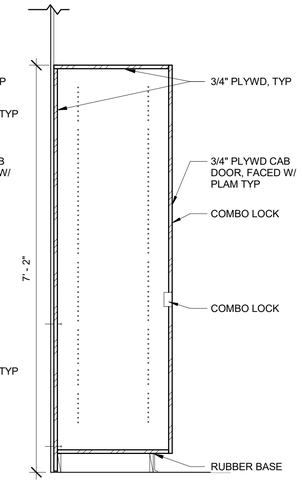
3 TYPICAL CASEWORK PLAM
3/4" = 1'-0"



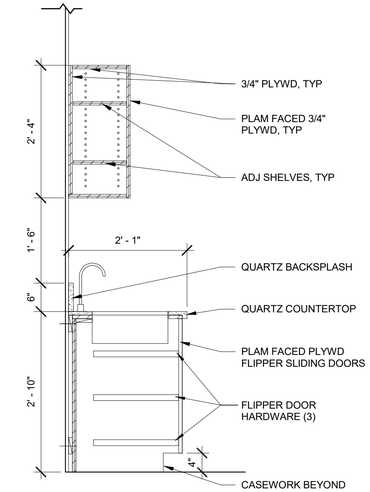
4 4 DOOR CABINET
3/4" = 1'-0"



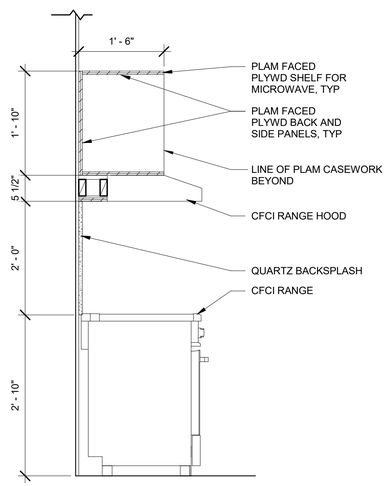
5 2 DOOR CABINET
3/4" = 1'-0"



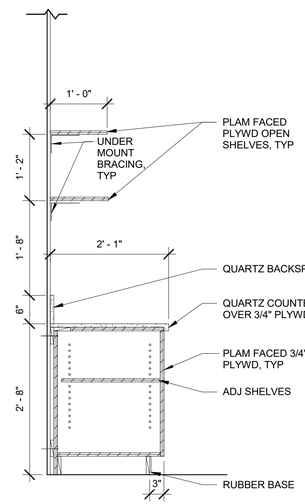
6 2 DOOR CABINET
3/4" = 1'-0"



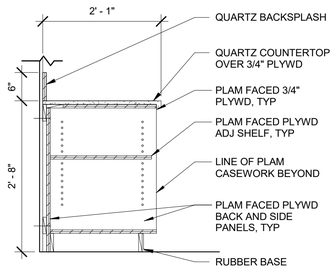
7 SINK DETAIL FLIPPER DOORS
3/4" = 1'-0"



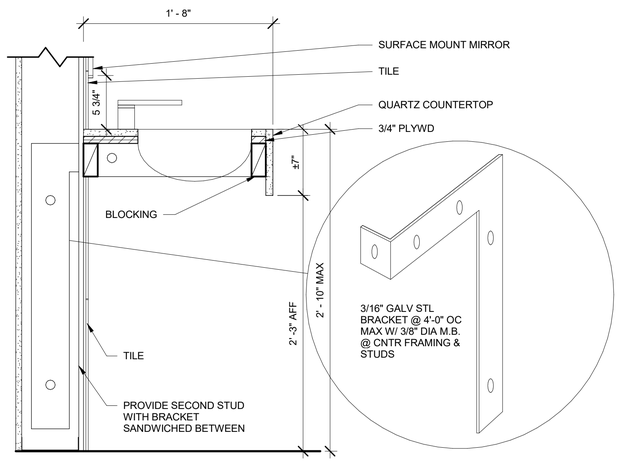
8 MICROWAVE RANGE DETAIL
3/4" = 1'-0"



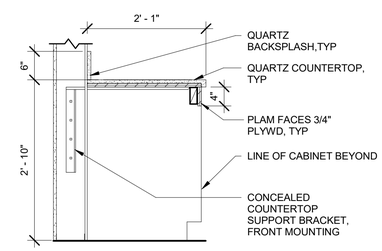
9 COFFEE STATION
3/4" = 1'-0"



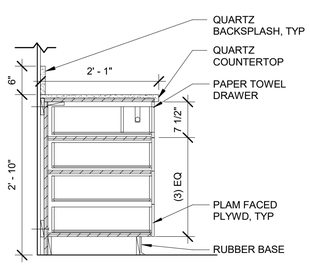
10 COFFEE STATION
3/4" = 1'-0"



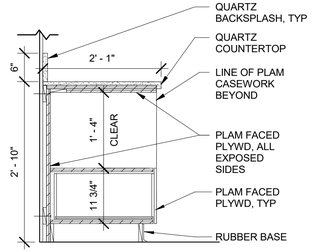
11 VANITY SINK DETAIL
1 1/2" = 1'-0"



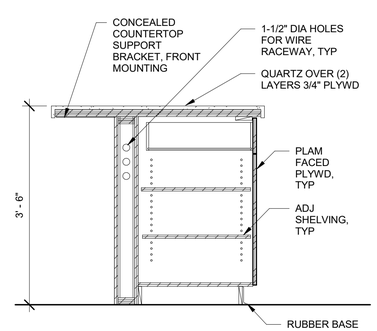
12 WORK SURFACE COUNTERTOP
3/4" = 1'-0"



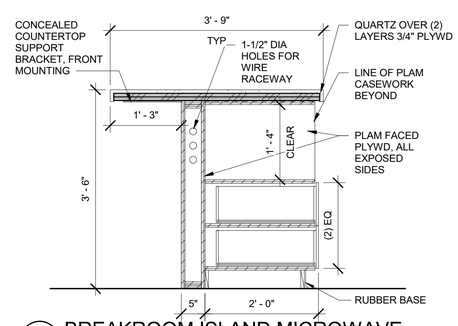
13 PAPER TOWEL DRAWER
3/4" = 1'-0"



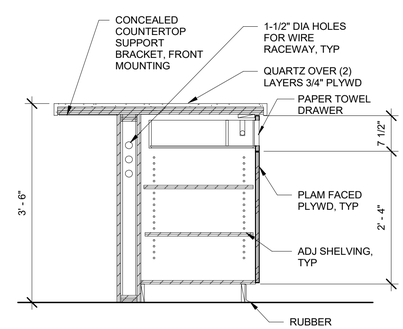
14 MICROWAVE
3/4" = 1'-0"



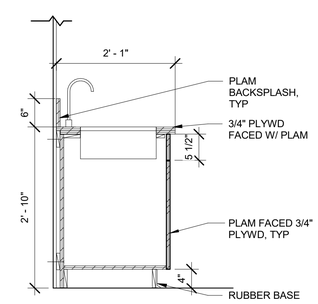
15 BREAKROOM ISLAND TYP
3/4" = 1'-0"



16 BREAKROOM ISLAND MICROWAVE
3/4" = 1'-0"



17 BREAKROOM ISLAND PTD
3/4" = 1'-0"



18 MOTHERS
3/4" = 1'-0"

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MCMINNVILLE, OR 97128

consultants:

revisions:

#	Description	Date

date: 04/25/25
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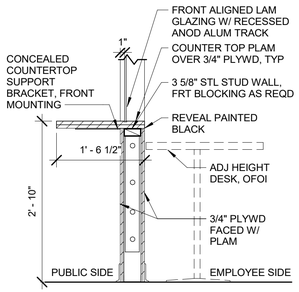
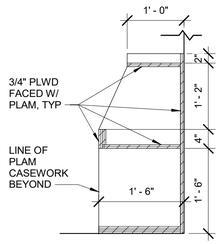
CASEWORK DETAILS

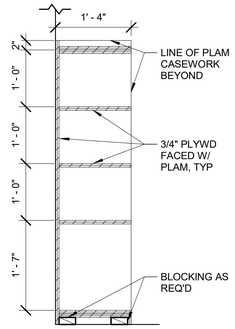
sheet: A-506
of:



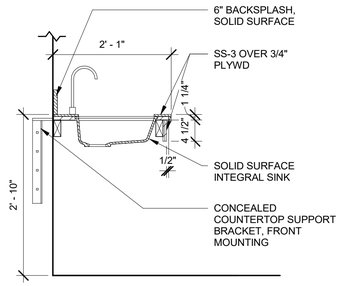
1 RECEPTION
3/4" = 1'-0"



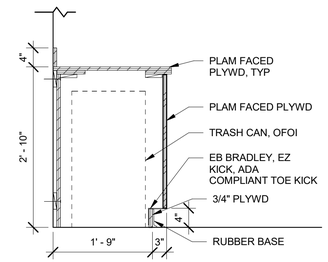
2 VISIT CUBBIES
3/4" = 1'-0"



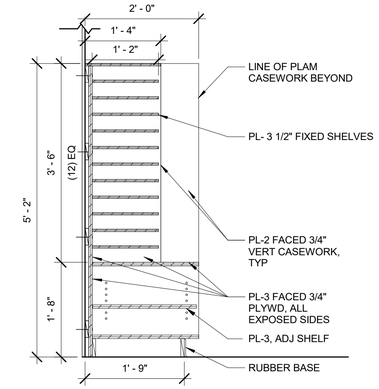
3 VISIT BOOKCASE
3/4" = 1'-0"



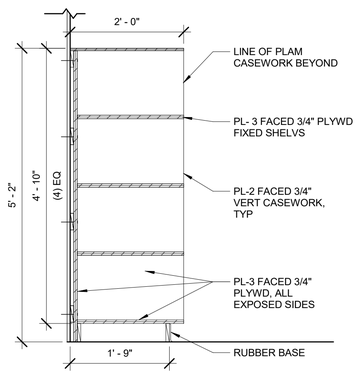
4 CLEAN-UP ROOM
3/4" = 1'-0"



5 MAIL TRASH PULL-OUT
3/4" = 1'-0"



6 MAILBOXES
3/4" = 1'-0"



7 MAIL CUBBIES
3/4" = 1'-0"

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CCC - YVC CAMPUS
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date: 04/25/25
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CASEWORK DETAILS

sheet: A-507

of:

INTERIOR MATERIAL SCHEDULE

TAG	DESCRIPTION	MANUFACTURER	STYLE	COLOR/FINISH	SIZE	GRID/GROUT/ NOTES	NOTES
CEILING							
ACT-1	SUSP ACOUS CLG TILES	CERTAINTEED	BAROQUE BET-197	WHITE	24"X48"	SUSP CLG TILE & GRID	SEE A-105
ACT-2	SUSP ACOUS CLG TILES	CERTAINTEED	BAROQUE BET-157	WHITE	24"X24"	SUSP CLG TILE & GRID	SEE A-105
FLOORING							
CPT-1	CARPET TILE	INTERFACE	HEART STRINGS	PARAMOUR 107381	50 X 50 CM	MONOLITHIC	-
LVT-1	VINYL FLOORING	XL FLOORING/ EZ LAY	EASYPLANK	LLOYDMINSTER	7" X 48"	ASHLAR	-
SV-1	SHEET VINYL	MANNINGTON	ASSURANCE III	MARL 16346	-	-	6" SELF-COVE
WO	WALK OFF CARPET	MILLIKEN	OBEX CUTX TILE FIZZ	RUSSET	19-11/16" X19-11/16"	ASHLAR	-
PAINT							
CP-1	CEILING PAINT	SHERWIN WILLIAMS	-	CLOUD WHITE, FLAT	-	MATCH BENJAMIN MOORE COLORS IN SHERWIN WILLIAMS PAINT	GYP BD CEILINGS
P-1	PAINT	SHERWIN WILLIAMS	-	REVERE PEWTER HC-172 SATIN	-	MATCH BENJAMIN MOORE COLORS IN SHERWIN WILLIAMS PAINT	MAIN FIELD COLOR
P-2	PAINT	SHERWIN WILLIAMS	-	PHILIPSBURG BLUE HC-159 SATIN	-	MATCH BENJAMIN MOORE COLORS IN SHERWIN WILLIAMS PAINT	ACCENT COLOR
P-3	PAINT	SHERWIN WILLIAMS	-	AEGEN TEAL 2163-40 SATIN	-	MATCH BENJAMIN MOORE COLORS IN SHERWIN WILLIAMS PAINT	ACCENT COLOR
P-4	PAINT	SHERWIN WILLIAMS	-	BRANDON BEIGE SEMI-GLOSS	-	MATCH BENJAMIN MOORE COLORS IN SHERWIN WILLIAMS PAINT	DOOR FRAMES
P-5	PAINT	SHERWIN WILLIAMS	-	WOODCLIFF LAKE 980 SEMI GLOSS	-	MATCH BENJAMIN MOORE COLORS IN SHERWIN WILLIAMS PAINT	RAMP HANDRAILS
P-6	PAINT	SHERWIN WILLIAMS	EPOXY	REVERE PEWTER HC-172 SEMI-GLOSS	-	MATCH BENJAMIN MOORE COLORS IN SHERWIN WILLIAMS PAINT	RESTROOM WALLS
PARTITIONS							
TP-1	TOILET PARTITION	SCRANTON PRODUCTS	ECLIPSE	SHALE ORANGE PEEL	-	-	RESTROOMS 1156 & 1157
RUBBER BASE							
RB-1	RUBBER BASE	JOHNSONITE	COVE BASE	DARK BROWN	4" TYP	-	ALL ROOMS, UON
SOLID SURFACE							
SS-1	QUARTZ	CORIAN	-	IRONSTONE	-	-	BREAKROOM AND VISIT KITCHEN COUNTERTOP
SS-2	QUARTZ	CORIAN	-	VENETIA CREAM Leathered	-	-	BREAKROOM ISLAND COUNTERTOP
SS-3	SOLID SURFACE	WILSONART	-	SAHARAN NIGHT	-	-	CLEAN-UP 1138
SURFACES							
PL-1	LAMINATE	LAB DESIGN LAMINATE	-	CINDER ZEBRA PS547-AFP	-	-	CASEWORK COUNTERTOP
PL-2	LAMINATE	PIONITE	-	LUMINESCENT SILK AY135	-	-	VERTICAL CASEWORK
PL-3	LAMINATE	NEVAMAR	-	FOUNDRY S-2084	-	-	OPEN SHELVING
TILE							
T-1	FLOOR TILE & WALL TILE	EMSER TILE	CITIZEN	RESIDENT MATTE	12"x24"	FLOOR: ASHLAR, SEE A-702 & A-703 FOR PATTERN DIRECTION. WALLS: STACK BOND SEE A-402. GROUT: CUSTOM WALNUT 541	RESTROOMS
T-2	BASE TILE	EMSER TILE	CITIZEN	RESIDENT MATTE	CUT IN 12" X 6" LENGTHS	ALIGN WITH FLOOR TILE, GROUT: CUSTOM CHATEAU 183	RESTROOMS
T-3	WALL TILE	EMSER TILE	CITIZEN	ELECTOR MATTE	12" X 24"	VERTICAL 1/3 OFFSET ALIGN PATTERN WITH BASE TILE, GROUT: CUSTOM CHATEAU 183	RESTROOMS
T-4	WALL TILE	TILE BAR	SHOP STORIES	TAUPE	23.62" x 23.62"	STACK BOND, GROUT: CUSTOM: CHATEAU 183	RESTROOMS
T-5	BASE TILE	EMSER TILE	CITIZEN	RESIDENT MATTE	CUT IN 24" X 6" LENGTHS	ALIGN WITH WALL TILE, GROUT: CUSTOM CHATEAU 183	RESTROOMS
TRANSITIONS							
TS-1	TRANSITION	SCHLUTER	DILEX-HKS	STAINLESS STEEL	-	FLOOR TO BASE TILE TRANSITIONS	RESTROOMS
TS-2	TRANSITION	SCHLUTER	JOLLY	ALUMINUM	-	EDGE OF WALL TILE	RESTROOMS
TS-3	TRANSITION	SCHLUTER	SHIENE	ALUMINUM	-	TILE TO CARPET	RESTROOMS
TS-4	TRANSITION	SCHLUTER	QUADEC	ALUMINUM	-	OUTSIDE EDGES OF WALL	RESTROOMS
WALL PROTECTION							
CG-1	CORNER GUARDS	-	-	STAINLESS STEEL	-		ALL 90 DEGREE CORNERS NEW & EXIST
CR-1	CHAIR RAIL	INPRO	2500 SERIES	TAUPE 0113	-	-	SEE A-701-703
WP-1	WALL PROTECTION	CARNEGIE	TURRIS	11	-	INSTALL VERTICALLY TO REDUCE SEAMS	LOBBY WING WALLS

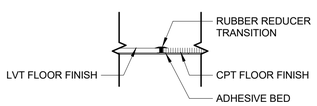
FINISH NOTES

1. PREP DEMOD FLOOR FOR NEW FLOORING INSTALL
2. INSTALL FLOOR TRANSITION WHERE NEW FLOOR MEETS EXISTING FLOOR
3. ALL WALLS, NEW AND EXISTING TO BE PAINTED P-1 UON
4. INSTALL RUBBER REDUCER AT ALL LVT TO CARPET FLOORING TRANSITIONS
5. AT ALL DAMAGED WALL SURFACES, PATCH AND REPAIR TO MATCH EXISTING WALL FINISH
6. AT AREAS WITH CARPET AND LVT TO BE RB-1, UON.
7. SEE SHEETS A-202 & A-203 FOR INTERIOR ELEVATIONS. SEE SHEETS A-401 & A-402 FOR LARGE SCALE PLANS FOR ADDITIONAL FINISH INFORMATION
8. FLOORING TO RUN BELOW ALL CASEWORK/ COUNTERTOPS THAT ARE OPEN BELOW AND UNDER DISHWASHER
9. SEE SHEETS A-108, A-109, A-110 REFLECTED CEILING PLANS FOR CELING COLORS

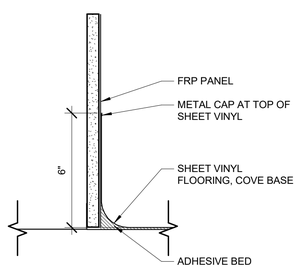
FINISH LEGEND

0-00 FINISH TAG

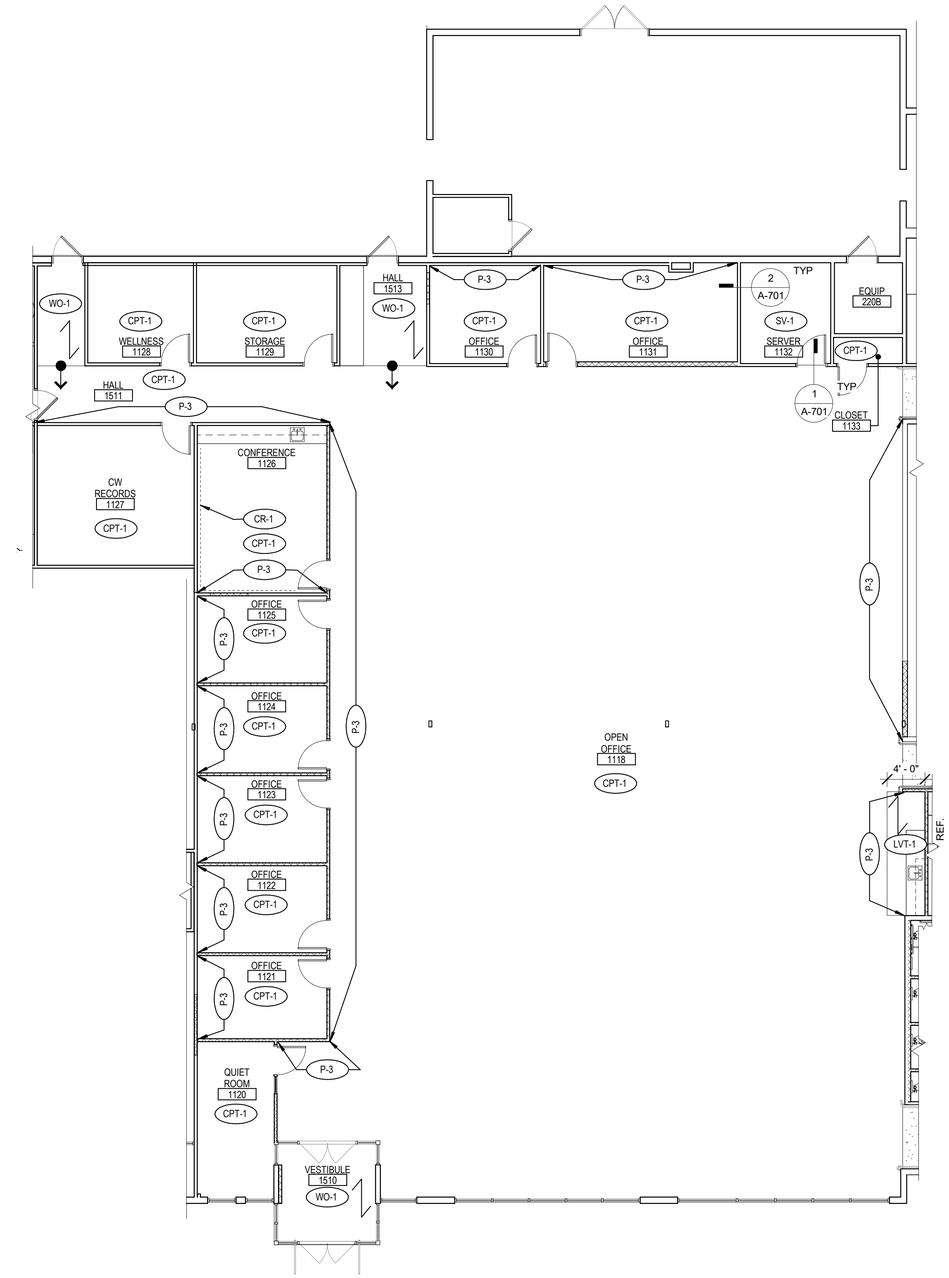
FLOOR DIRECTION ARROW



1 FLOOR TRANSITION DTL
3" = 1'-0"



2 COVE BASE DTL
3" = 1'-0"



FINISH PLAN - AREA A
1/8" = 1'-0"

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FINISH SCHEDULE & FINISH PLAN- AREA A

sheet: A-701

of:

FINISH NOTES

1. PREP DEMOD FLOOR FOR NEW FLOORING INSTALL
2. INSTALL FLOOR TRANSITION WHERE NEW FLOOR MEETS EXISTING FLOOR
3. ALL WALLS, NEW AND EXISTING TO BE PAINTED P-1 UON
4. INSTALL RUBBER REDUCER AT ALL LVT TO CARPET FLOORING TRANSITIONS
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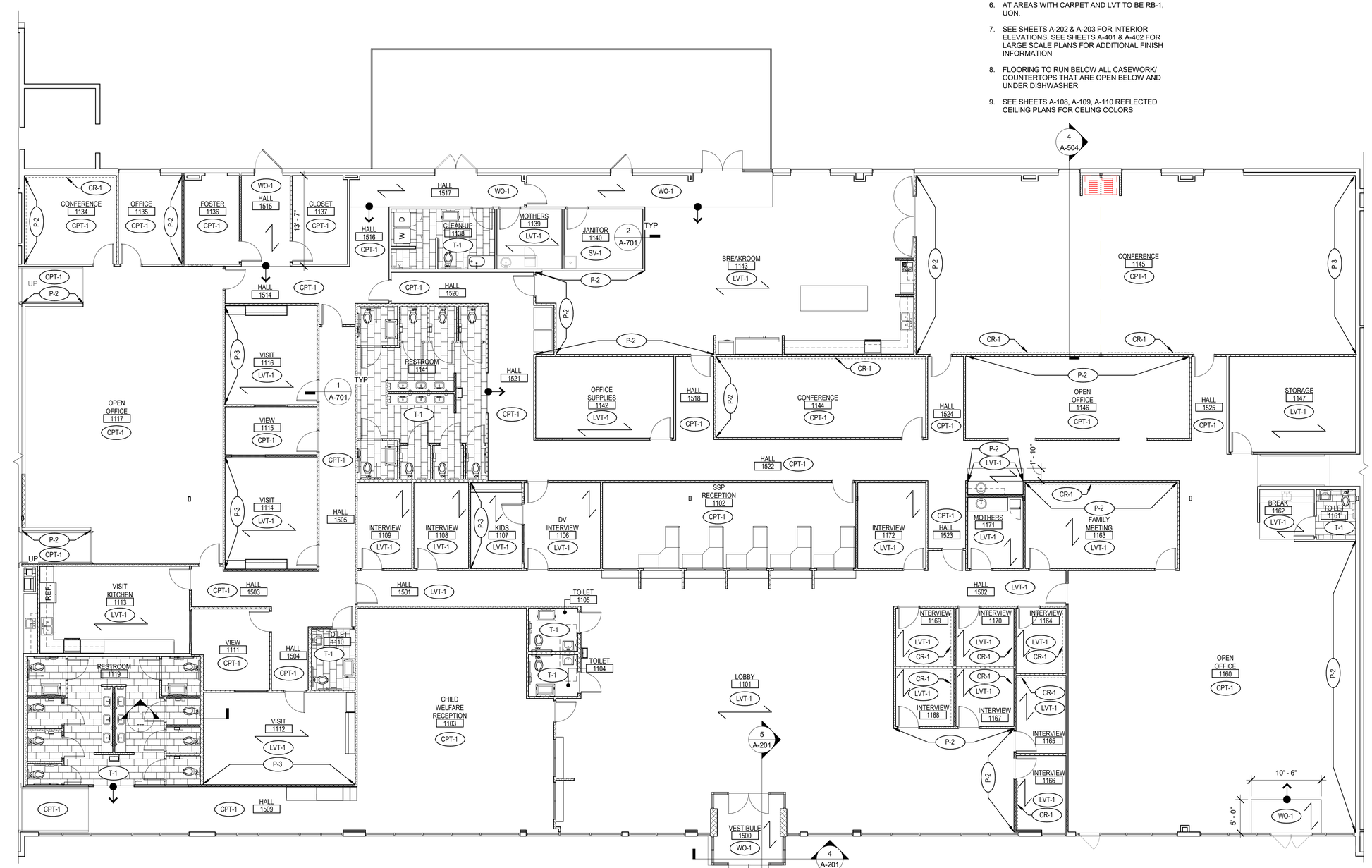
FINISH LEGEND

0-00 FINISH TAG

FLOOR DIRECTION ARROW



FINISH PLAN - AREA B
1/8" = 1'-0"

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CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: MP
checked by: AF

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FINISH PLAN-
AREA B

sheet: A-702

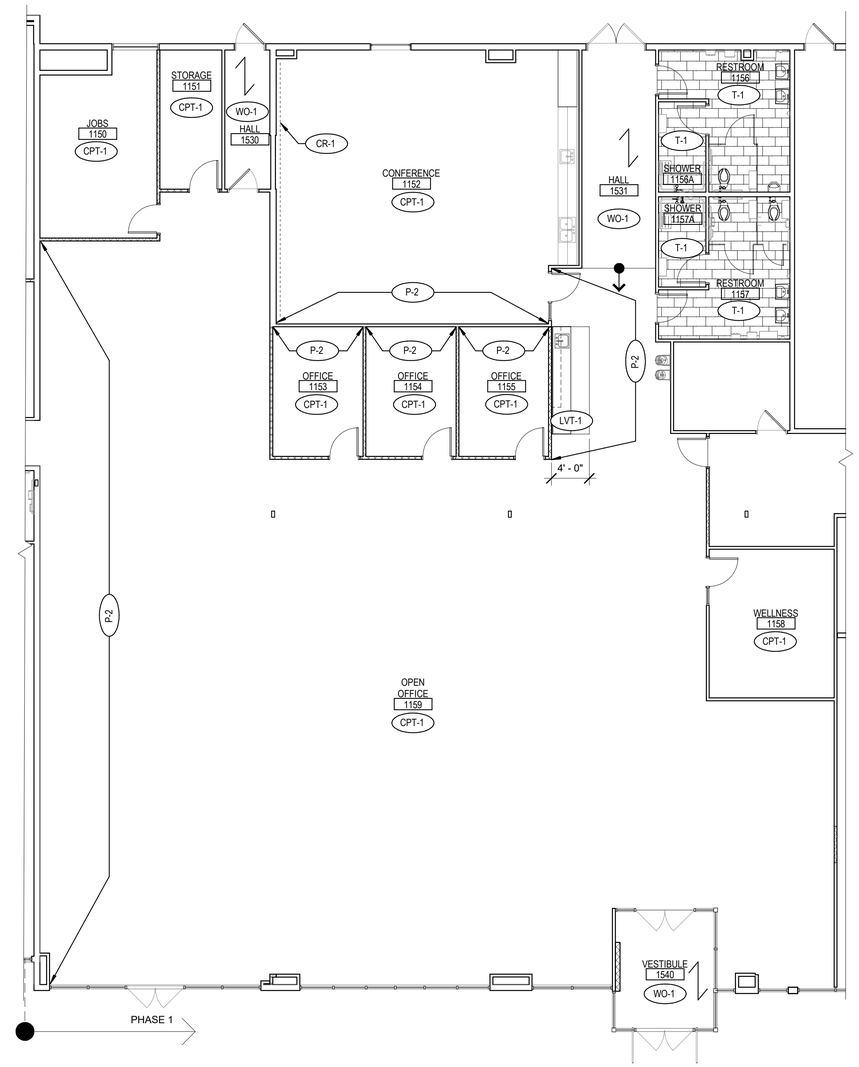
of:

FINISH NOTES

1. PREP DEMOD FLOOR FOR NEW FLOORING INSTALL
2. INSTALL FLOOR TRANSITION WHERE NEW FLOOR MEETS EXISTING FLOOR
3. ALL WALLS, NEW AND EXISTING TO BE PAINTED P-1 UON
4. INSTALL RUBBER REDUCER AT ALL LVT TO CARPET FLOORING TRANSITIONS
5. AT ALL DAMAGED WALL SURFACES, PATCH AND REPAIR TO MATCH EXISTING WALL FINISH
6. AT AREAS WITH CARPET AND LVT TO BE RB-1, UON.
7. SEE SHEETS A-202 & A-203 FOR INTERIOR ELEVATIONS. SEE SHEETS A-401 & A-402 FOR LARGE SCALE PLANS FOR ADDITIONAL FINISH INFORMATION
8. FLOORING TO RUN BELOW ALL CASEWORK/ COUNTERTOPS THAT ARE OPEN BELOW AND UNDER DISHWASHER
9. SEE SHEETS A-108, A-109, A-110 REFLECTED CEILING PLANS FOR CELING COLORS

FINISH LEGEND

0-00	FINISH TAG
	FLOOR DIRECTION ARROW



FINISH PLAN - C
1/8" = 1'-0"

FACET ARCHITECTS
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SALEM, OREGON
STATE OF OREGON

PERMIT SET

project:
CCC - YVC CAMPUS
BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:

revisions:

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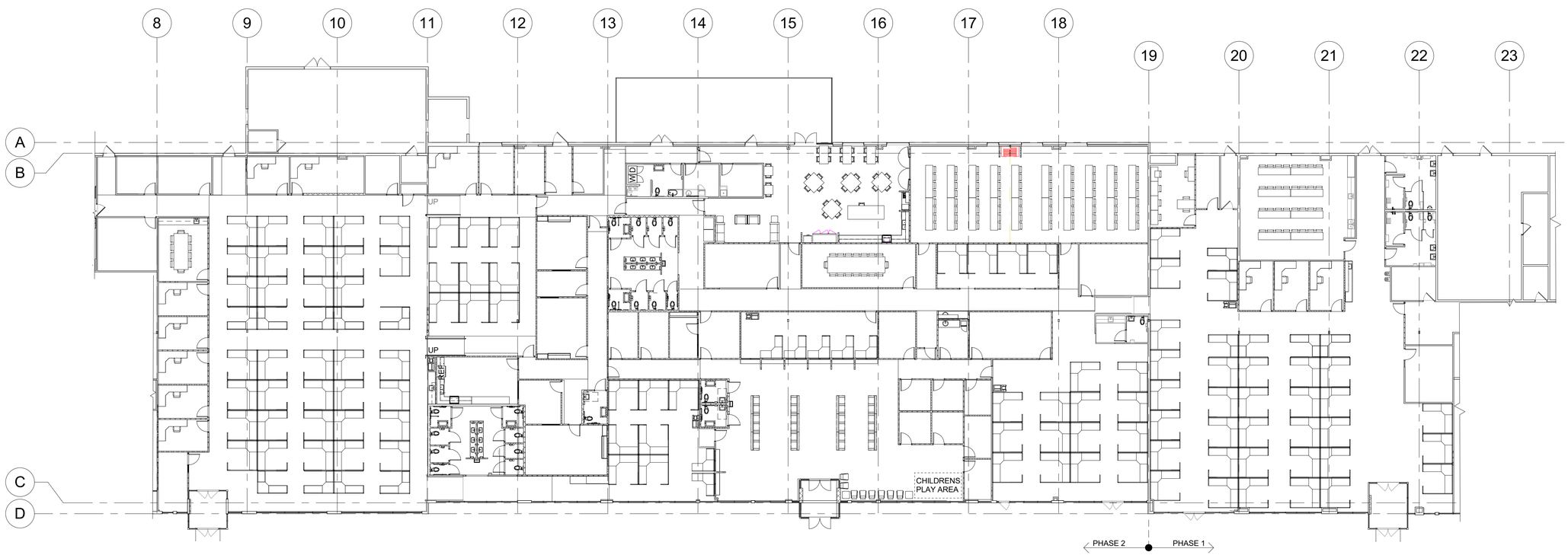
FINISH PLAN-
AREA C

sheet: A-703

of:

GENERAL NOTES

1. ALL FURNITURE TO BE OFCI



FURNITURE PLAN
1/16" = 1'-0"

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FURNITURE PLAN

sheet: A-704

of:

FIRE PROTECTION DESIGN CRITERIA

NFPA 13 SHALL BE USED FOR THE LOCATION, SIZING, & INSTALLATION OF PIPING & SPRINKLER SYSTEMS UNLESS LOCAL FIRE MARSHAL OR OWNER'S INSURANCE UNDERWRITER REQUIREMENTS ARE MORE STRINGENT.

FIRE PROTECTION SPRINKLER DESIGN CRITERIA:

PROVIDE THE FOLLOWING HAZARD CLASSIFICATIONS AND DENSITIES PER CURRENT NFPA 13 STANDARDS:

- LIGHT HAZARD OCCUPANCIES: 0.10 GPM/FT2 DENSITY AT MOST REMOTE 1500 SQUARE FEET FOR PUBLIC AREAS.
- ORDINARY HAZARD OCCUPANCIES GROUP 1: 0.15 GPM/FT2 DENSITY AT MOST REMOTE 1500 SQUARE FEET FOR MECHANICAL ROOM, KITCHEN, LABORATORY, AND PARKING AREAS.
- ORDINARY HAZARD OCCUPANCIES GROUP 2: 0.20 GPM/FT2 DENSITY AT MOST REMOTE 1500 SQUARE FEET FOR MECHANICAL ROOM, KITCHEN, LABORATORY, AND PARKING AREAS.

THE CONTRACTOR SHALL BE REQUIRED TO OBTAIN CURRENT FLOW TEST INFORMATION PRIOR TO STARTING THEIR DESIGN OF THE FIRE SPRINKLER SYSTEM.

GENERAL NOTES:

A. THIS IS A STANDARD LEGEND SHEET, THEREFORE, SOME SYMBOLS MAY APPEAR ON THIS SHEET THAT DO NOT APPEAR ON THE DRAWINGS.

SYMBOLS

A	ACCESS PANEL	#	NUMBERED NOTE
	POINT OF CONNECTION	X	REMOVE EXISTING
E	EXISTING TO REMAIN	K	CAP EXISTING / CAP FOR FUTURE
B	BELOW GRADE / FLOOR	R	RELOCATE EXISTING
1	REVISION NUMBER	F	FUTURE

XX-XXX
- UNIT NUMBER
- FLOOR UNIT IS LOCATED ON
- EQUIPMENT TYPE

XXXX-XX-XXXXX
- UNIT NUMBER
- FLOOR UNIT IS LOCATED ON
- EQUIPMENT TYPE

EQUIPMENT

X / XXX.XX
- DETAIL NUMBER
- SHEET NUMBER

DETAIL CALLOUT

DEMOLITION LEGEND

REMOVE EXISTING PIPE

REMOVE EXISTING EQUIPMENT

NEW, EXISTING, & FUTURE WORK

EXISTING PIPING

NEW PIPING

FUTURE PIPING

EXISTING EQUIPMENT

NEW EQUIPMENT

FUTURE EQUIPMENT

EXISTING EQUIPMENT CLEARANCES

NEW EQUIPMENT CLEARANCES

FUTURE EQUIPMENT CLEARANCES

FIRE PROTECTION SHEET LIST

SHEET #	SHEET NAME
FP-001	SYMBOLS, LEGENDS, & ABBREVIATIONS - FIRE PROTECTION
FP-101	DEMOLITION FLOOR PLAN - FIRE PROTECTION
FP-102	OVERALL FLOOR PLAN - FIRE PROTECTION
Grand total: 3	

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PERMIT SET

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: PWN
checked by: RLW

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SYMBOLS, LEGENDS, & ABBREVIATIONS - FIRE PROTECTION

sheet: FP-001

of:

GENERAL NOTES:

A. VERIFY EXISTING CONDITIONS PRIOR TO BEGINNING WITH WORK. PRIOR TO PROCEEDING WITH WORK, NOTIFY ARCHITECT ABOVE ANY DISCREPENCIES BETWEEN THE DESIGN DOCUMENTS AND FIELD CONDITIONS.

B. COORDINATE DEMOLTION WORK WITH ALL OTHER TRADES.

C. AFTER COMPLETEING DEMO WORK, VERIFY THAT ALL SERVICES TO THE AREA NOT INCLUDED IN THE DEMO WORK SCOPE AREA ARE FUNCTIONAL.

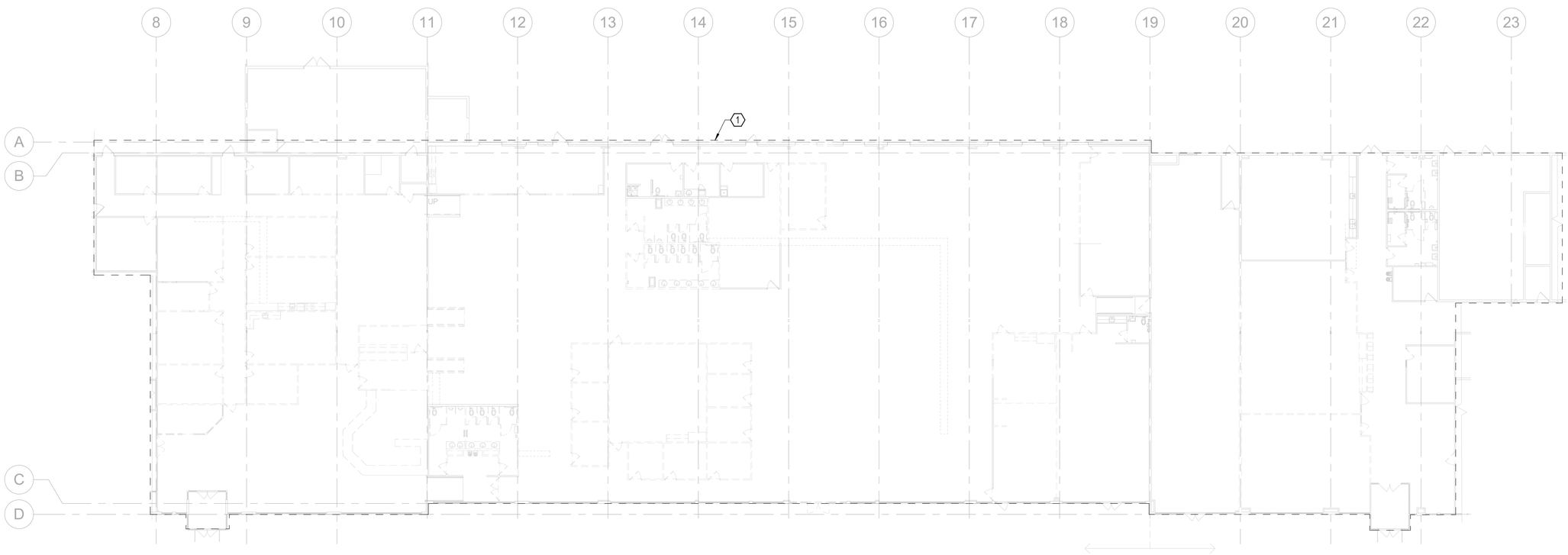
D. ALL PIPING AND EQUIPMENT SERVING AREAS OUTSIDE OF PROJECT SCOPE TO REMAIN IN SERVICE.

E. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS/DEMOLTION.

F. FIRE PROTECTION CONTRACTOR IS RESPONSIBLE FOR PROVIDING FIRE WATCH WHENEVER FIRE SPRINKLER SYSTEM IS NOT OPERATIONAL DURING CONSTRUCTION.

⬡ NOTES:

1. DEMOLISH EXISTING FIRE SPRINKLER PIPING AS NECESSARY TO SUPPORT NEW PROGRAM. EXISTING SPRINKLER MAIN DISTRIBUTION AND BRANCH PIPING THROUGHOUT THE FLOOR WILL NEED TO BE DEMOLISHED OR MODIFIED TO ACCOMMODATE THE MECHANICAL, ELECTRICAL, PLUMBING, STRUCTURAL, AND ARCHITECTURAL DESIGNS. CONTRACTOR'S SCOPE OF WORK SHALL INCLUDE ALL REQUIRED MODIFICATIONS THROUGH MULTIDISCIPLINARY SHOP DRAWING COORDINATION EFFORTS.



DEMOLITION FLOOR PLAN - FIRE PROTECTION
1/16" = 1'-0"

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consultants:
PAE
pae-engineers.com

PERMIT SET

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: PWN
checked by: RLW

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DEMOLITION FLOOR PLAN - FIRE PROTECTION

sheet: FP-101

of:

GENERAL NOTES:

A. VERIFY EXISTING CONDITIONS PRIOR TO BEGINNING WITH WORK. PRIOR TO PROCEEDING WITH WORK, NOTIFY ARCHITECT ABOUT ANY DISCREPANCIES BETWEEN THE DESIGN DOCUMENTS AND FIELD CONDITIONS.

B. COORDINATE WORK WITH ALL OTHER TRADES.

C. ALL PIPING AND EQUIPMENT SERVING AREAS OUTSIDE OF PROJECT SCOPE TO REMAIN IN SERVICE.

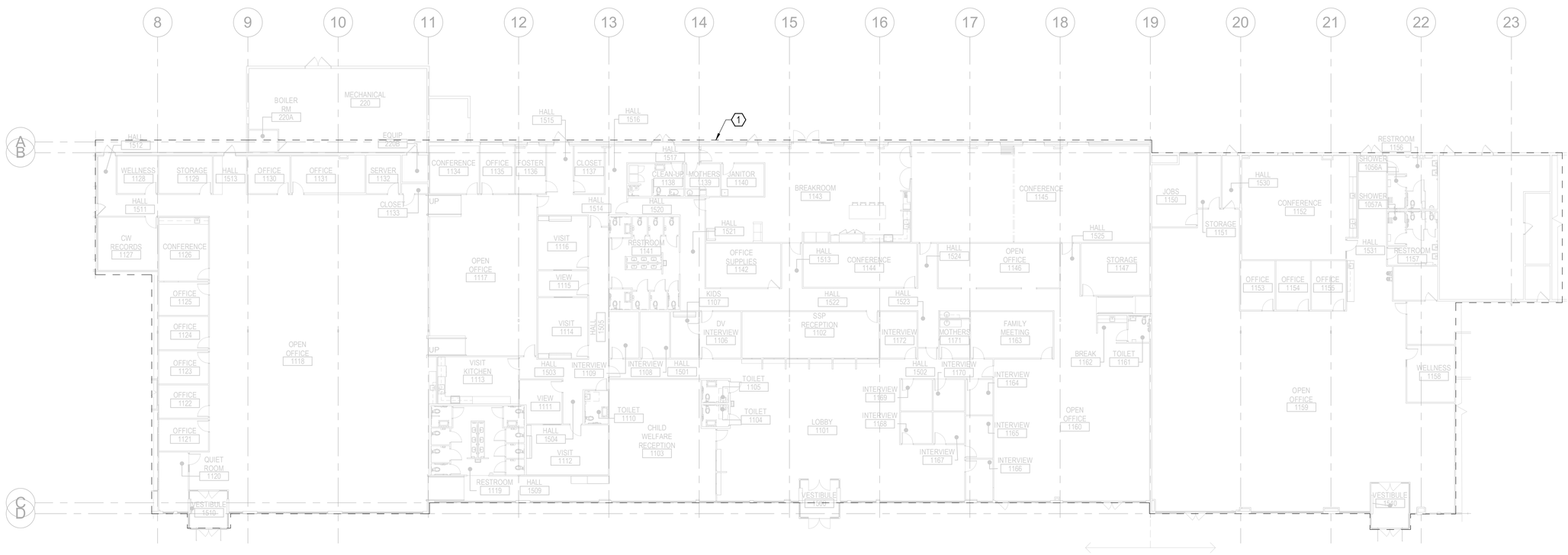
D. FIRE PROETECTION SYSTEM SHALL REMAIN FULLY FUNCTIONAL DURING ENTIRE CONSTURCTION PHASE. FIRE PROTECTION CONTRACTOR IS REPSONSIBLE FOR PROVIDING FIRE WATCH WHENEVER FIRE SPRINKLER SYSTEM IS NOT OPERATIONAL DURING CONSTRUCTION.

E. MODIFY THE EXISITNG PIPING DISTRIBUITION AS NEEDED AND INSTALL NEW QUICK RESPONSE CONCEALED SPINKLER HEADS THROUGHOUT THE PROJECT AREA TO PROVIDE FULL AREA CONVERAGE AS REQUIRED BY NFPA 13.

F. THESE DRAWINGS ACCOMPANY PERFORMANCE SPECIFICATIONS FOR DESIGN BUILT FIRE PROJECTION SYSTEMS

NOTES:

1. PROJECT AREA. MODIFY FIRE SPRINKLER MAIN PIPING, BRANCH PIPING AND QUICK RESPONSE SPRINKLER HEAD LAYOUT AS NECESSARY TO PROVIDE MINIMUM COVERAGE PER NFPA 13. MAIN SPRINKLER PIPING DISTRIBUTION WILL NEED TO BE MODIFIED TO COORDINATE WORK WITH OTHER TRADES IN THE FIELD. FIRE PROTECTION DESIGN-BUILD CONTRACTOR REQUIRED TO PARTICIPATE IN MULTIDISCIPLINARY SHOP DRAWING COORDINATION PROCESS.



OVERALL FLOOR PLAN - FIRE PROTECTION
1/16" = 1'-0"

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MCMININNVILLE, OR 97128

consultants:
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revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: PWN
checked by: RLW

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OVERALL FLOOR PLAN - FIRE PROTECTION

sheet: FP-102

of:

STANDARD ABBREVIATIONS

AD	AREA DRAIN
ADA	AMERICANS WITH DISABILITIES ACT
AF	AIRFOIL
AFF	ABOVE FINISHED FLOOR
ALT	ALTERNATIVE
AP	ACCESS PANEL
BFF	BELOW FINISHED FLOOR
BOP	BOTTOM OF PIPE
BOS	BOTTOM OF STRUCTURE
BSMT	BASEMENT
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNITS PER HOUR
BTV	BUTTERFLY VALVE
BV	BALANCING VALVE
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CL	CENTERLINE
CO	CLEANOUT
CONN	CONNECT, CONNECTION
CONT	CONTINUED, CONTINUATION
CP	CIRCULATING PUMP
CTG	CLEANOUT TO GRADE
CV	CHECK VALVE
DF	DRINKING FOUNTAIN
DFU	DRAINAGE FIXTURE UNIT
DIA	DIAMETER
DN	DOWN (PENETRATES FLOOR)
DR	DRAIN
DV	DRAIN VALVE
DWG	DRAWING
(E), EXIST	EXISTING
EEW	EMERGENCY EYE WASH
EFF	EFFICIENCY
ELEV	ELEVATION
ENGR	ENGINEER
EQ	EQUAL
EQUIP	EQUIPMENT
ET	EXPANSION TANK
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EWT	ENTERING WATER TEMPERATURE
EXP	EXPANSION
F	DEGREES FAHRENHEIT
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN (PLUMBING)
FFE	FINISHED FLOOR ELEVATION
FLA	FULL LOAD AMPACITY
FP	FIRE PUMP
FS	FLOOR SINK
FT	FEET/FOOT
FLT	FLUSH TANK
FU	FIXTURE UNIT
FV	FLUSH VALVE
(F)	FUTURE
G	GRADE
GAL	GALLON
GH	GROUND HYDRANT
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
H	HEIGHT
HB	HOSE BIBB
HD	HUB DRAIN
HP	HORSEPOWER
HR	HOUR
HT	HEAT TRACE
HTG	HEATING
ID	INSIDE DIAMETER, INSIDE DIMENSION
IE	INVERT ELEVATION
IN	INCH, INCHES
INSUL	INSULATION
ISO	ISOMETRIC
ISOL	ISOLATOR, ISOLATION
KW	KILOWATT
KWH	KILOWATT HOUR
L	LENGTH
LAV	LAVATORY
LB	POUND
MAX	MAXIMUM
MBH	THOUSAND BTU PER HOUR
MCA	MINIMUM CIRCUIT AMPACITY
MECH	MECHANICAL
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MS	MOP SINK
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NPS	NOMINAL PIPE SIZE
NTS	NOT TO SCALE
OC	ON CENTER DISTANCE
OD	OVERFLOW DRAIN
P/FT	PITCH PER FOOT
PG	PRESSURE GAUGE
PH	PHASE
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH (GAUGE)
PVC	POLYVINYL CHLORIDE
R, RAD	RADIUS
RD	ROOF DRAIN
REV	REVISION
RPM	REVOLUTIONS PER MINUTE
S	SINK
SCFM	STANDARD CUBIC FEET PER MINUTE
SD	SHOWER DRAIN (PLUMBING)
SE	SEWAGE EJECTOR
SECT	SECTION
SF	SQUARE FOOT, SQUARE FEET
SH	SHOWER
SOV	SHUTOFF VALVE
SPEC	SPECIFICATION
SQ	SQUARE
SQ IN	SQUARE INCH, SQUARE INCHES
TD	TRENCH DRAIN
TEMP	TEMPERATURE
TMV	THERMOSTATIC MIXING VALVE
TOP	TOP OF PIPE
TP	TRAP PRIMER VALVE
TYP	TYPICAL
U	URINAL
UG	UNDERGROUND
UP	UP (PENETRATES FLOOR SLAB)
UON	UNLESS OTHERWISE NOTED
V	VOLTS
VB	VACUUM BREAKER
VEL	VELOCITY
VFD	VARIABLE FREQUENCY DRIVE
VTR	VENT THROUGH ROOF
WC	WATER CLOSET
WCO	WALL CLEANOUT
WFU	WATER FIXTURE UNITS
WG	WATER GAUGE
WH	WALL HYDRANT
WHA	WATER HAMMER ARRESTOR
WPD	WATER PRESSURE DROP
W/	WITH
W/O	WITHOUT

PLUMBING PIPING

W	WASTE ABOVE GRADE
W	WASTE BELOW GRADE
PW	PUMPED WASTE ABOVE GRADE
V	VENT
CW	COLD WATER
HW	HOT WATER
RHW	RECIRCULATING HOT WATER
TW	TEMPERED WATER
HTW	HIGH TEMPERATURE HOT WATER
RHTW	HIGH TEMPERATURE RECIRCULATING HOT WATER
ICW	INDUSTRIAL COLD WATER

PLUMBING SPECIALITIES

- CLEANOUT
- FLOOR CLEANOUT
- CLEANOUT TO GRADE
- WALL CLEANOUT
- AREA DRAIN
- CATCH BASIN
- FLOOR DRAIN
- OVERFLOW ROOF DRAIN
- ROOF DRAIN
- TRENCH SHOWER DRAIN
- TRENCH DRAIN
- HOSE BIBB
- GROUND HYDRANT
- WALL HYDRANT
- WALL BOX
- FLOOR SINK
- THRUST BLOCK

SYMBOLS

- A — ACCESS PANEL
- POINT OF CONNECTION
- E — EXISTING TO REMAIN
- B — BELOW GRADE / FLOOR
- 1 — REVISION NUMBER
- # — NUMBERED NOTE
- X — REMOVE EXISTING
- K — CAP EXISTING / CAP FOR FUTURE
- R — RELOCATE EXISTING
- F — FUTURE

XX-XXX
- UNIT NUMBER
- FLOOR UNIT IS LOCATED ON
- EQUIPMENT TYPE

XXXX-XX-XXXXX
- UNIT NUMBER
- FLOOR UNIT IS LOCATED ON
- EQUIPMENT TYPE

EQUIPMENT

XXX
- TAG NUMBER

EQUIPMENT PROVIDED BY OTHERS

XX-XXX
XXX
- FIXTURE NUMBER
- FIXTURE UNITS
- FIXTURE TYPE

FIXTURES

X / XX.XX
- DETAIL NUMBER
- SHEET NUMBER

DETAIL CALLOUT

SYSTEM TYPE / RISER NUMBER — X / XX

RISER TAG

MISC. FITTINGS & SYMBOLS

- DIRECTION OF FLOW
- DIRECTION OF SLOPE
- PIPE SLEEVE
- REDUCER
- ANCHOR
- ELBOW (90 DEGREE)
- ELBOW (45 DEGREE)
- PIPING CONNECTIONS
- TEE
- JOINT OR COUPLING POINT
- UNION
- FLANGED CONNECTION
- CAP
- PLUG OR BLIND FLANGE
- RISER
- ELBOW UP
- ELBOW DOWN
- TEE UP
- TEE DOWN
- FLEXIBLE HOSE CONNECTOR
- MC — MECHANICAL COUPLING
- HEAT TRACE
- PIPE CONTINUATION

DEMOLITION LEGEND

- REMOVE EXISTING PIPE
- REMOVE EXISTING EQUIPMENT

NEW & EXISTING WORK

- EXISTING PIPING
- NEW PIPING
- EXISTING EQUIPMENT
- NEW EQUIPMENT
- EXISTING EQUIPMENT CLEARANCES
- NEW EQUIPMENT CLEARANCES

GENERAL NOTES:

A. THIS IS A STANDARD LEGEND SHEET, THEREFORE, SOME SYMBOLS MAY APPEAR ON THIS SHEET THAT DO NOT APPEAR ON THE DRAWINGS.

MISC. VALVES & COCKS

- SHUTOFF VALVE
- GLOBE VALVE
- GATE VALVE OS&Y
- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- WYE STRAINER
- WYE STRAINER WITH BLOWDOWN
- DRAIN VALVE
- BALANCING VALVE
- FC — AUTOMATIC FLOW CONTROL VALVE
- PRESSURE REDUCING VALVE
- RELIEF VALVE
- TRIPLE DUTY VALVE
- TWO-WAY CONTROL VALVE
- THREE-WAY CONTROL VALVE
- THREE-WAY BALANCING VALVE
- DOUBLE CHECK VALVE ASSEMBLY (DCVA)
- REDUCED PRESSURE BACKFLOW PREVENTER (RPBP)
- BWV — BACKWATER VALVE
- PIV — POST INDICATOR VALVE
- UG — UNDERGROUND GATE VALVE WITH VALVE BOX
- WATER FLOW METER
- GAS COCK VALVE
- PLUG VALVE
- BOILER BLOWDOWN VALVE, QUICK OPENING
- BOILER BLOWDOWN VALVE, Y-PATTERN
- NON-RETURN STOP VALVE
- F&T — FLOAT AND THERMOSTATIC STEAM TRAP
- IB — INVERTED BUCKET STEAM TRAP
- THERMOMETER
- PRESSURE GAUGE
- PRESSURE-TEMPERATURE TEST PLUG
- MAV — MANUAL AIR VENT
- S — SHUTOFF VALVE WITH TAMPER SWITCH
- P — PRESSURE SENSOR
- AAV — AUTOMATIC AIR VENT
- F — FLOW SWITCH
- T — TEMPERATURE SENSOR
- S (SIZE) — SHOCK ARRESTOR
- V — VACUUM BREAKER
- S — SOLENOID VALVE

PLUMBING SHEET LIST

SHEET #	SHEET NAME
P-001	SYMBOLS, LEGENDS, & ABBREVIATIONS - PLUMBING
P-002	EQUIPMENT SCHEDULE - PLUMBING
P-100	OVERALL DEMOLITION UNDERGROUND PLAN - PLUMBING
P-100A	DEMOLITION UNDERGROUND PLAN - AREA A - PLUMBING
P-100B	DEMOLITION UNDERGROUND PLAN - AREA B - PLUMBING
P-100C	DEMOLITION UNDERGROUND PLAN - AREA C - PLUMBING
P-101	OVERALL DEMOLITION FLOOR PLAN - PLUMBING
P-101A	DEMOLITION FLOOR PLAN - AREA A - PLUMBING
P-101B	DEMOLITION FLOOR PLAN - AREA B - PLUMBING
P-101C	DEMOLITION FLOOR PLAN - AREA C - PLUMBING
P-102	OVERALL UNDERGROUND PLAN - PLUMBING
P-102A	UNDERGROUND PLAN - AREA A - PLUMBING
P-102B	UNDERGROUND PLAN - AREA B - PLUMBING
P-102C	UNDERGROUND PLAN - AREA C - PLUMBING
P-103	OVERALL FLOOR PLAN - PLUMBING
P-103A	FLOOR PLAN - AREA A - PLUMBING
P-103B	FLOOR PLAN - AREA B - PLUMBING
P-103C	FLOOR PLAN - AREA C - PLUMBING
P-501	DETAILS - PLUMBING
Grand total: 19	

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REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON JAN 08 2014 EDZIB BIBERIC 04/04/25
EXPIRES: 12/31/2025

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drawn by: PWH
checked by: RLW

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SYMBOLS, LEGENDS, & ABBREVIATIONS - PLUMBING

sheet: P-001

of:

DOMESTIC HOT WATER PIPE SIZING

ALL WATER PIPE SIZED PER:
2023 OPSC APPENDIX A

BASED ON:
5 PSI PER 100 FT PRESSURE DROP
VELOCITY UNDER 5 FT/SEC

PIPE SIZE (IN)	MAX FLOW (GPM)	MAXIMUM FIXTURE UNITS	
		FLUSH TANK	FLUSH VALVE
3/4"	5	6	-
1"	11	15	-
1-1/4"	18	26	-
1-1/2"	28	49	-
2"	45	107	-
2-1/2"	70	225	-
3"	100	380	-

DOMESTIC COLD WATER PIPE SIZING

ALL WATER PIPE SIZED PER
2023 OPSC APPENDIX A

BASED ON:
5 PSI PER 100 FT PRESSURE DROP
VELOCITY UNDER 8 FT/SEC

PIPE SIZE (IN)	MAX FLOW (GPM)	MAXIMUM FIXTURE UNITS	
		FLUSH TANK	FLUSH VALVE
3/4"	5	6	-
1"	11	15	-
1-1/4"	18	26	-
1-1/2"	28	49	11
2"	60	175	76
2-1/2"	110	431	295
3"	170	748	700
4"	290	1668	1668

TRAP PRIMER SCHEDULE

TAG NUMBER	DESCRIPTION	NOTES
TP-101	PRESSURE DEPENDENT TRAP PRIMER	1
TP-102		
TP-103	CAPABLE OF PRIMING 1-4 FLOOR DRAINS	
TP-104		
TP-105	DISTRIBUTION, 1/2" TO 1-1/2" INLET CONNECTION	
TP-106		
TP-107	BASED ON: PPP PO-500 OREGON #1	

NOTES:
1. MOUNT IN AN ACCESSIBLE LOCATION BY FACILITIES STAFF.

PLUMBING FIXTURE SCHEDULE

TAG NUMBER	ACCESSIBILITY	TYPE	DESCRIPTION	BASIS OF DESIGN MANUFACTURER AND MODEL NUMBER			ROUGH-IN CONNECTION SIZE (INCH)				GPM / GPF	ELEC. CONN Y/N	NOTES
				COMPONENT	MANUFACTURER	MODEL NUMBER	W	V	CW	HW			
WC-1	ADA	WATER CLOSET	FLOOR MOUNT, MANUAL FLUSH VALVE	BOWL	KOHLER	HIGHCLIFF ULTRA - K-96057	4	2	1	-	1.28	N	
				FLUSH VALVE	SLOAN	REGAL 111-1.28-XL							
				SEAT	BEMIS	1600 SERIES							
				CARRIER	JR SMITH	SERIES 200							
U-1	ADA	URINAL	WALL HUNG, MANUAL FLUSH VALVE	BOWL	SLOAN	SU-1009	2	2	3/4	-	0.5	N	
				FLUSH VALVE	SLOAN	ROYAL 186							
L-1	ADA	LAVATORY	WALL MOUNT, BOWL DIMENSIONS: 16"L x 10" W x 3-1/8" DEEP, MANUAL FAUCET, WRISTBLADE, 3-DECK HOLE SINK	BOWL	KOHLER	KINGSTON - K-2005	2	1-1/2	1/2	1/2	0.5	N	1
				FAUCET	KOHLER	K-400T20-5ANA							
L-2	ADA	LAVATORY	WALL MOUNT, BOWL DIMENSIONS: 18"L x 13" W x 4-7/8" DEEP, METERING FAUCET, 4-DECK HOLE SINK	BOWL	KOHLER	SOHO - K-2053-NR	2	1-1/2	1/2	1/2	0.5	N	1
				FAUCET	CHICAGO FAUCET	3520-4E2805ABCP							
L-3	ADA	LAVATORY	COUNTERTOP, BOWL DIMENSIONS: 20-1/4" DIA x 4" DEEP, MANUAL FAUCET, WRISTBLADE, 3-DECK HOLE SINK	BOWL	KOHLER	PENNINGTON - K-2196-8	2	1-1/2	1/2	1/2	0.5	N	1
				FAUCET	KOHLER	K-400T20-5ANA							
L-4	ADA	LAVATORY	WALL MOUNT, BOWL DIMENSIONS: 16"L x 10" W x 3-1/8" DEEP, MANUAL FAUCET, WRISTBLADE, 3-DECK HOLE SINK	BOWL	KOHLER	KINGSTON - K-2005	2	1-1/2	1/2	1/2	0.5	N	1
				FAUCET	KOHLER	K-400T20-5ANA							
S-1	ADA	BREAKROOM	COUNTERTOP, BOWL DIMESSIONS: 19-1/2"x 19-1/2"x 5-1/2" SINGLE COMPARTMENT, MANUAL FAUCET, WRISTBLADE, 3-DECK HOLE SINK	BOWL	ELKAY	LRAD191955	2	1-1/2	3/4	3/4	1.5	N	1,2
				FAUCET	CHICAGO	786-ABCP							
S-2	ADA	KITCHEN	COUNTERTOP, BOWL DIMESSIONS: 29"x 22"x 6-1/2" DOUBLE COMPARTMENT, MANUAL FAUCET, SWING SPOUT, 1-DECK HOLE SINK	BOWL	ELKAY	LRAD292265PD	2	1-1/2	3/4	3/4	1.5	N	1
				FAUCET	CHICAGO	430-ABCP							
S-3	-	BABY BATH SINK	COUNTERTOP, BOWL DIMESSIONS: 28"x 17-3/16"x 7-5/16" SINGLE COMPARTMENT, MANUAL FAUCET, SWING SPOUT, WRISTBLADE, 2-DECK HOLE SINK	BOWL	WILSONART	AV2213	2	1-1/2	3/4	3/4	1	N	1,3
				FAUCET	CHICAGO	895-317GN8AE65VAB							
SB-1	-	SUPPLY BOX	DOUBLE HOSE BIBB OUTLET BOX	-	OX BOX	696	2	1-1/2	1/2	1/2	-	N	-
SH-1	-	SHOWER	WALL MOUNT SINGLE HANDHELD SHOWER WITH MIXING VLAVE	-	ZURN	Z7300-SS-MT-HW-T2	2	1-1/2	1/2	1/2	1.5	N	-
BF-1	ADA	BOTTLE FILLER	WALL MOUNT BOTTLE FILLING STATION	-	ELKAY	LZ8WSSSMC	2	1-1/2	1/2	-	-	Y	-
IH-1	-	INSTA-HOT FAUCET	DECK MOUNT	-	INSINKERATOR	H-WAVE-SS	-	-	1/4	-	-	Y	-

GENERAL NOTES:
A. FINAL FIXTURE SELECTION TO BE COORDINATED WITH ARCHITECT AND OWNER.

NOTES:
1. PROVIDE WITH ASSE1070 RATED POINT-OF-USE THERMOSTATIC MIXING VALVE.
2. INCLUDE A REMOVEABLE STRAINER BASKET WITH SINK DRAIN OUTLET.
3. SINK PROVIDED BY ARCHITECT.

PLUMBING DESIGN CRITERIA

WASTE AND VENT PIPING SYSTEM:
BASIS OF DESIGN: 2023 OREGON PLUMBING SPECIALTY CODE, CHAPTER 7, 'SANITARY DRAINAGE'.
ALL WASTE PIPING SIZED AT 1/4"/FT. SLOPE UNLESS OTHERWISE NOTED.

PLUMBING DRAINS AND CLEANOUTS SCHEDULE

TAG	DESCRIPTION	MANUFACTURER	MODEL NO.	STRAINER	REMARKS
FD-1	FLOOR DRAIN	JR SMITH	2005B-Y-U-NB-P050	5" SQ	NO HUB, VANDAL RESISTANT, NICKEL BRONZE, PRIMER CONNECTION
FS-1	FLOOR DRAIN	JR SMITH	3040B-Y-U-NB-P050	5" SQ	NO HUB, VANDAL RESISTANT, NICKEL BRONZE, PRIMER CONNECTION
FCO-1	FLOOR CLEANOUT	JR SMITH	4023Y-F-C-U	8" DIA	CAST IRON BODY, TAPERED BRONZE PLUG, FLASHING FLANGE, VANDAL RESISTANT
WCO -1	WALL CLEANOUT	JR SMITH	4532S-Y-U	5" DIA	CAST IRON BODY, TAPERED BRONZE PLUG, HUBLESS CONNECTIONS, SS COVER WITH SCREW

PIPE INSULATION SCHEDULE

SYSTEM	PIPE SIZE	INSULATION TYPE	INSULATION THICKNESS	NOTES
DOMESTIC COLD WATER, ABOVE GRADE	1 1/4-INCH AND SMALLER	FIBERGLASS, ALL PURPOSE JACKET OR ELASTOMERIC	1-INCH	1
DOMESTIC COLD WATER, ABOVE GRADE	ABOVE 1 1/4-INCH	FIBERGLASS, ALL PURPOSE JACKET	1 1/2-INCH	1
DOMESTIC HOT WATER SUPPLY/RETURN, ABOVE GRADE	1 1/2-INCH AND SMALLER	FIBERGLASS, ALL PURPOSE JACKET OR ELASTOMERIC	1-INCH	-
DOMESTIC HOT WATER SUPPLY/RETURN, ABOVE GRADE	ABOVE 1 1/2-INCH	FIBERGLASS, ALL PURPOSE JACKET	1 1/2-INCH	-

1. REFER TO SPECIFICATION 220700-3.3 G FOR VAPOR BARRIER REQUIREMENTS FOR COLD WATER PIPING.

PLUMBING PIPING SPECIFICATION SCHEDULE

SERVICE		MATERIAL
DOMESTIC WATER	ABOVE GRADE - 4" AND SMALLER	COPPER: ASTM B88 HARD DRAWN COPPER TUBING, TYPE L, WROUGHT COPPER FITTINGS (150 PSI SERVICE), ANSI B16.22 SOLDERED JOINTS.
SANITARY WASTE	BELOW GRADE	CAST IRON SOIL PIPE, SERVICE WEIGHT (NO HUB): NO HUB PIPE AND FITTINGS ASTM A74, CISPI, WITH 28 GAUGE 304 STAINLESS STEEL CLAMP AND CORRUGATED SHIELD ASSEMBLIES HAVING NEOPRENE GASKETS ASTM C564, CISPI 310-90.
	ABOVE GRADE	CAST IRON SOIL PIPE, SERVICE WEIGHT (NO HUB): NO HUB PIPE AND FITTINGS ASTM A74, CISPI, WITH STAINLESS STEEL CLAMP AND CORRUGATED SHIELD ASSEMBLIES HAVING NEOPRENE GASKETS ASTM C564, CISPI 310-90.
SANITARY VENT	BELOW GRADE	CAST IRON SOIL PIPE, SERVICE WEIGHT (NO HUB): NO HUB PIPE AND FITTINGS ASTM A74, CISPI, WITH 28 GAUGE 304 STAINLESS STEEL CLAMP AND CORRUGATED SHIELD ASSEMBLIES HAVING NEOPRENE GASKETS ASTM C564, CISPI 310-90.
	ABOVE GRADE	CAST IRON SOIL PIPE, SERVICE WEIGHT (NO HUB): NO HUB PIPE AND FITTINGS ASTM A74, CISPI, WITH STAINLESS STEEL CLAMP AND CORRUGATED SHIELD ASSEMBLIES HAVING NEOPRENE GASKETS ASTM C564, CISPI 310-90.
INDIRECT WASTE	ABOVE GRADE - 1-1/2" & SMALLER	PIPE: COPPER DWV B306 FITTINGS: WROT COPPER DWV PER ANSI B16.29 JOINTS: SWEAT, LEAD - FREE SOLDER
TRAP PRIMING LINES		CROSS-LINKED POLYETHYLENE (PEX): PEX-A OR PEROXIDE METHOD, ASTM F876, ASTM F877, CAN/CDA-B137.5.

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EQUIPMENT SCHEDULE - PLUMBING

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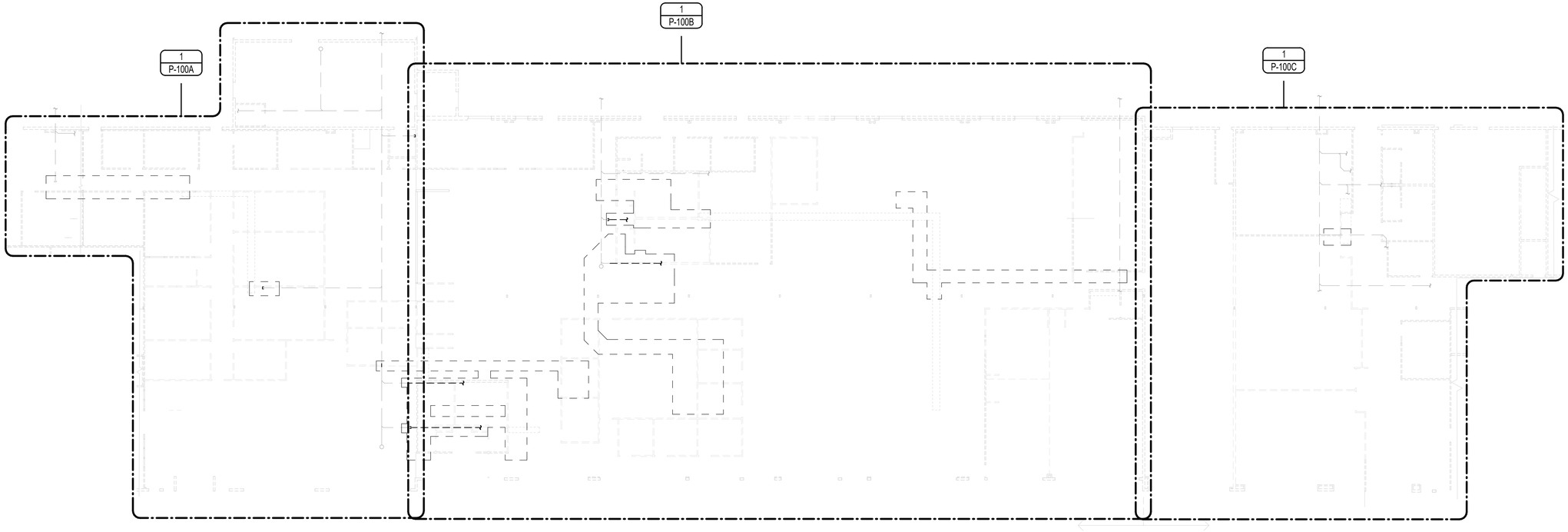
GENERAL NOTES - DEMOLITION:

A. OVERALL SHEET FOR REFERENCE ONLY. SEE ENLARGED PLANS FOR ADDITIONAL INFO.



OVERALL DEMOLITION UNDERGROUND PLAN - PLUMBING
1/16" = 1'-0"

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OVERALL DEMOLITION UNDERGROUND PLAN - PLUMBING

sheet: P-100

of:

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C. ALL PIPING AND EQUIPMENT SERVING AREAS OUTSIDE OF THE PROJECT SCOPE TO REMAIN IN SERVICE. AFTER COMPLETING DEMO WORK, VERIFY THAT ALL OTHER SERVICES TO THE AREAS NOT INCLUDED IN THE DEMO WORK SCOPE AREA ARE FUNCTIONAL.

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G. EXISTING BELOW GRADE WASTE PIPING LOCATIONS AND INVERT ELEVATIONS (IE) ARE NOT VERFIED. LOCATIONS AND SIZES ARE BASED ON RECORD DRAWINGS. CONTRCTOR TO VERIFY SIZES AND IE'S PIOR TO ANY DEMOLITION.

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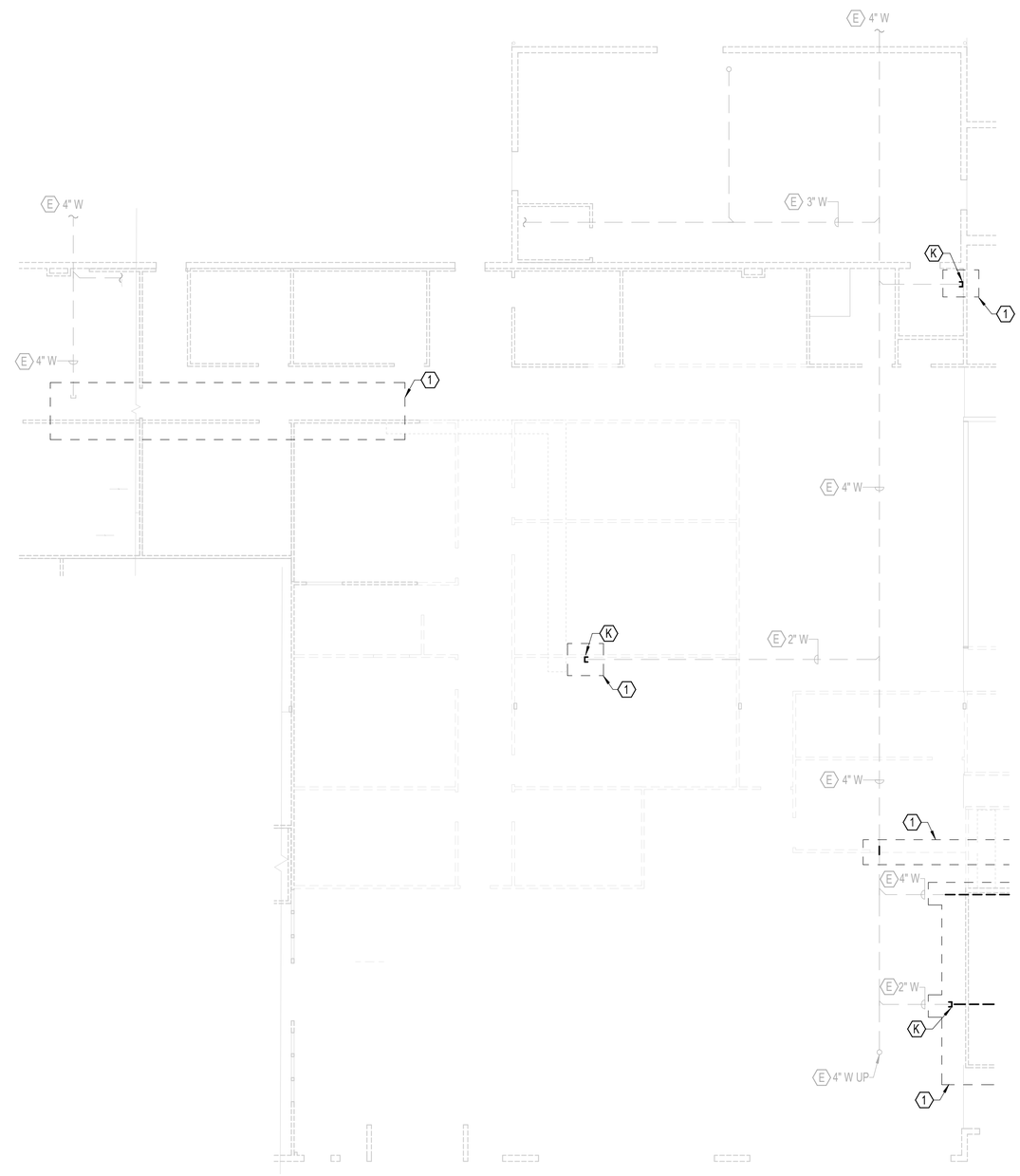

DEMOLITION UNDERGROUND PLAN - AREA A - PLUMBING
1/8" = 1'-0"

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DEMOLITION UNDERGROUND PLAN - AREA A - PLUMBING

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GENERAL NOTES - DEMOLITION:

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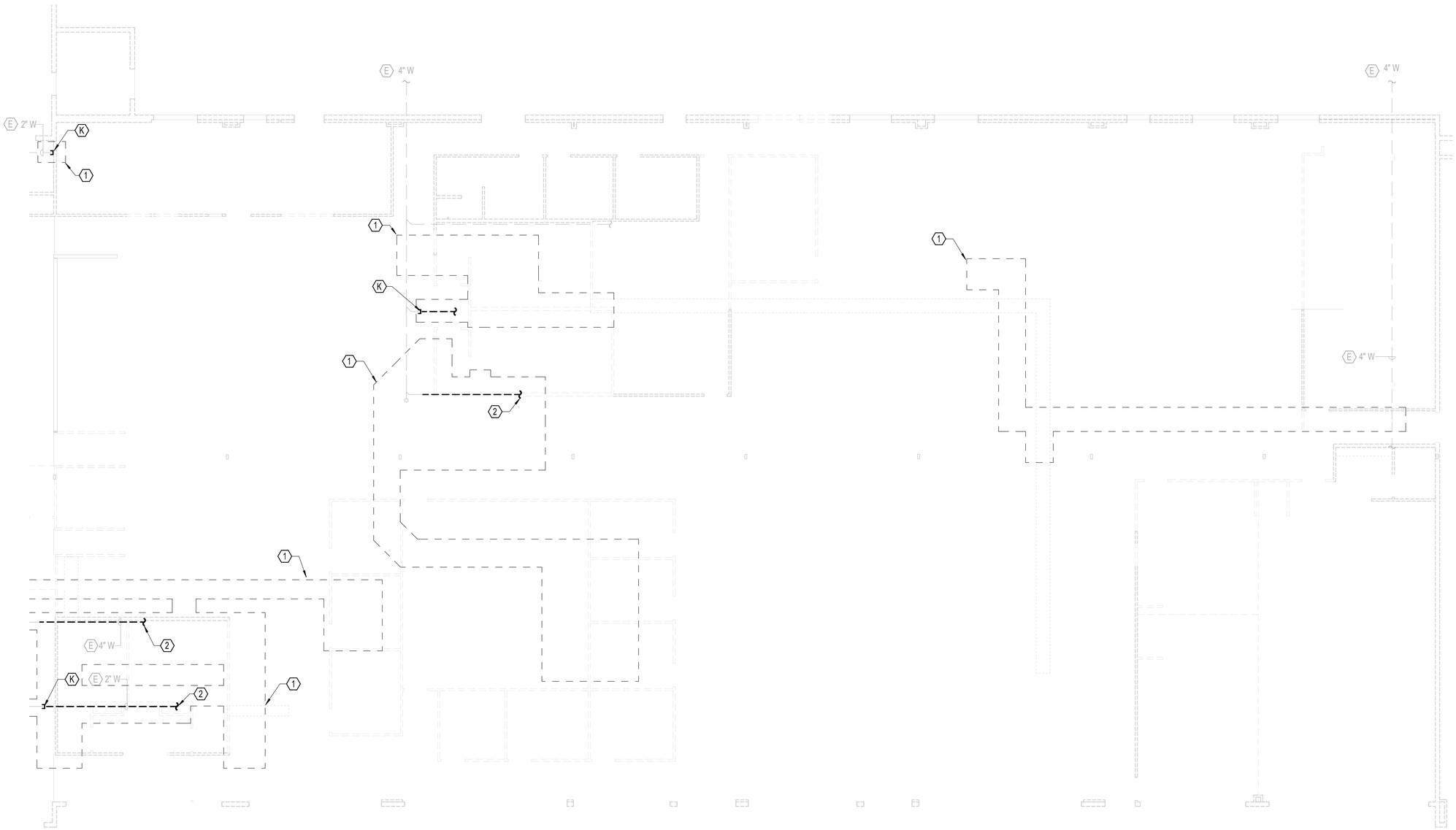
NOTES - DEMOLITION

1. AREA OF ANTICIPATED SLAB CUT REGION. SAW CUT REGION INDICATED WILL CAPTURE DEMO + NEW PLUMBING SCOPE.

2. DEMOLISH ALL PIPING BEYOND CONTINUATION SYMBOL THAT SERVES ANY EXISTING FIXTURES THAT ARE TO BE REMOVED. SLAB CUT REGION MAY NEED TO BE EXTENDED BASED ON FIELD CONDITIONS.



DEMOLITION UNDERGROUND PLAN - AREA B - PLUMBING
1/8" = 1'-0"

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DEMOLITION UNDERGROUND PLAN - AREA B - PLUMBING

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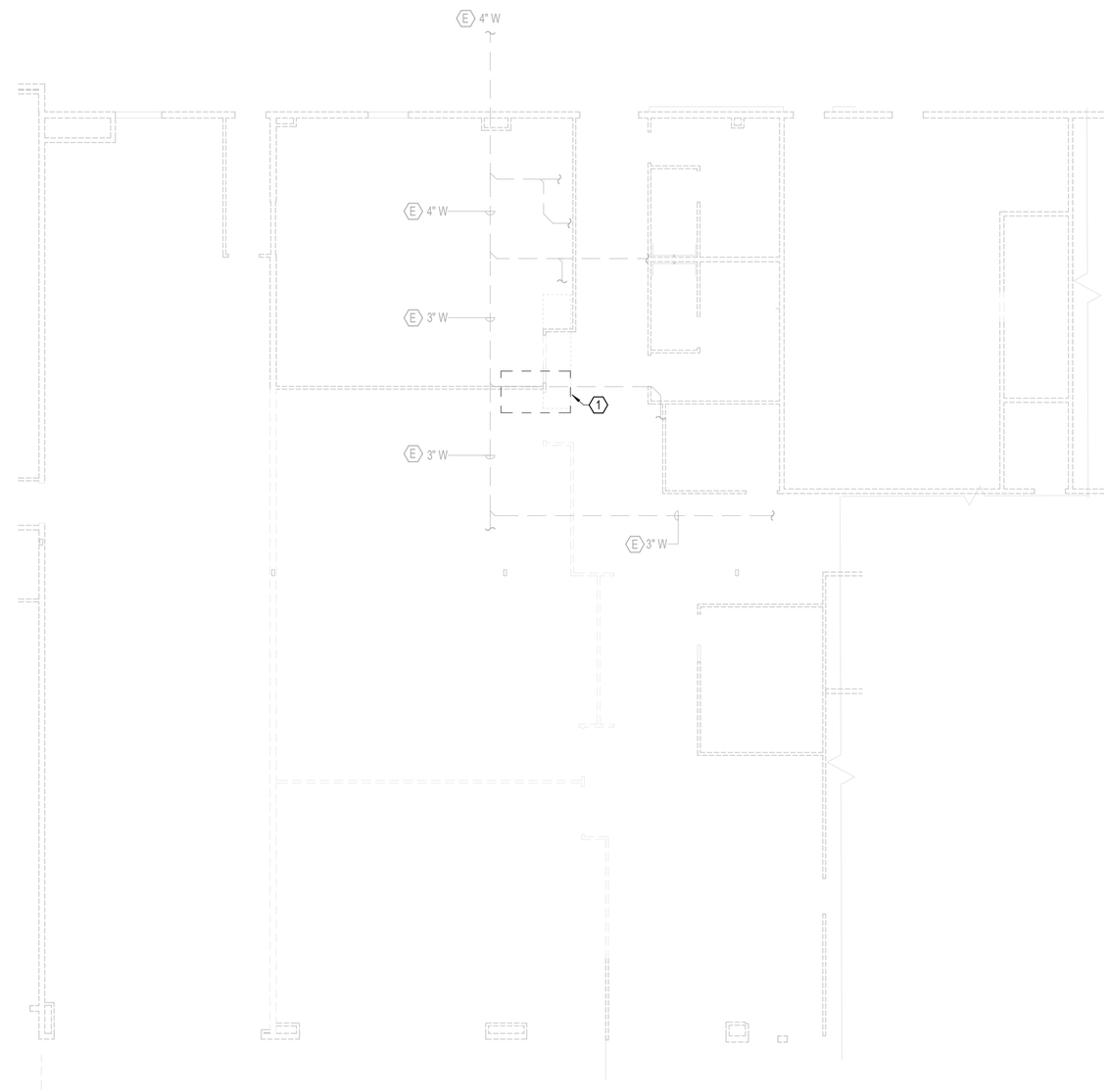

DEMOLITION UNDERGROUND PLAN - AREA C - PLUMBING
1/8" = 1'-0"

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DEMOLITION UNDERGROUND PLAN - AREA C - PLUMBING

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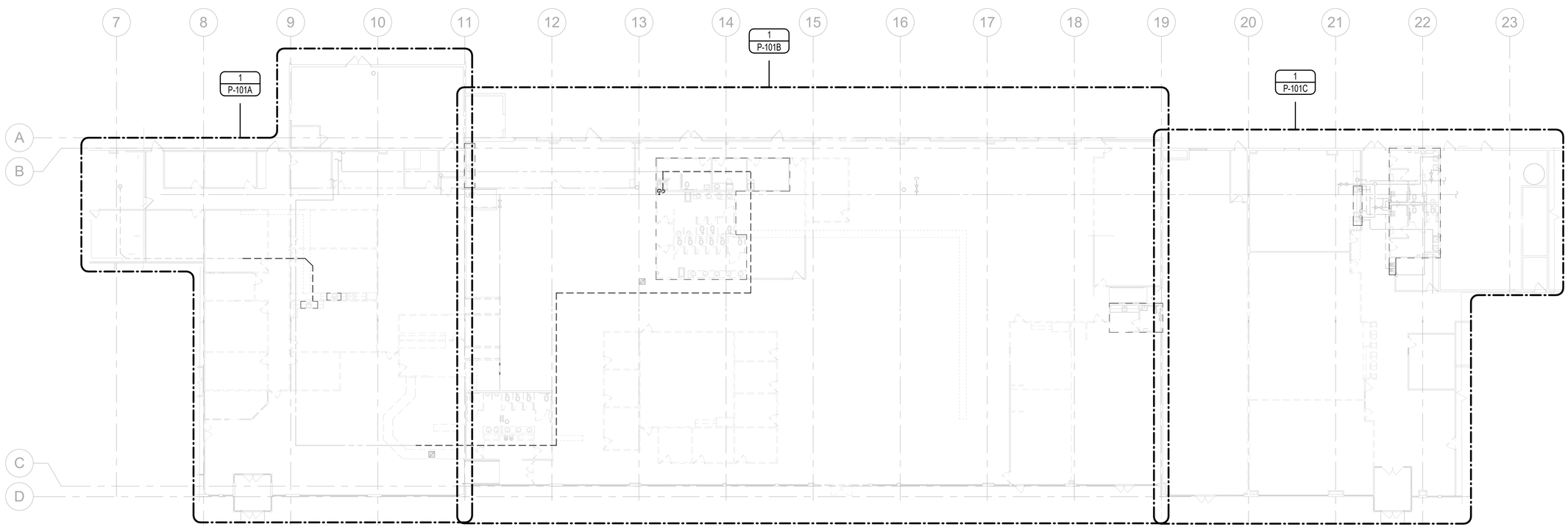

OVERALL DEMOLITION FLOOR PLAN - PLUMBING
1/16" = 1'-0"

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OVERALL DEMOLITION
FLOOR PLAN - PLUMBING

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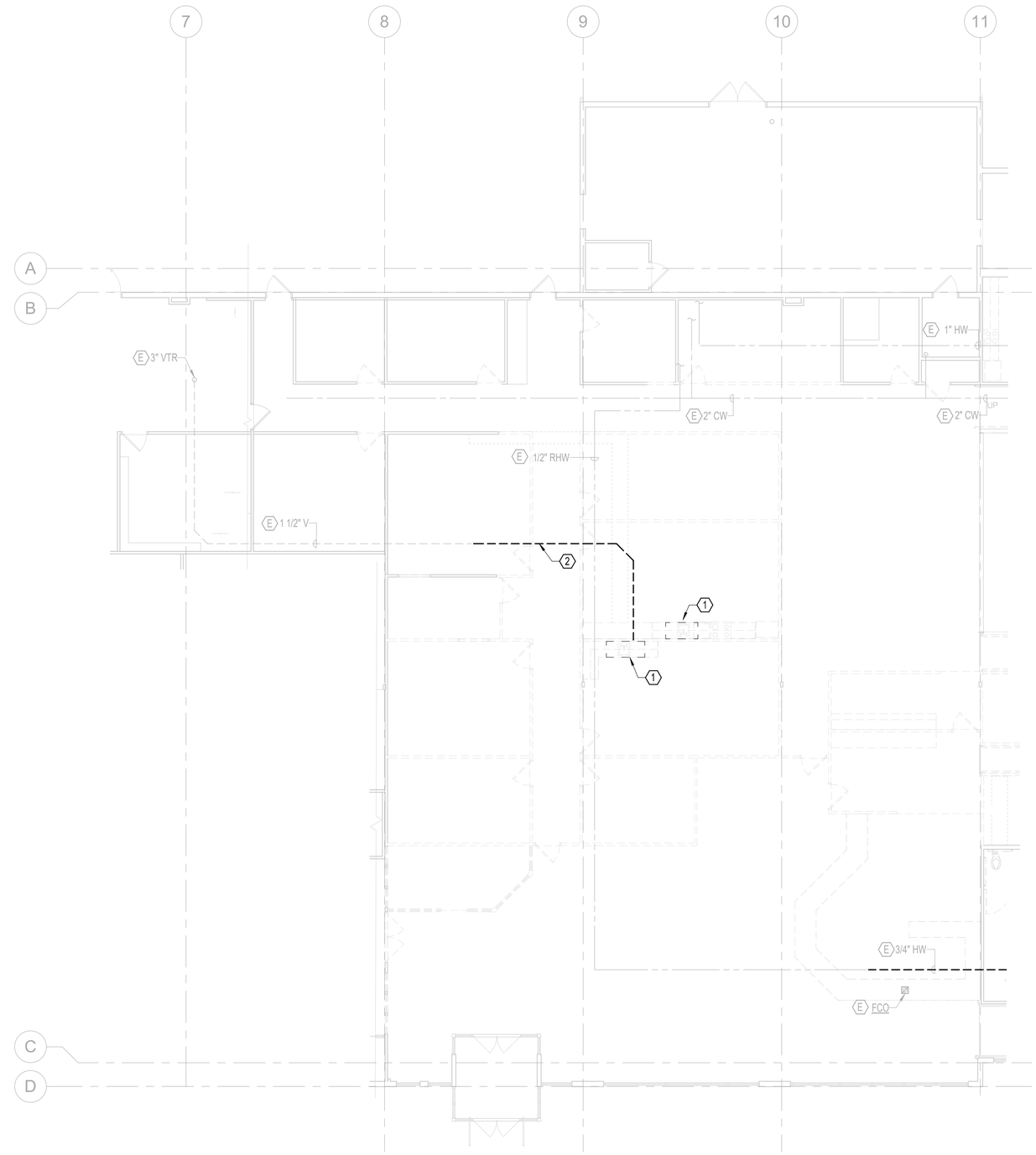
NOTES - DEMOLITION

1. DEMOLISH FIXUTRES AND ASSOCIATED PIPING & VALVES. CAP & VALVE PIPING AT THE CLOSEST ACTIVE BRANCH.

2. DEMO EXISTING OVERHEAD VENT PIPING BACK TO THE LOCATION SHOWN WITH PIPE CAP.



DEMOLITION FLOOR PLAN - AREA A - PLUMBING
1/8" = 1'-0"

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DEMOLITION FLOOR PLAN - AREA A - PLUMBING

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D. DEMOLITION WORK SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING: REMOVAL OF EQUIPMENT, SUPPORTS, ANCHORS, PIPING, AND ALL APPURTENANCES WHERE INDICATED ON THE PLANS.

E. ALL EXISTING WORK SHOWN IS EXISTING-TO-REMAIN UNLESS OTHERWISE NOTED.

F. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS. REFER TO ARCHITECTURAL SPECIFICATIONS FOR PATCHING AND REPAIR OF EXISTING WALLS AND FLOORS.

G. EXISTING BELOW GRADE WASTE PIPING LOCATIONS AND INVERT ELEVATIONS (IE) ARE NOT VERFIED. LOCATIONS AND SIZES ARE BASED ON RECORD DRAWINGS. CONTRCTOR TO VERIFY SIZES AND IE'S PIOR TO ANY DEMOLITION.

H. EXISTING UNDERGROUND WASTE PIPING LOCATIONS ARE APPROXIMATE AND BASED ON RECORD DRAWINGS FROM PREVIOUS CONSTRUCTION PROJECT. CONTRACTOR TO PROVIDE CAMERA SCOPE INVESTIGATION TO CONFIRM EXACT LOCATIONS OF PIPING, INVERT ELEVATIONS, CLEANOUTS AND INVESTIGATION TO BE COMPLETED PRIOR TO SLAB DEMOLITION.

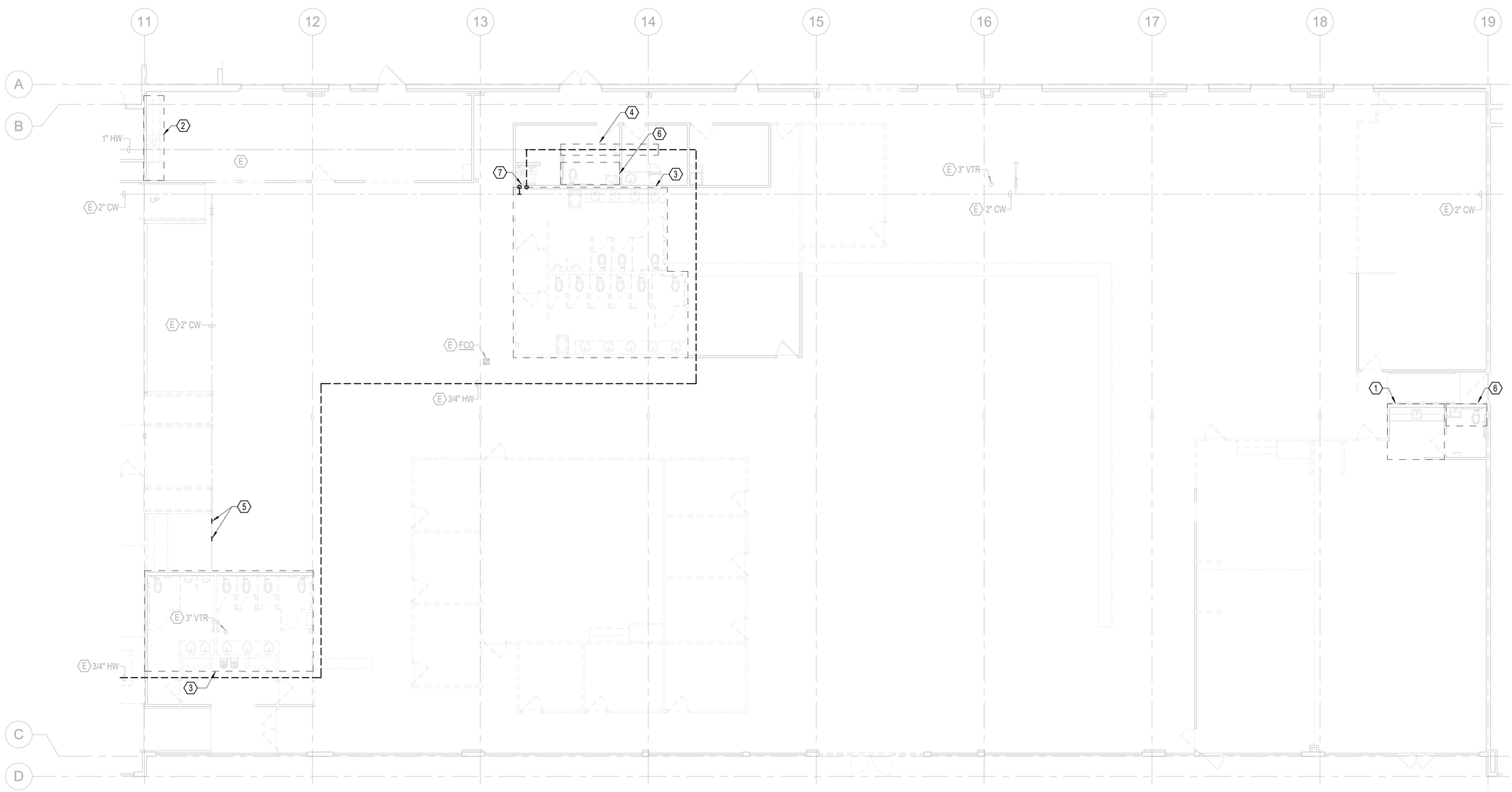
LOCATIONS AND INVERT ELEVATIONS DETERMINED FROM THE CONTRACTOR'S INVESTIGATION SHALL BE INCORPORATED INTO PLUMBING SHOP DRAWINGS WITH ANNOTATIONS FOR HORIZONTAL DIMENSIONS AND VERTICAL ELEVATIONS. SUBMIT COORDINATED SHOP DRAWINGS FOR DESIGN TEAM REVIEW PRIOR TO DEMOLITION & CONSTRUCTION.

I. COORDINATE APPROVAL FOR SYSTEM SHUT DOWNS WITH THE OWNER.

J. ALL PIPING NO LONGER REQUIRED/ACTIVE SHALL BE REMOVED AND NOT ABANDONED IN PLACE. DEADLEGS IN PIPING SYSTEMS ARE NOT ALLOWED AND BRANCHES SHOULD BE CAPPED AT THE NEAREST LIVE MAIN.

NOTES - DEMOLITION

1. EXISTING FIXTURES IN THIS REGION TO BE EXISTING-TO-REMAIN.
2. DEMOLISH FIXUTRES AND ASSOCIATED PIPING & VALVES. CAP & VALVE PIPING AT THE CLOSEST ACTIVE BRANCH.
3. DEMOLISH AND REMOVE EXISTING FIXTURES AND ASSOCIATED PIPING AND VALVES IN THIS AREA. PREPARE AREA FOR NEW FIXTURE. REFER TO NEW WORK PLUMBING SHEETS (P-103, 103A, 103B, 103C) FOR NEW PIPING SCOPE.
4. DEMO SECTION OF HW MAIN PIPING IN CEILING. MAINTAIN/RETAIN EXISTING FIXTURE CONNECTION PIPING TIED TO THIS SECTION. ANY FIXTURE BRANCH PIPING TIED TO DEMO SECTION OF PIPING TO BE CONNECTED TO THE NEAREST MAIN. REFER TO NEW WORK PLUMBING SHEETS (P-103, 103A, 103B) FOR NEW PIPING SCOPE.
5. DEMO SECTION OF CW MAIN PIPING IN CEILING TO PREPARE FOR INTALLATION OF TEES FOR NEW WORK. REFER TO NEW WORK PLUMBING SHEET P-103 & P-103B.
6. EXISTING FIXTURES TO BE REMOVED, AND PLACED WITH NEW FIXTURES. REFER TO P-103B FOR ADDITIONAL INFORMATION.
7. DEMO SECTION OF OVERHEAD CW AND HW SUPPLY PIPING SERVING SHOWER FIXTURE. REFER TO NEW WORK PLUMBING SHEET P-103 & P-103B.



DEMOLITION FLOOR PLAN - AREA B - PLUMBING
1/8" = 1'-0"

FACET ARCHITECTS
Formerly Carlson Veit Junge Architects
3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON ROZIB BIBERIC 04/04/25
EXPIRES: 12/31/2025

project:
CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:
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project: 00524
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DEMOLITION FLOOR PLAN - AREA B - PLUMBING

sheet: P-101B
of:

GENERAL NOTES - DEMOLITION:

A. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO BEGINNING WORK.

B. COORDINATE DEMOLITION WORK WITH ALL OTHER TRADES.

C. ALL PIPING AND EQUIPMENT SERVING AREAS OUTSIDE OF THE PROJECT SCOPE TO REMAIN IN SERVICE. AFTER COMPLETING DEMO WORK, VERIFY THAT ALL OTHER SERVICES TO THE AREAS NOT INCLUDED IN THE DEMO WORK SCOPE AREA ARE FUNCTIONAL.

D. DEMOLITION WORK SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING: REMOVAL OF EQUIPMENT, SUPPORTS, ANCHORS, PIPING, AND ALL APPURTENANCES WHERE INDICATED ON THE PLANS.

E. ALL EXISTING WORK SHOWN IS EXISTING-TO-REMAIN UNLESS OTHERWISE NOTED.

F. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS. REFER TO ARCHITECTURAL SPECIFICATIONS FOR PATCHING AND REPAIR OF EXISTING WALLS AND FLOORS.

G. EXISTING BELOW GRADE WASTE PIPING LOCATIONS AND INVERT ELEVATIONS (IE) ARE NOT VERFIED. LOCATIONS AND SIZES ARE BASED ON RECORD DRAWINGS. CONTRCTOR TO VERIFY SIZES AND IE'S PIOR TO ANY DEMOLITION.

H. EXISTING UNDERGROUND WASTE PIPING LOCATIONS ARE APPROXIMATE AND BASED ON RECORD DRAWINGS FROM PREVIOUS CONSTRUCTION PROJECT. CONTRACTOR TO PROVIDE CAMERA SCOPE INVESTIGATION TO CONFIRM EXACT LOCATIONS OF PIPING, INVERT ELEVATIONS, CLEANOUTS AND INVESTIGATION TO BE COMPLETED PRIOR TO SLAB DEMOLITION.

LOCATIONS AND INVERT ELEVATIONS DETERMINED FROM THE CONTRACTOR'S INVESTIGATION SHALL BE INCORPORATED INTO PLUMBING SHOP DRAWINGS WITH ANNOTATIONS FOR HORIZONTAL DIMENSIONS AND VERTICAL ELEVATIONS. SUBMIT COORDINATED SHOP DRAWINGS FOR DESIGN TEAM REVIEW PRIOR TO DEMOLITION & CONSTRUCTION.

I. COORDINATE APPROVAL FOR SYSTEM SHUT DOWNS WITH THE OWNER.

J. ALL PIPING NO LONGER REQUIRED/ACTIVE SHALL BE REMOVED AND NOT ABANDONED IN PLACE. DEADLEGS IN PIPING SYSTEMS ARE NOT ALLOWED AND BRANCHES SHOULD BE CAPPED AT THE NEAREST LIVE MAIN.

NOTES - DEMOLITION

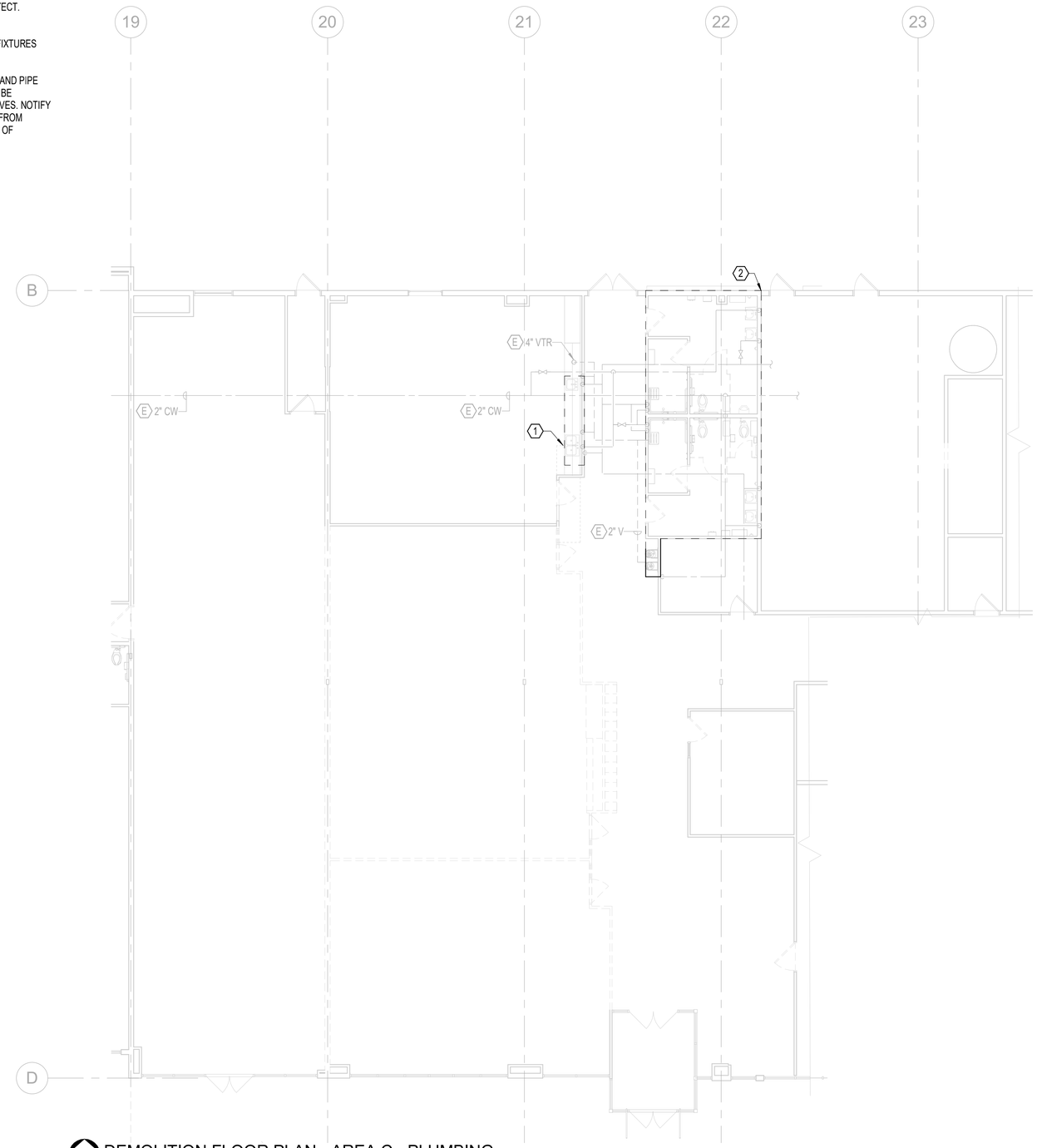
1. DEMOLISH FIXUTRES AND ASSOCIATED PIPING & VALVES. CAP & VALVE PIPING AT THE CLOSEST ACTIVE BRANCH.

2. EXISTING FIXTURES IN THIS REGION TO BE REPLACED WITH NEW FIXTURES. REFER TO P-103 FOR ADDITIONAL INFORMATION.

   - SHOWER STALLS WILL BE RETILED. REFER TO ARCHITECT. EXSITING SHOWER DRAIN TO REUSED.

   - EXISTING WATER CLOSETS, URINAL, AND LAVATORY FIXTURES WILL BE REPLACED WITH NEW.

   - CONTRACOR TO INVESTIGATE EXISTING CONDITIONS AND PIPE ROUTING. RESTROOM 1156 AND RESTROOM 1157 WILL BE REQUIRED TO SERVE WITH DEDICATED ISOLATION VALVES. NOTIFY THE ARCHITECT AND FACILITY GROUP WITH FINDINGS FROM EXISTING CONDITIONS, PIPE ROUTING AND LOCATIONS OF ISOLATION VALVES PRIOR TO DEMOLITION.



DEMOLITION FLOOR PLAN - AREA C - PLUMBING
1/8" = 1'-0"

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REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON JAN 18 2011 NEDZIB BIBERIC 04/04/25
EXPIRES: 12/31/2025

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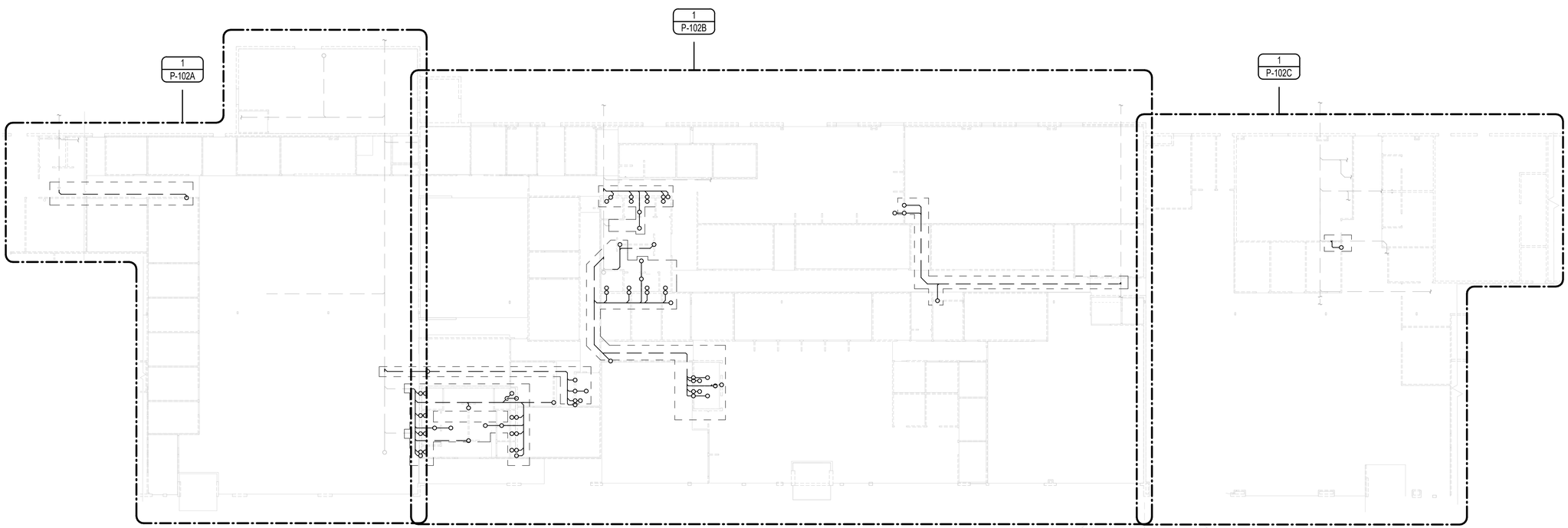
DEMOLITION FLOOR PLAN - AREA C - PLUMBING

sheet: P-101C
of:

GENERAL NOTES:

A. OVERALL SHEET FOR REFERENCE ONLY. SEE ENLARGED PLANS FOR ADDITIONAL INFO.



OVERALL UNDERGROUND PLAN - PLUMBING
1/16" = 1'-0"

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OVERALL UNDERGROUND PLAN - PLUMBING

sheet: P-102

of:

GENERAL NOTES:

A. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO BEGINNING WORK.

B. COORDINATE DEMOLITION WORK WITH ALL OTHER TRADES.

C. ALL PIPING AND EQUIPMENT SERVING AREAS OUTSIDE OF THE PROJECT SCOPE TO REMAIN IN SERVICE. AFTER COMPLETING DEMO WORK, VERIFY THAT ALL OTHER SERVICES TO THE AREAS NOT INCLUDED IN THE DEMO WORK SCOPE AREA ARE FUNCTIONAL.

D. VERIFY EXACT SIZES, LOCATIONS, INVERTS AND ELEVATIONS PRIOR TO RUNNING ANY PIPING. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS OF ALL FIXTURES AND EQUIPMENT. REFER TO LAB LAYOUT DRAWINGS FOR EXACT LOCATION AND ROUGH IN REQUIREMENTS OF ALL LAB FIXTURES, OUTLETS, AND EQUIPMENT.

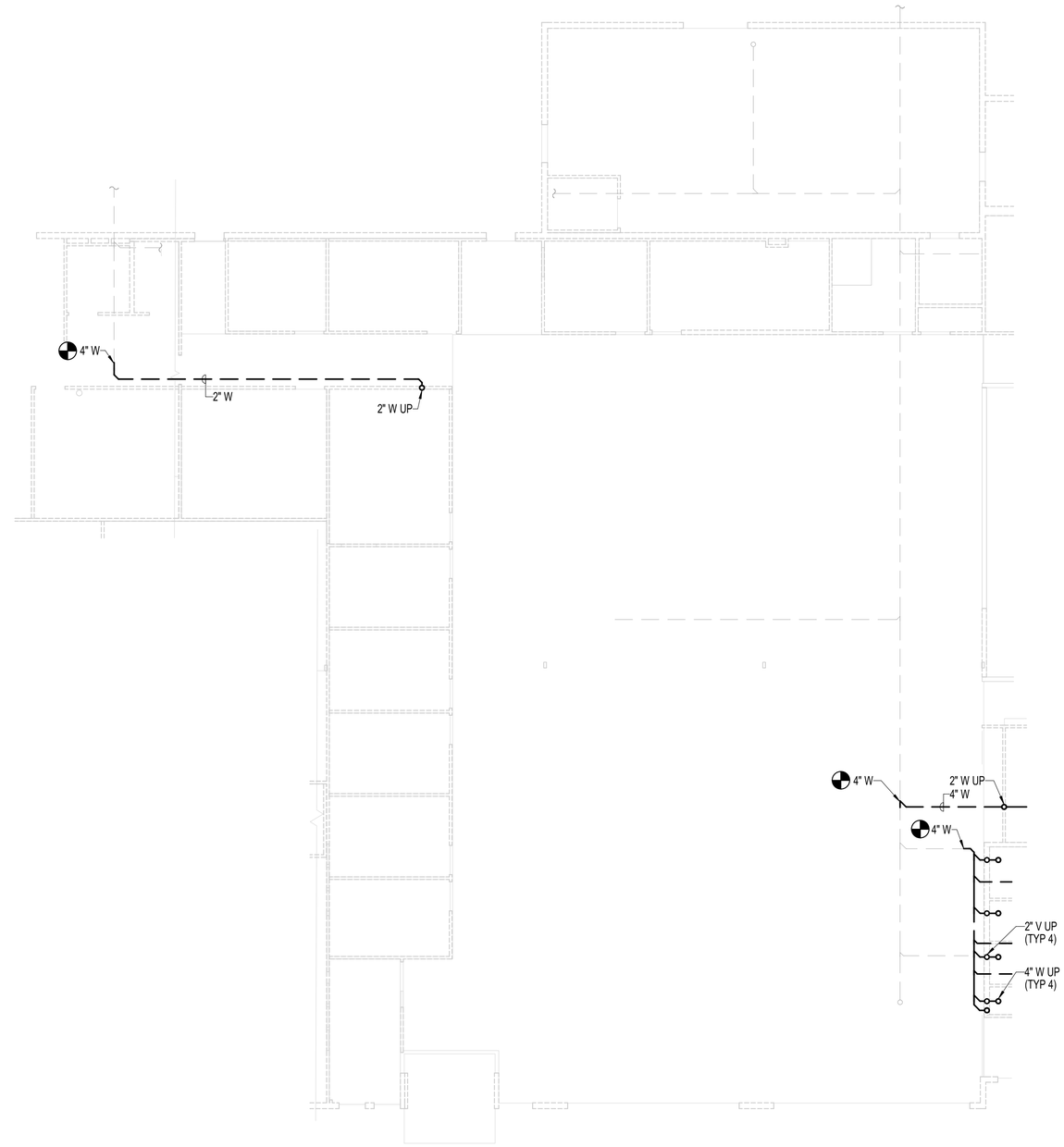
E. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS. REFER TO ARCHITECTURAL SPECIFICATIONS FOR PATCHING AND REPAIR OF EXISTING WALLS AND FLOORS.

F. COORDINATE APPROVAL FOR SYSTEM SHUT DOWNS WITH THE OWNER

G. AVOID STRUCTURAL FOOTINGS WHERE POSSIBLE. COORDINATE FOOTING DEPTHS WHERE FIXTURES ARE LOCATED ABOVE FOOTINGS. COORDINATE WITH STRUCTURAL FOOTING CROSSING DETAILS WITH STRUCTURAL ENGINEER.

H. PROVIDE CLEANOUTS ABOVE FINISHED FLOOR ON PIPING PASSING THROUGH SLAB ON GRADE. PROVIDE CLEANOUTS EVERY 100 FEET AND FOR EACH AGGREGATE HORIZONTAL CHANGE IN DIRECTION EXCEEDING 135 DEGREES PER PLUMBING CODE. PROVIDE CLEANOUTS AT EACH BUILDING CONNECTION.

I. TESTING OF ANY TIE IN POINTS AND REUSE OF ANY EXISTING SECTIONS OF BELOW GRADE PIPING. REQUIRE BUILDING OFFICIAL'S APPROVAL PRIOR TO ANY BACKFILL OR COVER.



UNDERGROUND PLAN - AREA A - PLUMBING
1/8" = 1'-0"

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OREGON
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UNDERGROUND PLAN - AREA A - PLUMBING

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of:

GENERAL NOTES:

A. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO BEGINNING WORK.

B. COORDINATE DEMOLITION WORK WITH ALL OTHER TRADES.

C. ALL PIPING AND EQUIPMENT SERVING AREAS OUTSIDE OF THE PROJECT SCOPE TO REMAIN IN SERVICE. AFTER COMPLETING DEMO WORK, VERIFY THAT ALL OTHER SERVICES TO THE AREAS NOT INCLUDED IN THE DEMO WORK SCOPE AREA ARE FUNCTIONAL.

D. VERIFY EXACT SIZES, LOCATIONS, INVERTS AND ELEVATIONS PRIOR TO RUNNING ANY PIPING. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS OF ALL FIXTURES AND EQUIPMENT. REFER TO LAB LAYOUT DRAWINGS FOR EXACT LOCATION AND ROUGH IN REQUIREMENTS OF ALL LAB FIXTURES, OUTLETS, AND EQUIPMENT.

E. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS. REFER TO ARCHITECTURAL SPECIFICATIONS FOR PATCHING AND REPAIR OF EXISTING WALLS AND FLOORS.

F. COORDINATE APPROVAL FOR SYSTEM SHUT DOWNS WITH THE OWNER

G. AVOID STRUCTURAL FOOTINGS WHERE POSSIBLE. COORDINATE FOOTING DEPTHS WHERE FIXTURES ARE LOCATED ABOVE FOOTINGS. COORDINATE WITH STRUCTURAL FOOTING CROSSING DETAILS WITH STRUCTURAL ENGINEER.

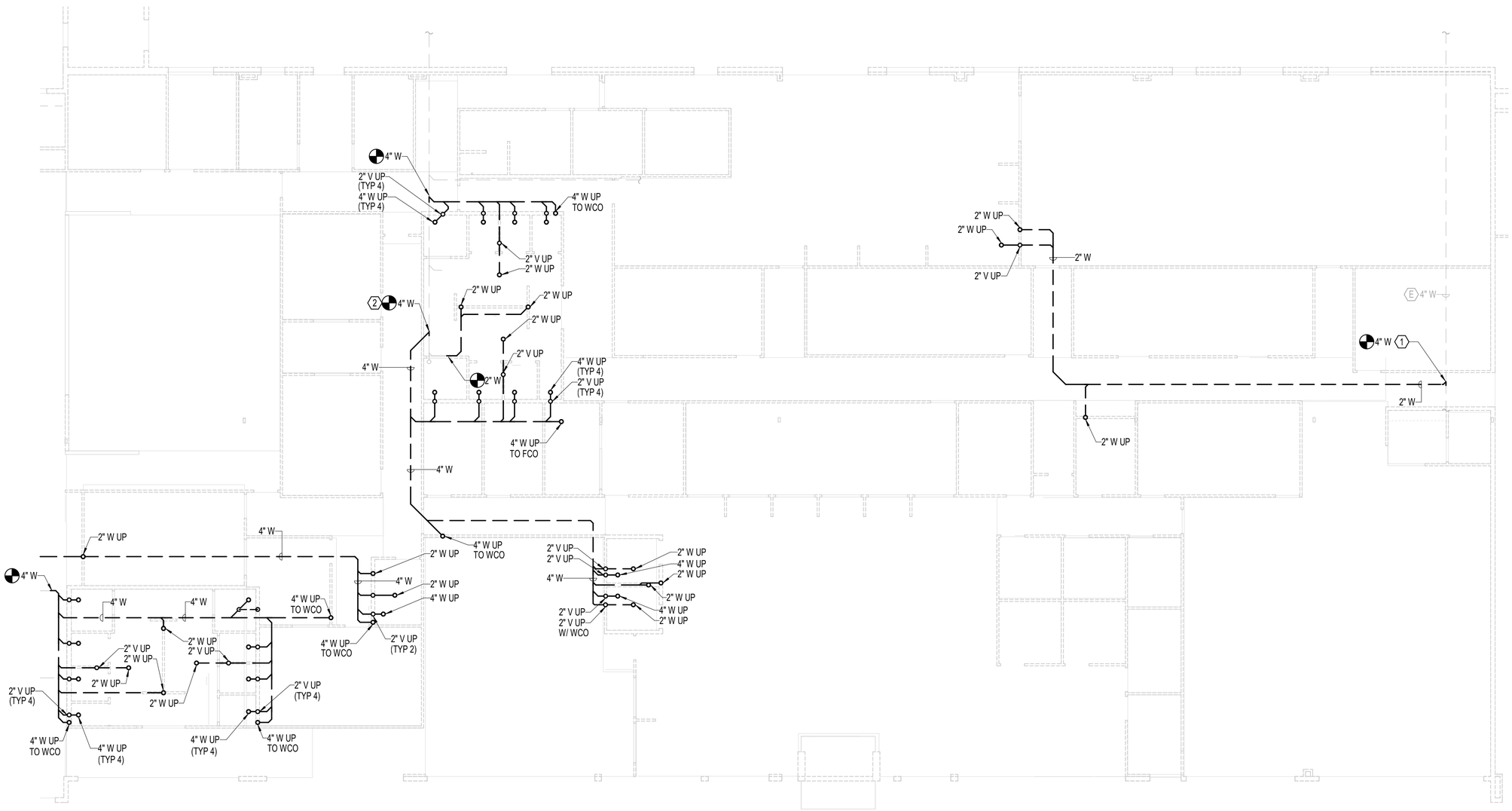
H. PROVIDE CLEANOUTS ABOVE FINISHED FLOOR ON PIPING PASSING THROUGH SLAB ON GRADE. PROVIDE CLEANOUTS EVERY 100 FEET AND FOR EACH AGGREGATE HORIZONTAL CHANGE IN DIRECTION EXCEEDING 135 DEGREES PER PLUMBING CODE. PROVIDE CLEANOUTS AT EACH BUILDING CONNECTION.

I. TESTING OF ANY TIE IN POINTS AND REUSE OF ANY EXISTING SECTIONS OF BELOW GRADE PIPING. REQUIRE BUILDING OFFICIAL'S APPROVAL PRIOR TO ANY BACKFILL OR COVER.

NOTES:

1. SCOPE & VERIFY EXISTING PIPE INVERT PRIOR TO DEMOLITION/SAW CUTTING OF THIS REGION. ANTICIPATED INVERT OF NEW SANITARY MAIN TO BE 2.5' BFF.

2. SCOPE & VERIFY EXISTING PIPE INVERT PRIOR TO DEMOLITION/SAW CUTTING OF THIS REGION. ENSURE THE INVERT OF NEW SANITARY MAIN WILL ALLOW FOR PROPER INSTALLATION OF TOILET 1104 & 1105.



UNDERGROUND PLAN - AREA B - PLUMBING
1/8" = 1'-0"

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checked by: RLW

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UNDERGROUND PLAN - AREA B - PLUMBING

sheet: P-102B
of:

GENERAL NOTES:

A. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO BEGINNING WORK.

B. COORDINATE DEMOLITION WORK WITH ALL OTHER TRADES.

C. ALL PIPING AND EQUIPMENT SERVING AREAS OUTSIDE OF THE PROJECT SCOPE TO REMAIN IN SERVICE. AFTER COMPLETING DEMO WORK, VERIFY THAT ALL OTHER SERVICES TO THE AREAS NOT INCLUDED IN THE DEMO WORK SCOPE AREA ARE FUNCTIONAL.

D. VERIFY EXACT SIZES, LOCATIONS, INVERTS AND ELEVATIONS PRIOR TO RUNNING ANY PIPING. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS OF ALL FIXTURES AND EQUIPMENT. REFER TO LAB LAYOUT DRAWINGS FOR EXACT LOCATION AND ROUGH IN REQUIREMENTS OF ALL LAB FIXTURES, OUTLETS, AND EQUIPMENT.

E. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS. REFER TO ARCHITECTURAL SPECIFICATIONS FOR PATCHING AND REPAIR OF EXISTING WALLS AND FLOORS.

F. COORDINATE APPROVAL FOR SYSTEM SHUT DOWNS WITH THE OWNER

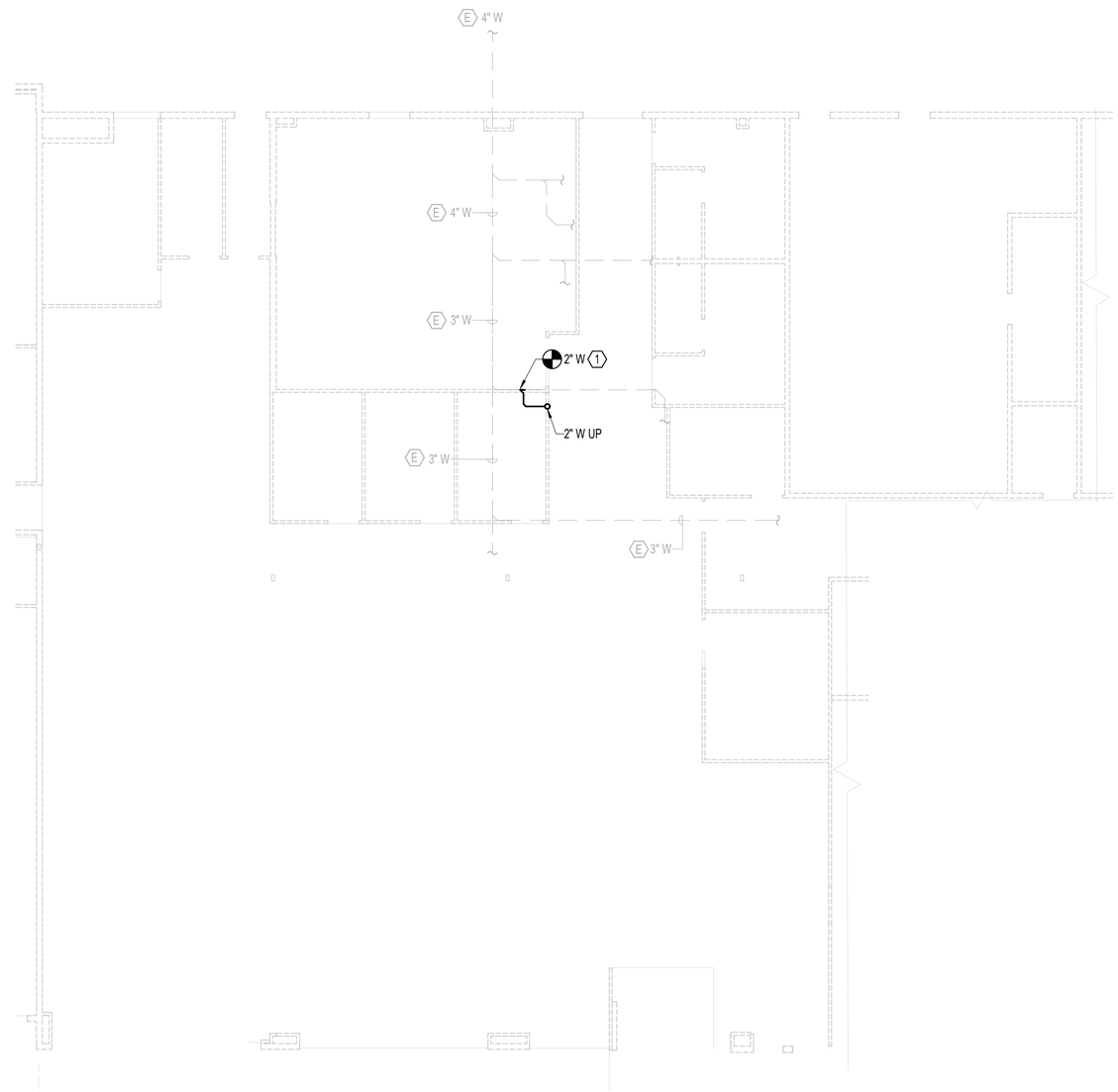
G. AVOID STRUCTURAL FOOTINGS WHERE POSSIBLE. COORDINATE FOOTING DEPTHS WHERE FIXTURES ARE LOCATED ABOVE FOOTINGS. COORDINATE WITH STRUCTURAL FOOTING CROSSING DETAILS WITH STRUCTURAL ENGINEER.

H. PROVIDE CLEANOUTS ABOVE FINISHED FLOOR ON PIPING PASSING THROUGH SLAB ON GRADE. PROVIDE CLEANOUTS EVERY 100 FEET AND FOR EACH AGGREGATE HORIZONTAL CHANGE IN DIRECTION EXCEEDING 135 DEGREES PER PLUMBING CODE. PROVIDE CLEANOUTS AT EACH BUILDING CONNECTION.

I. TESTING OF ANY TIE IN POINTS AND REUSE OF ANY EXISTING SECTIONS OF BELOW GRADE PIPING. REQUIRE BUILDING OFFICIAL'S APPROVAL PRIOR TO ANY BACKFILL OR COVER.

NOTES:

1. SCOPE & VERIFY EXISTING PIPE INVERT PRIOR TO DEMOLITION/SAW CUTTING OF THIS REGION. ENSURE THE INVERT OF NEW SANITARY MAIN WILL ALLOW FOR PROPER INSTALLATION OF SINK.



UNDERGROUND PLAN - AREA C - PLUMBING
1/8" = 1'-0"

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REGISTERED PROFESSIONAL ENGINEER
74533PE
OREGON
JAN 05 2011
NEDZIB BIBERIC
04/04/25
EXPIRES: 12/31/2025

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368 NE NORTON LN
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consultants:
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project: 00524
drawn by: PWH
checked by: RLW

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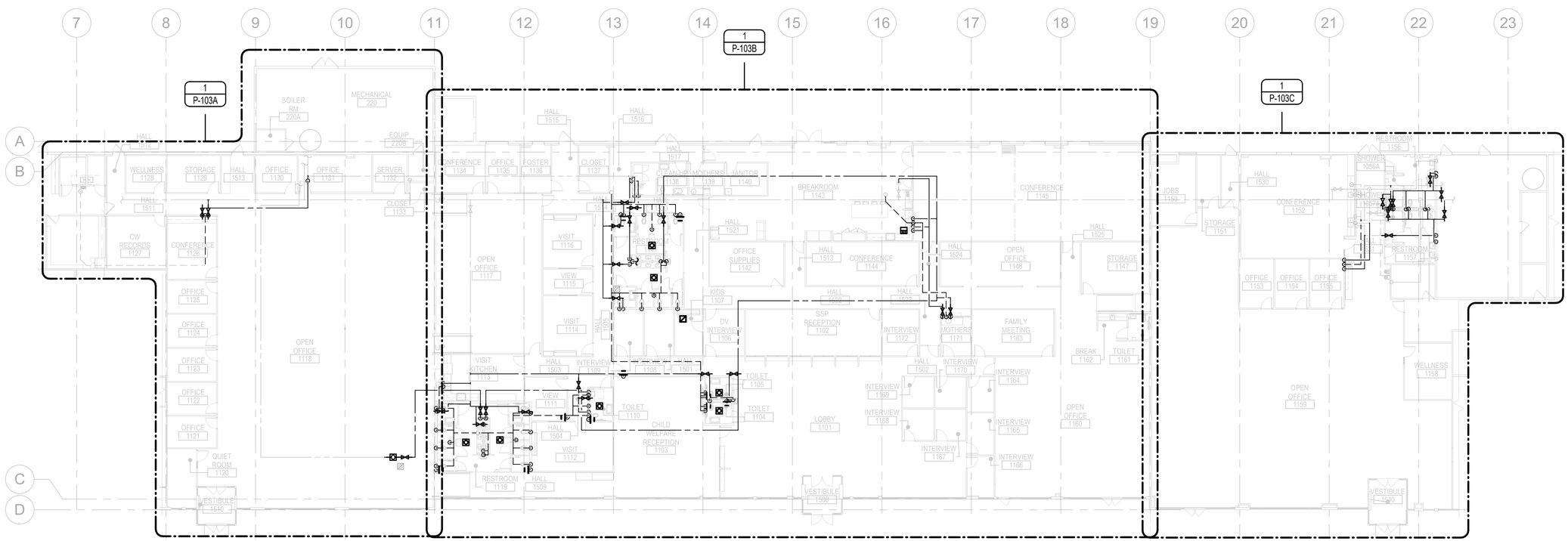
UNDERGROUND PLAN - AREA C - PLUMBING

sheet: P-102C
of:

GENERAL NOTES:

A. OVERALL SHEET FOR REFERENCE ONLY. SEE ENLARGED PLANS FOR ADDITIONAL INFO.



OVERALL FLOOR PLAN - PLUMBING

1/16" = 1'-0"

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OVERALL FLOOR PLAN - PLUMBING

sheet: P-103

of:

GENERAL NOTES:

A. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO BEGINNING WORK.

B. COORDINATE DEMOLITION WORK WITH ALL OTHER TRADES.

C. ALL PIPING AND EQUIPMENT SERVING AREAS OUTSIDE OF THE PROJECT SCOPE TO REMAIN IN SERVICE. AFTER COMPLETING DEMO WORK, VERIFY THAT ALL OTHER SERVICES TO THE AREAS NOT INCLUDED IN THE DEMO WORK SCOPE AREA ARE FUNCTIONAL.

D. VERIFY EXACT SIZES, LOCATIONS, INVERTS AND ELEVATIONS PRIOR TO RUNNING ANY PIPING. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS OF ALL FIXTURES AND EQUIPMENT. REFER TO LAB LAYOUT DRAWINGS FOR EXACT LOCATION AND ROUGH IN REQUIREMENTS OF ALL LAB FIXTURES, OUTLETS, AND EQUIPMENT.

E. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS. REFER TO ARCHITECTURAL SPECIFICATIONS FOR PATCHING AND REPAIR OF EXISTING WALLS AND FLOORS.

F. COORDINATE APPROVAL FOR SYSTEM SHUT DOWNS WITH THE OWNER

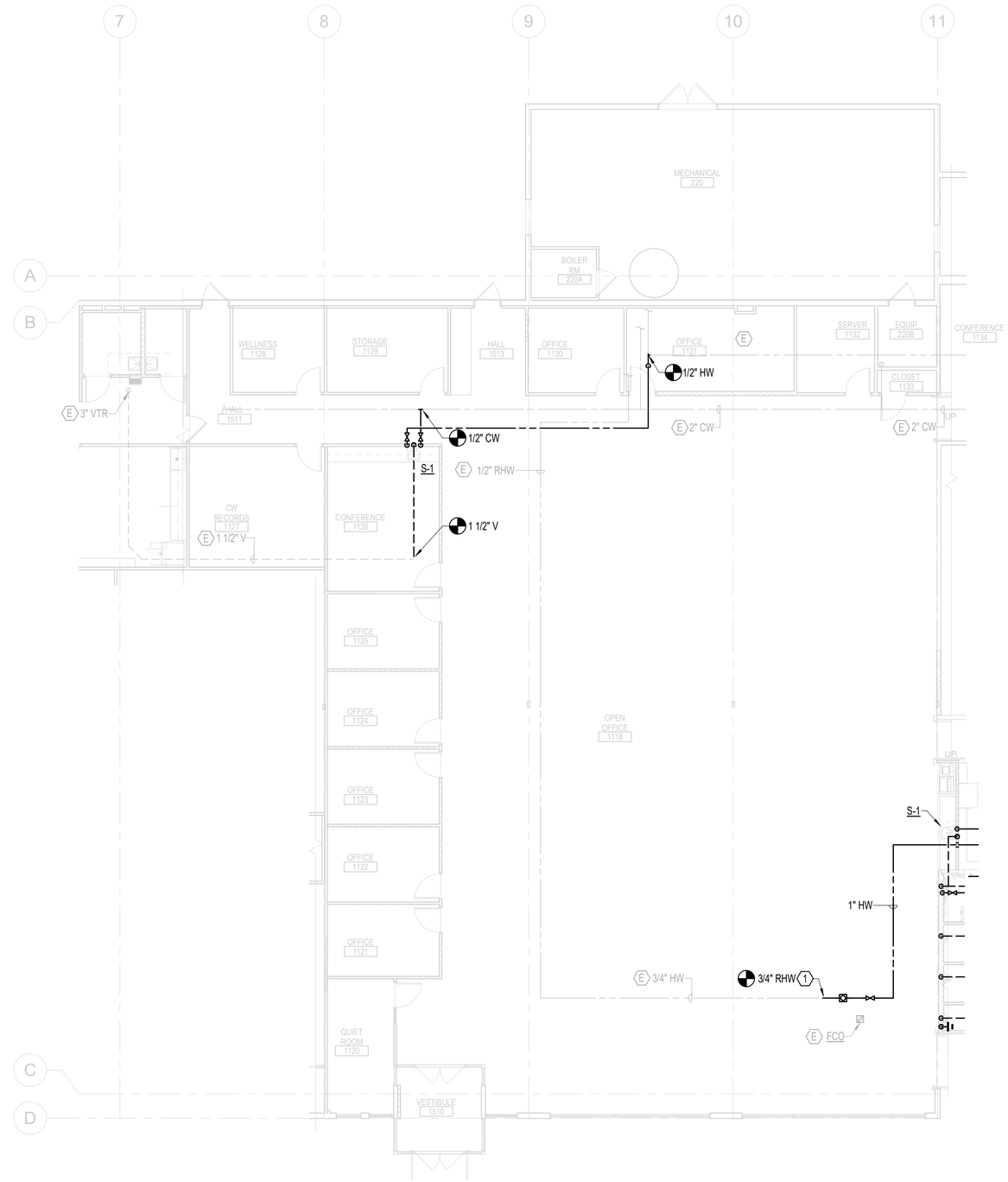
G. AVOID STRUCTURAL FOOTINGS WHERE POSSIBLE. COORDINATE FOOTING DEPTHS WHERE FIXTURES ARE LOCATED ABOVE FOOTINGS. COORDINATE WITH STRUCTURAL FOOTING CROSSING DETAILS WITH STRUCTURAL ENGINEER.

H. PROVIDE CLEANOUTS ABOVE FINISHED FLOOR ON PIPING PASSING THROUGH SLAB ON GRADE. PROVIDE CLEANOUTS EVERY 100 FEET AND FOR EACH AGGREGATE HORIZONTAL CHANGE IN DIRECTION EXCEEDING 135 DEGREES PER PLUMBING CODE. PROVIDE CLEANOUTS AT EACH BUILDING CONNECTION.

I. TESTING OF ANY TIE IN POINTS AND REUSE OF ANY EXISTING SECTIONS OF BELOW GRADE PIPING. REQUIRE BUILDING OFFICIAL'S APPROVAL PRIOR TO ANY BACKFILL OR COVER.

NOTES

1. CONNECT TO EXISTING 3/4-INCH HOT WATER PIPING AND UTILIZE AS THE RECIRCULATING HOT WATER LOOP. THE BALANCING VALVE IS TO BE SET AT 0.5 GPM.



FLOOR PLAN - AREA A - PLUMBING
1/8" = 1'-0"

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FLOOR PLAN - AREA A - PLUMBING

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of:

GENERAL NOTES:

A. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO BEGINNING WORK.

B. COORDINATE DEMOLITION WORK WITH ALL OTHER TRADES.

C. ALL PIPING AND EQUIPMENT SERVING AREAS OUTSIDE OF THE PROJECT SCOPE TO REMAIN IN SERVICE. AFTER COMPLETING DEMO WORK, VERIFY THAT ALL OTHER SERVICES TO THE AREAS NOT INCLUDED IN THE DEMO WORK SCOPE AREA ARE FUNCTIONAL.

D. VERIFY EXACT SIZES, LOCATIONS, INVERTS AND ELEVATIONS PRIOR TO RUNNING ANY PIPING. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS OF ALL FIXTURES AND EQUIPMENT. REFER TO LAB LAYOUT DRAWINGS FOR EXACT LOCATION AND ROUGH IN REQUIREMENTS OF ALL LAB FIXTURES, OUTLETS, AND EQUIPMENT.

E. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS. REFER TO ARCHITECTURAL SPECIFICATIONS FOR PATCHING AND REPAIR OF EXISTING WALLS AND FLOORS.

F. COORDINATE APPROVAL FOR SYSTEM SHUT DOWNS WITH THE OWNER

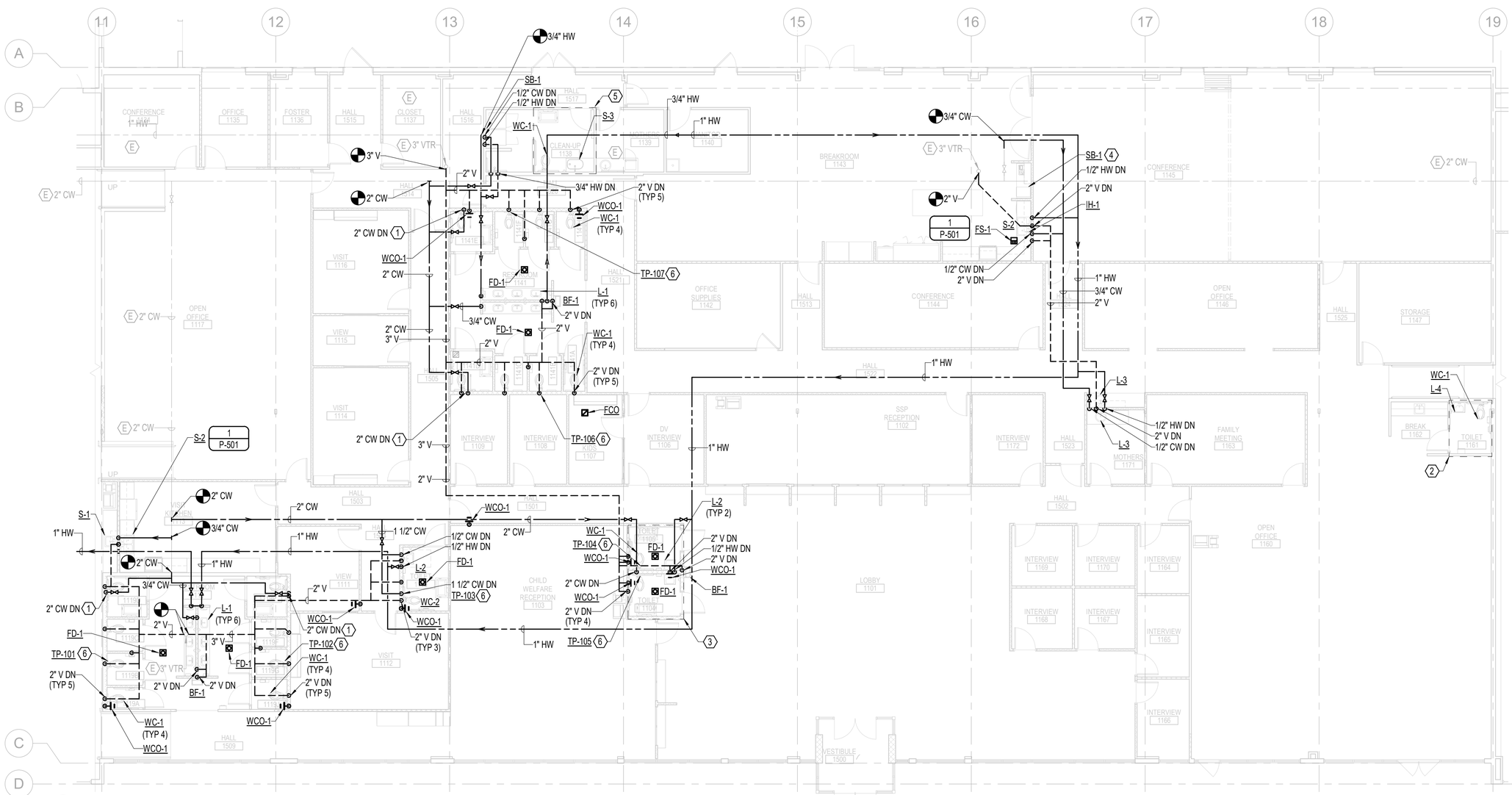
G. AVOID STRUCTURAL FOOTINGS WHERE POSSIBLE. COORDINATE FOOTING DEPTHS WHERE FIXTURES ARE LOCATED ABOVE FOOTINGS. COORDINATE WITH STRUCTURAL FOOTING CROSSING DETAILS WITH STRUCTURAL ENGINEER.

H. PROVIDE CLEANOUTS ABOVE FINISHED FLOOR ON PIPING PASSING THROUGH SLAB ON GRADE. PROVIDE CLEANOUTS EVERY 100 FEET AND FOR EACH AGGREGATE HORIZONTAL CHANGE IN DIRECTION EXCEEDING 135 DEGREES PER PLUMBING CODE. PROVIDE CLEANOUTS AT EACH BUILDING CONNECTION.

I. TESTING OF ANY TIE IN POINTS AND REUSE OF ANY EXISTING SECTIONS OF BELOW GRADE PIPING. REQUIRE BUILDING OFFICIAL'S APPROVAL PRIOR TO ANY BACKFILL OR COVER.

NOTES

1. COLD WATER SUPPLY TO WATER CLOSETS TO BE ROUTED IN THE WALL TO THE FARTHEST WATER CLOSET WITH A WATER HAMMER ARRESTOR.
2. MAINTAIN/RETAIN EXISITING FIXTURE CONNECTION PIPING TIED TO THIS SECTION. REPLACE THE EXITISTING FIXTURES WITH NEW FIXTURES. SEE SHEET P-002 FOR MORE INFORMATION.
3. CONTRACTOR TO COORDINATE EXACT LOCATION OF ISOLATION VALVES PER RESTROOM. ACCESS PANELS AND EXACT LOCATIONS TO BE COORDINATED WITH FACILITIES.
4. CONTRACTOR TO ROUTE TWO DOMESTIC COLD WATER LINES IN THE WALL TO SUPPLY THE FIXTURE SB-1.
5. MAINTAIN/RETAIN EXISTING FIXTURE CONNECTION PIPING TIED TO THIS SECTION FOR FIXTURES WC-1 AND S-3. REPLACE THE EXITISTING FIXTURES WITH NEW FIXTURES. SEE SHEET P-002 FOR MORE INFORMATION.
6. PRESSURE DEPENDENT TRAP PRIMER TO SERVE THE NEAREST FLOOR DRAIN.



FLOOR PLAN - AREA B - PLUMBING

1/8" = 1'-0"

FACET ARCHITECTS

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3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON JAN 08 2014 EDZIB BIBERIC 04/04/25

EXPIRES: 12/31/2025

PERMIT SET

project: CCC - YVC CAMPUS BUILDING 2 - DHS TI

368 NE NORTON LN
MCMINNINVILLE, OR 97128

consultants: PAE pae-engineers.com

revisions:

	Description	Date

date: 04/25/25

project: 00524

drawn by: PWH

checked by: RLW

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FLOOR PLAN - AREA B - PLUMBING

sheet: P-103B

of:

GENERAL NOTES:

A. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO BEGINNING WORK.

B. COORDINATE DEMOLITION WORK WITH ALL OTHER TRADES.

C. ALL PIPING AND EQUIPMENT SERVING AREAS OUTSIDE OF THE PROJECT SCOPE TO REMAIN IN SERVICE. AFTER COMPLETING DEMO WORK, VERIFY THAT ALL OTHER SERVICES TO THE AREAS NOT INCLUDED IN THE DEMO WORK SCOPE AREA ARE FUNCTIONAL.

D. VERIFY EXACT SIZES, LOCATIONS, INVERTS AND ELEVATIONS PRIOR TO RUNNING ANY PIPING. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS OF ALL FIXTURES AND EQUIPMENT. REFER TO LAB LAYOUT DRAWINGS FOR EXACT LOCATION AND ROUGH IN REQUIREMENTS OF ALL LAB FIXTURES, OUTLETS, AND EQUIPMENT.

E. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS. REFER TO ARCHITECTURAL SPECIFICATIONS FOR PATCHING AND REPAIR OF EXISTING WALLS AND FLOORS.

F. COORDINATE APPROVAL FOR SYSTEM SHUT DOWNS WITH THE OWNER

G. AVOID STRUCTURAL FOOTINGS WHERE POSSIBLE. COORDINATE FOOTING DEPTHS WHERE FIXTURES ARE LOCATED ABOVE FOOTINGS. COORDINATE WITH STRUCTURAL FOOTING CROSSING DETAILS WITH STRUCTURAL ENGINEER.

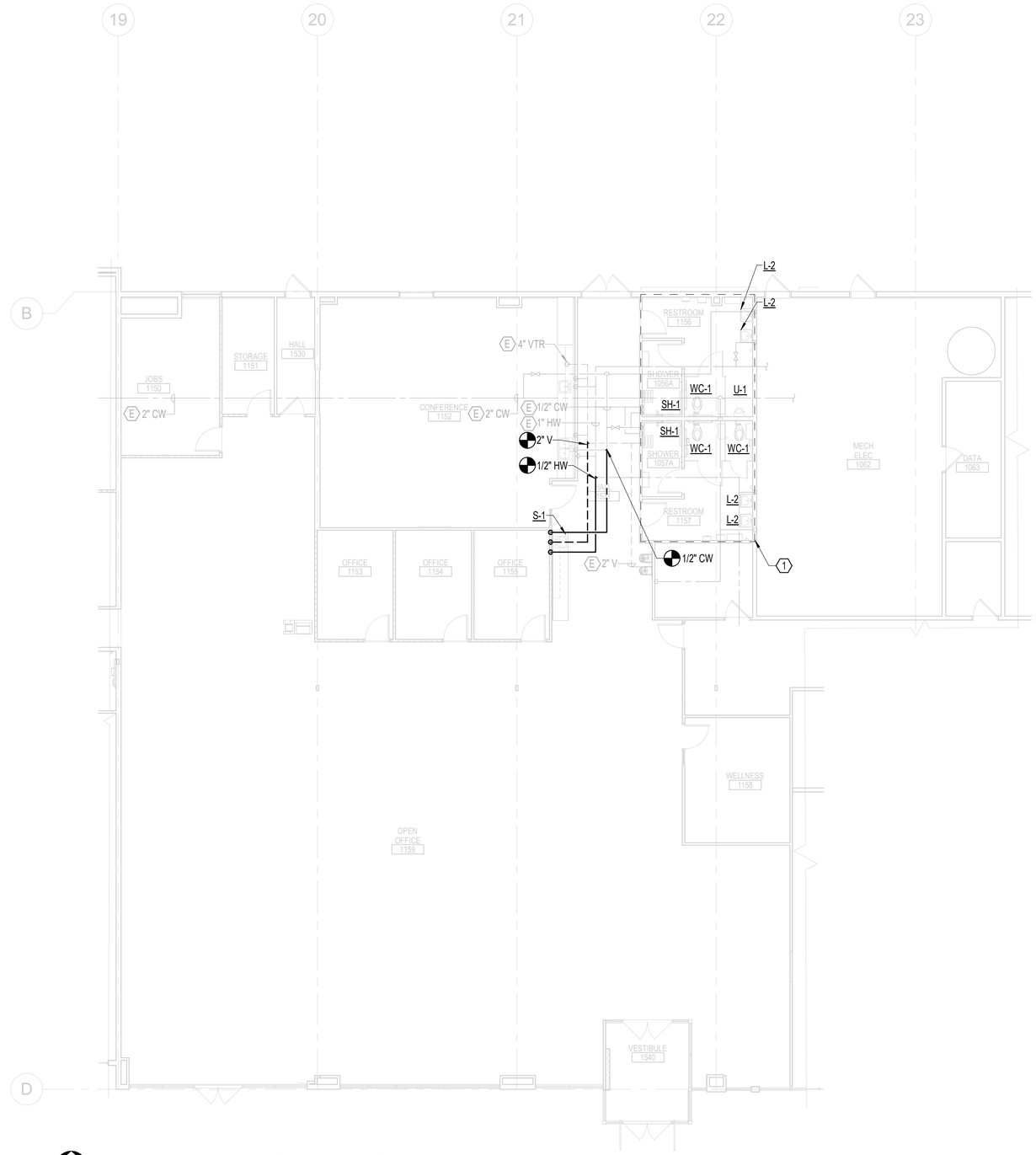
H. PROVIDE CLEANOUTS ABOVE FINISHED FLOOR ON PIPING PASSING THROUGH SLAB ON GRADE. PROVIDE CLEANOUTS EVERY 100 FEET AND FOR EACH AGGREGATE HORIZONTAL CHANGE IN DIRECTION EXCEEDING 135 DEGREES PER PLUMBING CODE. PROVIDE CLEANOUTS AT EACH BUILDING CONNECTION.

I. TESTING OF ANY TIE IN POINTS AND REUSE OF ANY EXISTING SECTIONS OF BELOW GRADE PIPING. REQUIRE BUILDING OFFICIAL'S APPROVAL PRIOR TO ANY BACKFILL OR COVER.

NOTES

1. CONTRACTOR TO FIELD VERIFY EXISITING CONDITIONS IN THIS AREA. UTILIZE THE EXISTING PLUMBING SERVICES WHEREVER POSSIBLE. PROVIDE AN ISOLATION VALVE PER RESTROOM

   - ISOLATION VALVE FOR RESTROOM 1158
   - ISOLATION VALVE FOR RESTROOM 1157



FLOOR PLAN - AREA C - PLUMBING

1/8" = 1'-0"

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EXPIRES: 12/31/2025

project:
CCC - YVC CAMPUS BUILDING 2 - DHS TI
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consultants:
PAE pae-engineers.com

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revisions:

	Description	Date

date: 04/25/25
project: 00524
drawn by: PWH
checked by: RLW

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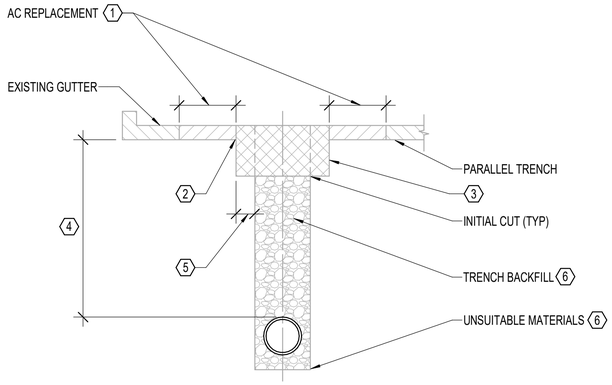
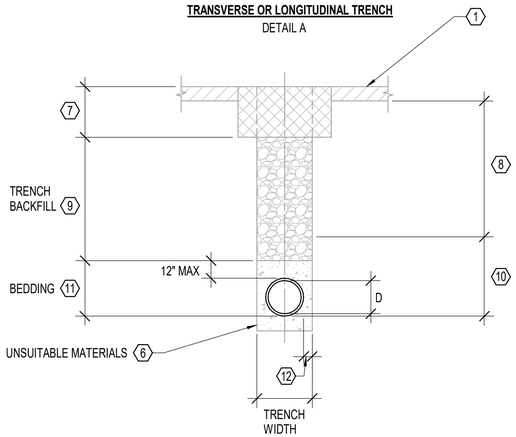
FLOOR PLAN - AREA C - PLUMBING

sheet: P-103C

of:



TRANSVERSE OR LONGITUDINAL TRENCH
DETAIL A



BACKFILL REQUIREMENTS
DETAIL B

GENERAL NOTES:

A. WHEN DISTANCE BETWEEN EDGE OF AC CAP AND LIP OF GUTTER IS 24" OR LESS, ASPHALT PAVING SHALL BE REPLACED TO LIP OF GUTTER.

B. IF STREET HAS BEEN OVERLAID WITH FABRIC, SPECIAL MEASURES, AS DIRECTED BY THE CITY ENGINEER, SHALL BE TAKEN TO INSURE INTEGRITY OF FABRIC.

C. PLACEMENT OF BACKFILL SHALL BE IN 6-INCH LIFTS EVENLY PLACED AND MECHANICALLY COMPACTED TO RELATIVE DENSITY AS SPECIFIED, COMPACTION TEST SHALL BE REQUIRED EXCEPT AS WAIVED BY THE ENGINEER.

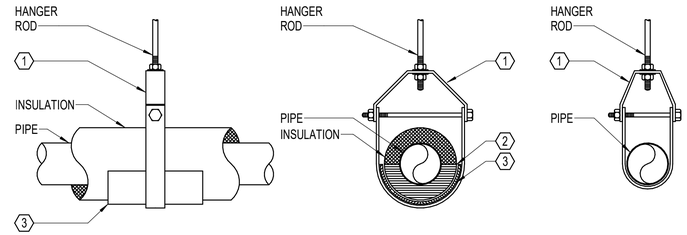
D. INITIAL CUT IN THE STREET PAVEMENT SHALL BE EQUAL TO THE WIDTH OF THE TRENCH WITH THE OPTION OF BEING JACK HAMMERED OR SAW CUT.

E. FINAL CUT IN THE STREET PAVEMENT SHALL BE ONE FOOT WIDER THAN THE TRENCH WIDTH AS SHOWN IN THE STANDARD DETAILS AND SHALL BE MADE BY SAW CUTTING ONLY.

NOTES:

1. REMOVE AND REPLACE EXISTING AC WITH NEW AC IF PARALLEL TRENCH CUT IS WITHIN 2'.
2. FINAL STRAW CUT LINE.
3. 12" THICK AC CAP (8" LOCAL RESIDENTIAL) OR 1" MORE THAN EXISTING AC WHICHEVER IS GREATER.
4. TRENCHES SHALL BE BACKFILLED WITH CLASS 2 AB AND COMPACTED TO 95% RELATIVE COMPACTION (90% BELOW 5" DEPTH) PER SOILS REPORT RECOMMENDATION.
5. 12" MINIMUM (AT LEAST 6" BEYOND ANY PAVEMENT DAMAGED BY TRENCH EXCAVATION).
6. UNSUITABLE MATERIAL SHALL BE REMOVED WHEN DIRECTED BY THE ENGINEER AND REPLACED WITH 3/4" CRUSHED ROCK OR GRAVEL.
7. PERMINENT SURFACING (SEE DETAIL A).
8. 5" 95% RELATIVE COMPACTION PER SOILS REPORT RECOMMENDATION.
9. COVER TO FINISH GRADE SHALL BE MINIMUM 36" FOR LOCAL STREET AND 42" FOR THOROUGHFARE STREETS.
10. 90% RELATIVE COMPACTION (MAX).
11. BEDDING - CLASS 2 AGGREGATE BASE OR AS APPROVED BY CITY ENGINEER.
12. D/3 (6" MIN, 12" MAX).

7 TRENCH BACKFILLING & RESURFACING DETAIL
NONE



INSULATED PIPE WITH VAPOR BARRIER

UNINSULATED PIPE

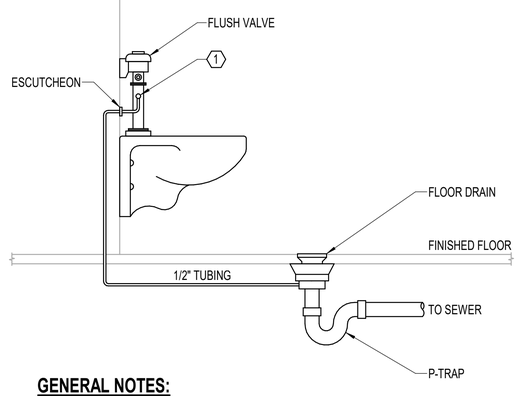
GENERAL NOTES:

A. REFER TO SPECIFICATION 22 07 00 FOR INSULATION THICKNESS REQUIREMENTS AND VAPOR BARRIER VS NON-VAPOR BARRIER INSTALLATION REQUIREMENTS.

NOTES:

1. PIPE HANGER (CLEVIS OR RING STYLE). REFER TO SPECIFICATION 22 05 29 FOR TYPE TO BE USED BASED ON PIPE SIZE AND INSTALLATION (INSULATED VS UNINSULATED PIPING).
2. HIGH DENSITY INSULATION INSERT. REFER TO SPECIFICATION 22 07 00.
3. INSULATION PROTECTION SHIELD. 12" LONG (MIN).

5 PIPE SUPPORT DETAIL - HANGER
NONE



GENERAL NOTES:

A. ALL FLOOR DRAINS, FLOOR SINKS AND SIMILAR TRAPS SHALL BE PRIMED.

B. REFER TO SPECIFICATIONS FOR ALLOWABLE TRAP PRIMER LINE PIPE MATERIALS.

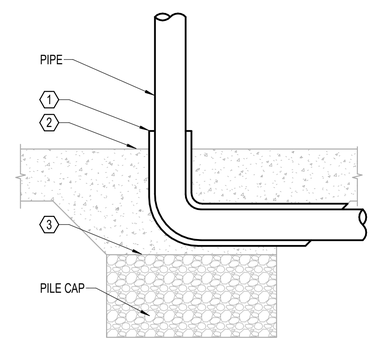
C. REFER TO MANUFACTURER LITERATURE FOR INSTALLATION INSTRUCTIONS.

D. PROVIDE WITH PIPE SLEEVES WHERE PIPES ARE ROUTED THROUGH SLAB.

NOTES:

1. FLUSH VALVE TRAP PRIMER OUTLET.

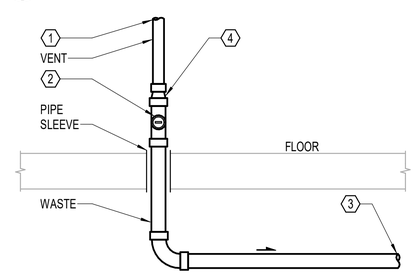
6 FLUSH VALVE TRAP PRIMER
NONE



NOTES:

1. DOUBLE STYROFOAM WRAP (TYP).
2. TOP OF CONCRETE SLAB.
3. TOP OF PILE CAP.

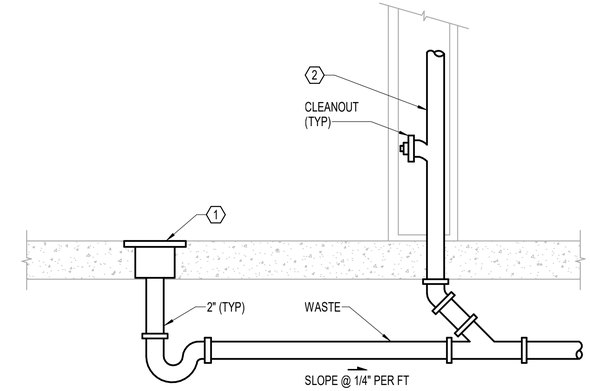
4 PIPE FITTINGS ROUTED OVER GRADE BEAMS & PILE CAPS
NONE



NOTES:

1. TO BUILDING VENT SYSTEM.
2. LINE SIZE CLEANOUT TEE WITH CLEANOUT PLUG.
3. TO BUILDING WASTE SYSTEM.
4. PIPE REDUCER ABOVE CLEANOUT.

3 WALL CLEANOUT WITH VENT DETAIL
NONE



GENERAL NOTES:

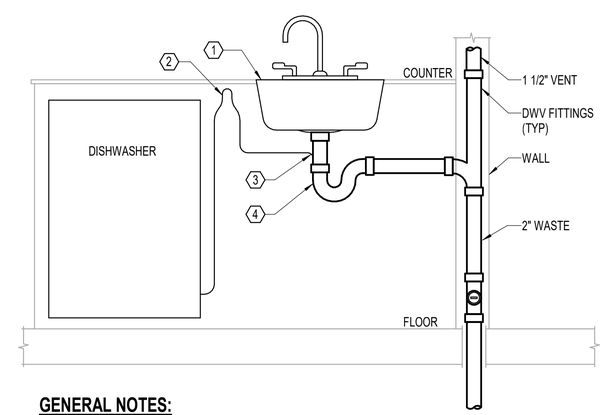
A. EACH VENT SHALL RISE VERTICALLY TO A POINT NOT LESS THAN 6 INCHES ABOVE THE FLOOD LEVEL RIM OF THE FIXTURE SERVED BEFORE OFFSETTING HORIZONTALLY.

B. IF STRUCTURAL CONDITIONS PROHIBIT STANDARD VENTING, VENTS SHALL BE FLAT VENTED.

NOTES:

1. FLOOR DRAIN/ FLOOR SINK.
2. VENT INSIDE PLUMBING WALL.

2 FLOOR DRAIN/ FLOOR SINK STANDARD VENT DETAIL
NONE



GENERAL NOTES:

A. GARBAGE DISPOSAL NOT SHOWN FOR CLARITY.

NOTES:

1. KITCHEN SINK PER FIXTURE SCHEDULE.
2. ROUTE AIR GAP DISCHARGE TO SINK TAILPIECE.
3. 1 1/2" TAIL PIECE WITH DISHWASHER CONNECTION.
4. 1 1/2" TRAP & TRAP ARM TRAP PRIMER LINE.

1 DISHWASHER AIR GAP DETAIL
NONE

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REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON JAN 08 2014 EDZIB BIBERIC 04/04/25
EXPIRES: 12/31/2025

project:
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368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:
PAE pae-engineers.com

revisions:

#	Description	Date

PERMIT SET

date: 04/25/25
project: 00524
drawn by: PWH
checked by: RLW

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DETAILS - PLUMBING

sheet: P-501
of:

DUCT LEGEND

CFM / TYPE — FLOW DIRECTION (NONE SHOWN IF 4-WAY)

RETURN EXHAUST SUPPLY

SEE SPEC FOR TYPE
SEE SCHEDULE FOR SIZE

CEILING DIFFUSERS & GRILLES

CFM / SIZE TYPE

TYPE REFERENCE
H = 6" BELOW CEILING
L = 6" ABOVE FLOOR
F = FLOOR
S = SLOT DIFFUSER
C = CEILING
T = DOOR TRANSFER

NECK SIZE (SIDEWALL & FLOOR GRILLE)
PLENUM INLET SIZE (SLOT DIFFUSER)

SIDEWALL, SLOT & FLOOR GRILLES

SUPPLY AIR — RETURN AIR — EXHAUST AIR — OUTSIDE AIR

DUCT SECTIONS

FSD — FD — SD

COMBINATION FIRE/SMOKE — SMOKE — FIRE — AUTOMATIC VOLUME

DAMPERS

RETURN OR EXHAUST AIR FLOW

SUPPLY OR OUTSIDE AIR FLOW

UC 1/2" UNDERCUT DOOR

LOW PRESSURE DUCTWORK

D — R=2D FOR FLEX — SECTION — PLAN — FLEX DUCT

D — R=1-1/2D FOR ROUND — SECTION — PLAN — ROUND DUCT

RETURN OR EXHAUST GRILLE CONNECTION

D — R=2D FOR FLEX — SECTION — PLAN — FLEX DUCT

D — R=1-1/2D FOR ROUND — SECTION — PLAN — ROUND DUCT

SUPPLY DIFFUSER CONNECTION

SECTION — PLAN — RECTANGULAR DUCT

RETURN OR EXHAUST GRILLE

LINED PLENUM — FLEX DUCT — SPIN-IN FITTING — SECTION — PLAN — SQUARE NECK

SUPPLY DIFFUSER SIDE FLEX CONNECTION

SECTION — PLAN

SUPPLY DIFFUSER HARD CONNECTION

SECTION — PLAN

SIDEWALL SUPPLY GRILLE CONNECTION

MEDIUM PRESSURE DUCTWORK

CONICAL TEE — LOW LOSS — LATERAL TEE — CONICAL LATERAL

BRANCH FITTINGS

R=1-1/2D — ELBOW

Y-BRANCH

R=.2D — D — R — BELL MOUTH

L=D1-D2 — L — D1 — D2 — REDUCER

APPLICABLE CODES AND STANDARDS

- 2022 OREGON STRUCTURAL SPECIALTY CODE
- 2022 OREGON FIRE CODE
- 2022 OREGON MECHANICAL SPECIALTY CODE
- 2021 OREGON ENERGY EFFICIENCY SPECIALTY CODE
- 2023 OREGON ELECTRICAL SPECIALTY CODE
- 2023 OREGON PLUMBING SPECIALTY CODE
- ASHRAE STANDARD 62.1-2019: VENTILATION FOR ACCEPTABLE INDOOR AIR QUALITY
- ASHRAE STANDARD 90.1-2019: ENERGY STANDARD FOR BUILDINGS EXCEPT LOW-RISE RESIDENTIAL BUILDINGS
- ADA OR UNIFORM FEDERAL ACCESSIBILITY STANDARDS

DEFERRED SUBMITTALS

THE FOLLOWING ARE DEFERRED SUBMITTALS WHICH ARE REQUIRED TO BE COMPLETED FOR THIS PROJECT AND ARE THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO DEVELOP OR SUB-CONTRACT TO A LICENSED ENGINEER OR CERTIFIED PROFESSIONAL AS REQUIRED IN THE STATE OF OREGON. IT IS ALSO THE INSTALLING CONTRACTOR'S RESPONSIBILITY TO SUBMIT TO ALL APPLICABLE AUTHORITIES HAVING JURISDICTION AS NEEDED FOR PERMITTING. DEFERRED SUBMITTALS TO BE SUBMITTED TO CITY 30 DAYS PRIOR TO WORK START.

SEISMIC AND VIBRATION ENGINEERING FOR MECHANICAL SYSTEMS.

SYMBOLS

A	ACCESS PANEL	#	NUMBERED NOTE
	POINT OF CONNECTION	X	REMOVE EXISTING
E	EXISTING TO REMAIN	K	CAP EXISTING / CAP FOR FUTURE
B	BELOW GRADE / FLOOR	R	RELOCATE EXISTING
1	REVISION NUMBER	F	FUTURE

WALL-MOUNTED / PENDENT-MOUNTED

T T TEMPERATURE
H H HUMIDITY
DP DP DIFFERENTIAL PRESSURE SWITCH

CO CO CARBON MONOXIDE
CO2 CO2 CARBON DIOXIDE
NOX NOX NITROGEN OXIDE

SENSORS

XX-XXX — UNIT NUMBER — EQUIPMENT TYPE

EQUIPMENT

XXXX-XX-XXXXX — UNIT NUMBER — FLOOR UNIT IS LOCATED ON — EQUIPMENT TYPE

EQUIPMENT

XXX — TAG NUMBER

EQUIPMENT PROVIDED BY OTHERS

TU-X-XXX — TERMINAL UNIT NUMBER — FLOOR UNIT IS LOCATED ON — AIR HANDLER NUMBER — TERMINAL UNIT

TERMINAL UNITS

X / XX.XX — DETAIL NUMBER — SHEET NUMBER

DETAIL CALLOUT

DEMOLITION LEGEND

REMOVE EXISTING DUCTWORK

REMOVE EXISTING PIPE

REMOVE EXISTING EQUIPMENT

NEW, EXISTING, & FUTURE WORK

EXISTING DUCTWORK — NEW DUCTWORK — FUTURE DUCTWORK

EXISTING PIPING — NEW PIPING — FUTURE PIPING

EXISTING EQUIPMENT — NEW EQUIPMENT — FUTURE EQUIPMENT

EXISTING EQUIPMENT CLEARANCES — NEW EQUIPMENT CLEARANCES — FUTURE EQUIPMENT CLEARANCES

GENERAL NOTES:

A. THIS IS A STANDARD LEGEND SHEET, THEREFORE, SOME SYMBOLS MAY APPEAR ON THIS SHEET THAT DO NOT APPEAR ON THE DRAWINGS.

MISC. VALVES & COCKS

SHUTOFF VALVE
GLOBE VALVE
GATE VALVE OS&Y
BALL VALVE
BUTTERFLY VALVE
CHECK VALVE
WYE STRAINER
WYE STRAINER WITH BLOWDOWN
DRAIN VALVE
BALANCING VALVE
FC — AUTOMATIC FLOW CONTROL VALVE
PRESSURE REDUCING VALVE
RELIEF VALVE
TRIPLE DUTY VALVE
TWO-WAY CONTROL VALVE
THREE-WAY CONTROL VALVE

THERMOMETER
PRESSURE GAUGE
PRESSURE-TEMPERATURE TEST PLUG
MAV — MANUAL AIR VENT
AAV — AUTOMATIC AIR VENT
F — FLOW SWITCH
T — TEMPERATURE SENSOR
V — VACUUM BREAKER
S — SOLENOID VALVE
THRUST BLOCK

MECHANICAL SHEET LIST

SHEET #	SHEET NAME
M-001	SYMBOLS, LEGENDS & ABBREVIATIONS - MECHANICAL
M-002	SYMBOLS, LEGENDS & ABBREVIATIONS - MECHANICAL
M-003	EQUIPMENT SCHEDULE - MECHANICAL
M-004	EQUIPMENT SCHEDULE - MECHANICAL
M-005	EQUIPMENT SCHEDULE - MECHANICAL
M-006	EQUIPMENT SCHEDULE - MECHANICAL
M-007	EQUIPMENT SCHEDULE - MECHANICAL
M-101	DEMOLITION FLOOR PLAN - MECHANICAL
M-101A	DEMOLITION FLOOR PLAN - AREA A - MECHANICAL
M-101B	DEMOLITION FLOOR PLAN - AREA B - MECHANICAL
M-101C	DEMOLITION FLOOR PLAN - AREA C - MECHANICAL
M-102	OVERALL FLOOR PLAN - MECHANICAL
M-102A	FLOOR PLAN - AREA A - MECHANICAL
M-102B	FLOOR PLAN - AREA B - MECHANICAL
M-102C	FLOOR PLAN - AREA C - MECHANICAL
M-103	ROOF PLAN - MECHANICAL
M-302A	FLOOR PLAN - AREA A - MECHANICAL PIPING
M-302B	FLOOR PLAN - AREA B - MECHANICAL PIPING
M-302C	FLOOR PLAN - AREA C - MECHANICAL PIPING
M-501	DETAILS - MECHANICAL
M-701	CONTROL DIAGRAMS - MECHANICAL
M-702	CONTROL DIAGRAMS - MECHANICAL
M-703	CONTROL DIAGRAMS - MECHANICAL
M-704	CONTROL DIAGRAMS - MECHANICAL
M-901	FLOOR PLAN - AREA A - MECHANICAL ZONES
M-902	FLOOR PLAN - AREA B - MECHANICAL ZONES
M-903	FLOOR PLAN - AREA C - MECHANICAL ZONES
Grand total: 27	

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REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON JAN. 03, 2014 WEDZIB BIBERIC
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checked by: NB

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SYMBOLS, LEGENDS & ABBREVIATIONS - MECHANICAL

sheet: M-001

of:

HVAC PIPING

	D	DRAIN (CONDENSATE/INDIRECT)
	HWS	HEATING WATER SUPPLY
	HWR	HEATING WATER RETURN
	RL	REFRIGERANT LIQUID
	RS	REFRIGERANT SUCTION

STANDARD ABBREVIATIONS

AD	AREA DRAIN
ADA	AMERICANS WITH DISABILITIES ACT
AF	AIRFOIL
AFF	ABOVE FINISHED FLOOR
AHP	APPARATUS HOUSING PLENUM
AL	ALUMINUM
ALT	ALTERNATIVE
AP	ACCESS PANEL
APD	AIR PRSSURE DROP
APPROX	APPROXIMATELY
ARCH	ARCHITECT, ARCHITECTURAL
AS	AUTOMATIC SPRINKLER
AUTO	AUTOMATIC
BDD	BACKDRAFT DAMPER
BFF	BELOW FINISHED FLOOR
BHP	BREAK HORESPOWER
BI	BACKWARD INCLINED
BLDG	BUILDING
BOP	BOTTOM OF PIPE
BOS	BOTTOM OF STRUCTURE
BSMT	BASEMENT
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNITS PER HOUR
BTV	BUTTERFLY VALVE
BV	BALANCING VALVE
CALC	CALCULATION
CB	CATCH BASIN
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CI	CAST IRON
CL	CENTERLINE
CLG	CEILING OR COOLING
CO	CLEANOUT
CONC	CONCRETE
CONN	CONNECT, CONNECTION
CONT	CONTINUED, CONTINUATION
CP	CIRCULATING PUMP
CTG	CLEANOUT TO GRADE
CV	CHECK VALVE
DB	DRY BULB
DDC	DIRECT DIGITAL CONTROL
DEFL	DEFLECTION
DF	DRINKING FOUNTAIN
DFU	DRAINAGE FIXTURE UNIT
DI	DEIONIZED
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DN	DOWN (PENETRATES FLOOR)
DP	DEW POINT
DR	DRAIN
DV	DRAIN VALVE
DROP	DROP (WITHIN FLOOR)
DWDI	DOUBLE WIDTH DOUBLE INLET
DWG	DRAWING
(E), EXIST	EXISTING
EAT	ENTERING AIR TEMPERATURE
EC	EXTENDED COVERAGE
ECM	ELECTRONICALLY COMMUTATED MOTOR
EDB	ENTERING DRY BULB
EEW	EMERGENCY EYE WASH
EFF	EFFICIENCY
EFT	ENTERING FLUID TEMPERATURE
ELEC	ELECTRIC, ELECTRICAL
ELEV	ELEVATION
ENGR	ENGINEER
EQ	EQUAL
EQUIP	EQUIPMENT
ES	EMERGENCY SHOWER
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
EWB	ENTERING WET BULB
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EWT	ENTERING WATER TEMPERATURE
EX	EXTRACTOR
EXP	EXPANSION
EXH	EXHAUST OR EXHAUST AIR
F	DEGREES FAHRENHEIT
FC	FORWARD CURVED
FCO	FLOOR CLEANOUT
FD	FIRE DAMPER (MECHANICAL)
FD	FLOOR DRAIN (PLUMBING)
FDC	FIRE DEPARTMENT CONNECTION
FFE	FINISHED FLOOR ELEVATION
FIG	FIGURE
FL	FLOOR
FLA	FULL LOAD AMPACITY
FLEX	FLEXIBLE
FP	FIRE PUMP
FPD	FLUID PRESSURE DROP
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FS	FLOOR SINK
FSD	FIRE SMOKE DAMPER
FT	FEET/FOOT
FTR	FINNED TUBE RADIATOR
FLT	FLUSH TANK
FU	FIXTURE UNIT
FV	FLUSH VALVE
(F)	FUTURE
G	GRADE
GA	GAGE/GAUGE
GAL	GALLON
GALV	GALVANIZED
GLY	GLYCOL
GH	GROUND HYDRANT
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GV	GATE VALVE
H	HEIGHT
HB	HOSE BIBB
HD	HUB DRAIN
HORIZ	HORIZONTAL
HP	HORSEPOWER
HR	HOUR
HSW	HORIZONTAL SIDE WALL
HT	HEAT TRACE
HTG	HEATING
HV	HOSE VALVE
HVC	HOSE VALVE CABINET
ID	INSIDE DIAMETER, INSIDE DIMENSION
IE	INVERT ELEVATION
IN	INCH, INCHES
INSUL	INSULATION
IPS	IRON PIPE SIZE
ISO	ISOMETRIC
ISOL	ISOLATOR, ISOLATION
JP	JOCKEY PUMP
KW	KILOWATT
KWH	KILOWATT HOUR
L	LENGTH
LAT	LEAVING AIR TEMP
LAV	LAVATORY
LB	POUND
LDB	LEAVING DRY BULB
LF	LINEAR FEET
LFT	LEAVING FLUID TEMPERATURE
LVG	LEAVING
LWB	LEAVING WET BULB
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	THOUSAND BTU PER HOUR
MCA	MINIMUM CIRCUIT AMPACITY
MECH	MECHANICAL
MERV	MINIMUM EFFICIENCY REPORTING VALUE
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MOCP	MAXIMUM OVERCURRENT PROTECTION
MS	MOP SINK
MTD	MOUNTED
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NPS	NOMINAL PIPE SIZE
NRS	NON-RISING STEM
NTS	NOT TO SCALE
OAT	OUTSIDE AIR TEMPERATURE
OC	ON CENTER DISTANCE
OD	OVERFLOW DRAIN
OS&Y	OUTSIDE SCREW & YOKE GATE VALVE
OSA	OUTSIDE AIR
PD	PLANTER DRAIN
P/FT	PITCH PER FOOT
PG	PRESSURE GAUGE
PH	PHASE
PIV	POST INDICATING VALVE
PP	POLYPROPYLENE
PRV	PRESSURE REDUCING VALVE
PS	PRESSURE SWITCH
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH (GAUGE)
PVC	POLYVINYL CHLORIDE
PVS	PVC COATED STEEL
R, RAD	RADIUS
RA	RELIEF AIR
RD	ROOF DRAIN
RET	RETURN AIR
REV	REVISION
RH	RELATIVE HUMIDITY
RISE	RISE (WITHIN FLOOR)
RM	ROOF MANIFOLD
RN	RISER NIPPLE
RPM	REVOLUTIONS PER MINUTE
S	SINK
SA	SUPPLY AIR
SAD	SEE ARCHITECTURAL DRAWINGS
SB	SWAY BRACE
SCD	SEE CIVIL DRAWINGS
SCFM	STANDARD CUBIC FEET PER MINUTE
SD	SHOWER DRAIN (PLUMBING)
SD	SMOKE DAMPER (MECHANICAL)
SE	SEWAGE EJECTOR
SECT	SECTION
SED	SEE ELECTRICAL DRAWINGS
SENS	SENSIBLE
SF	SQUARE FOOT, SQUARE FEET
SH	SHOWER
SIM	SIMILAR
SMD	SEE MECHANICAL DRAWINGS
SOV	SHUTOFF VALVE
SP	STATIC PRESSURE
SPD	SEE PLUMBING DRAWINGS
SPEC	SPECIFICATION
SQ	SQUARE
SQ IN	SQUARE INCH, SQUARE INCHES
SS	STAINLESS STEEL (ALL)
SSD	SEE STRUCTURAL DRAWINGS
SSP	STANDARD SPRAY PENDENT
SSU	STANDARD SPRAY UPRIGHT
STL	STEEL
STRUCT	STRUCTURE, STRUCTURAL
SWP	SINGLE WALL PLENUM
SWSI	SINGLE WIDTH SINGLE INLET
TD	TRENCH DRAIN
TDH	TOTAL DISCHARGE HEAD
TDL	TOTAL DEVELOPED LENGTH
TEMP	TEMPERATURE
TMV	THERMOSTATIC MIXING VALVE
TOP	TOP OF PIPE
TP	TRAP PRIMER VALVE
TS	TAMPER SWITCH
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
U	URINAL
UG	UNDERGROUND
UP	UP (PENETRATES FLOOR SLAB)
UON	UNLESS OTHERWISE NOTED
V	VOLTS
VB	VACUUM BREAKER
VD	VOLUME DAMPER
VEL	VELOCITY
VERT	VERTICAL
VFD	VARIABLE FREQUENCY DRIVE
VTR	VENT THROUGH ROOF
W	WIDTH
WB	WET BULB
WC	WATER CLOSET
WCO	WALL CLEANOUT
WFU	WATER FIXTURE UNITS
WG	WATER GAUGE
WH	WALL HYDRANT
WHA	WATER HAMMER ARRESTOR
WPD	WATER PRESSURE DROP
WTD	WATER TEMPERATURE DROP
WTR	WATER TEMPERATURE RISE
W/	WITH
W/O	WITHOUT

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REGISTERED PROFESSIONAL ENGINEER 74933PE OREGON JAN. 03, 2014 NEDZIB BIBERIC
4/25/2025
EXPIRES: 12/31/2025

PERMIT SET

project:
CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
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consultants:
PAE pae-engineers.com

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: RNW
checked by: NB

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SYMBOLS, LEGENDS & ABBREVIATIONS - MECHANICAL

sheet: M-002
of:

DESIGN CONDITIONS

GENERAL NOTES:
A. OUTDOOR CONDITIONS BASED ON ASHRAE FUNDAMENTALS 2021 99.6% AND 0.4% DATA.

SPACE	WINTER		SUMMER	
	TEMPERATURE	HUMIDITY	TEMPERATURE	HUMIDITY
OUTDOOR	24.8˚ F DB	17.5˚ F DP / 13.4 HR / 28.4˚ F MCDB	92.9˚ F DB / 67.2˚ F MCWB	61.3˚ F DP / 81.7 HR / 75.5˚ F MCDB
OFFICES	68˚ F ± 2˚ F DB	60% RH MAX, NO MINIMUM	74˚ F ± 2˚ F DB	60% RH MAX, NO MINIMUM
MEETING ROOMS	68˚ F ± 2˚ F DB	60% RH MAX, NO MINIMUM	74˚ F ± 2˚ F DB	60% RH MAX, NO MINIMUM
RECEPTION	68˚ F ± 2˚ F DB	60% RH MAX, NO MINIMUM	74˚ F ± 2˚ F DB	60% RH MAX, NO MINIMUM
KITCHEN	68˚ F ± 2˚ F DB	60% RH MAX, NO MINIMUM	74˚ F ± 2˚ F DB	60% RH MAX, NO MINIMUM
IT CLOSETS	75˚ F ± 2˚ F DB	-	75˚ F ± 2˚ F DB	60% RH MAX, NO MINIMUM

SPLIT SYSTEM HEAT PUMP SCHEDULE

GENERAL NOTES:
A. MINIMUM EFFICIENCY IS AT ARI STANDARD CONDITIONS.
B. PROVIDE WASHABLE MERV 8 FILTERS
C. PROVIDE HARDWIRED FACTORY THERMOSTAT WITH UNIT. ADDITIONAL DDC THERMOSTAT PROVIDED IN SPACE, REFER TO ZONING PLANS.
D. PROVIDE DDC TEMPERATURE SENSOR FOR MONITORING AND ALARM.
NOTES:
1. PROVIDE CONDENSATE PUMP POWERED FROM INDOOR UNIT. ROUTE CONDENSATE DRAIN TO MOP SINK OR ADJACENT LAV TAILPIECE.
2. INDOOR UNIT RECEIVES POWER FROM OUTDOOR UNIT.
3. COOLING ONLY UNIT.

TAG	LOCATION	SERVICE	TYPE	AIRFLOW (CFM)	COOLING CAPACITY TOTAL (MBH)	COOLING CAPACITY SENSIBLE (MBH)	COOLING CAPACITY EAT (°F DB/WB)	MIN EFFICIENCY SEER	REFRIGERANT TYPE	REFRIGERANT CHARGE (LBS)	ELECTRICAL VOLT/ PHASE	ELECTRICAL FLA (A)	ELECTRICAL MCA (A)	ELECTRICAL MOCP (A)	BACKUP POWER (Y/N)	APPROX. WEIGHT (LBS)	MANUFACTURER & MODEL	NOTES
ACCU-201 / AC-101	ROOF/LEVEL 1	1132 SERVER	WALL-MOUNT	400	12	9.5	80/67	21.0	R-32	1.65	208/1	9	15	30	YES	25/60	DAIKIN FTKF12	1, 2, 3
ACCU-202 / AC-102	ROOF/LEVEL 1	220B EQUIP	WALL-MOUNT	400	12	9.5	80/67	21.0	R-32	1.65	208/1	9	15	30	YES	25/60	DAIKIN FTKF12	1, 2, 3
ACCU-203 / AC-103	ROOF/LEVEL 1	1147 STORAGE	WALL-MOUNT	400	12	9.5	80/67	21.0	R-32	1.65	208/1	9	15	30	YES	25/60	DAIKIN FTKF12	1, 2, 3

FAN SCHEDULE

GENERAL NOTES:
A. FAN ENERGY INDEX (FEI) BASED ON MANUFACTURERS' CERTIFIED DATA, RATIO OF THE ELECTRIC INPUT POWER OF A REFERENCE FAN TO THE ELECTRIC INPUT POWER OF THE ACTUAL FAN, AS CALCULATED PER AMCA 208.
B. FANS TO BE INSTALLED ON FACTORY SUPPLIED HINGED ROOF CURBS. REFER TO DETAIL 2/M5.01 FOR ADDITIONAL REQUIREMENTS.
NOTES:
1. PROVIDE SWITCH TO OVERRIDE FAN OPERATION TO EXHAUST HIGH AIRFLOW.
2. PROVIDE VARI-GREEN MOTOR WITH FAN.

TAG	LOCATION	SERVICE	TYPE	DRIVE	AIRFLOW MAX (CFM)	AIRFLOW DESIGN (CFM)	AIRFLOW ESP (IN WG)	AIRFLOW FAN SPEED (RPM)	FAN ENERGY INDEX	ELECTRICAL POWER (BHP)	ELECTRICAL RATING (HP)	ELECTRICAL MCA	ELECTRICAL MOCP	ELECTRICAL VOLT/ PHASE	ELECTRICAL VFD (Y/N)	ELECTRICAL BACKUP POWER (Y/N)	APPROX. WEIGHT (LBS)	MANUFACTURER & MODEL	NOTES
EF-201	ROOF	EXISTING SPACE	CENTRIFUGAL	DIRECT	300	300	0.5	1,155	-	0.05	0.25	2.60	15.00	208/1	NO	NO	100	GREENHECK G-098-VG	2
EF-202	ROOF	1104/1105 TOILET	CENTRIFUGAL	DIRECT	800	200	0.5	1,308	-	0.13	0.25	2.60	15.00	208/1	NO	NO	100	GREENHECK G-100-VG	1, 2
EF-203	ROOF	1101 LOBBY	CENTRIFUGAL	DIRECT	1,840	1,840	0.8	1,056	1.71	0.44	1.00	10.00	15.00	208/1	NO	NO	150	GREENHECK G-160-VG	2
EF-204	ROOF	RESTROOMS	CENTRIFUGAL	DIRECT	2,660	2,660	1.2	1,413	1.28	1.11	2.00	6.50	15.00	208/3	NO	NO	150	GREENHECK G-160-VG	2
EF-205	ROOF	1147 STORAGE	CENTRIFUGAL	DIRECT	800	800	0.5	1,085	-	0.12	0.25	2.60	15.00	208/1	NO	NO	100	GREENHECK G-120-VG	2
EF-206	ROOF	1132 SERVER / 220B EQUIP	CENTRIFUGAL	DIRECT	600	600	0.5	1,177	-	0.09	0.25	2.60	15.00	208/1	NO	NO	100	GREENHECK G-100-VG	2
EF-207	ROOF	1156/1157 RESTROOMS	CENTRIFUGAL	DIRECT	840	840	0.5	1,085	-	0.12	0.25	2.60	15.00	208/1	NO	NO	100	GREENHECK G-120-VG	2

UNIT HEATER SCHEDULE

NOTES:
1. UNIT MOUNTED THERMOSTAT; SET TO 50 °F

TAG	LOCATION	SERVICE	TYPE	ELEC. COIL CAPACITY (kW)	ELECTRICAL VOLT/ PHASE	ELECTRICAL MOCP (A)	ELECTRICAL MCA (A)	BACKUP POWER (Y/N)	APPROX. WEIGHT (LBS)	MANUFACTURER & MODEL	NOTES
UH-101	VESTIBULE 1510	VESTIBULE 1510	RECESSED	4.0	208/1	17	20	NO	50	MARLEY WH	1
UH-102	VESTIBULE 1500	VESTIBULE 1500	RECESSED	4.0	208/1	17	20	NO	50	MARLEY WH	1
UH-103	VESTIBULE 1540	VESTIBULE 1540	RECESSED	4.0	208/1	17	20	NO	50	MARLEY WH	1

DIFFUSERS AND GRILLES

GENERAL NOTES:
A. NOISE CRITERIA (NC) BASED ON ROOM ABSORPTION OF 10 dB, MEASURED PER ANSI/ASHRAE STANDARD 70.
B. THROW VALUES GIVEN FOR TERMINAL VELOCITIES 150, 100, AND 50 FPM FOR ISOTHERMAL CONDITIONS.
C. ADJUST THROW DIRECTION AND QUANTITY PRIOR TO AIR BALANCING.
D. PROVIDE ALUMINUM DIFFUSERS AND GRILLES IN SHOWER ROOMS.

TAG	TYPE	DESCRIPTION	AIRFLOW RANGE MIN (CFM)	AIRFLOW RANGE MAX (CFM)	INLET SIZE (IN)	FACE SIZE T-BAR (IN)	FACE SIZE HARD LID (IN)	MAX NC	THROW (FT)	MANUFACTURER & MODEL	NOTES
C-1	CEILING SUPPLY DIFFUSER	PERFORATED FACE, MODULAR CORE, ADJUSTABLE 4-WAY THROW	0	220	8x8	24x24	15x15	17	2-3-6	TITUS PMC	
			221	345	10x10	24x24	17x17	21	3-4-8		
			346	500	12x12	24x24	19x19	24	3-5-9		
			501	780	16x16	24x24	23x23	28	4-6-11		
C-2	CEILING RETURN/ EXHAUST GRILLE	PERFORATED FACE, STEEL, ROUND DUCT CONNECTION	0	340	10x10	24x24	12x12	17	-	TITUS PAR	
			341	780	15x15	24x24	17x17	22	-		
			781	1,125	18x18	24x24	20x20	24	-		
			1,129	1,670	22x22	24x24	24x24	26	-		
			1,671	3,500	22x46	24x48	24x48	25	-		
H-1	SIDEWALL TRANSFER GRILLE	ALUMINUM, PERFORATED FACE, RECTANGULAR DUCT CONNECTION	0	320	12x6	-	12x6	19	-	TITUS 8F	
			321	500	12x10	-	12x10	18	-		
			501	1,090	24x12	-	24x12	19	-		
L-1	SIDEWALL TRANSFER GRILLE	ALUMINUM, PERFORATED FACE, RECTANGULAR DUCT CONNECTION	0	320	12x6	-	12x6	19	-	TITUS 8F	
			321	500	12x10	-	12x10	18	-		
			501	1,090	24x12	-	24x12	19	-		

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REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON JAN. 03, 2014 NEDZIB BIBERIC
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PERMIT SET

project:
CCC - YVC CAMPUS BUILDING 2 - DHS TI
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revisions:

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project: 00524
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EQUIPMENT SCHEDULE - MECHANICAL

sheet: M-003
of:

TERMINAL UNIT SCHEDLUE - AHU-2

TAG NUMBER	SERVICE	TYPE	PRIMARY AIR INLET (IN)	PRIMARY AIR MIN CFM	PRIMARY AIR MAX COOLING CFM	PRIMARY AIR HEATING CFM	GPM	PIPE SIZE (IN)	LAT	MANUFACTURER & MODEL	NOTES
TU-2-101	1150 JOBS	VVR	8	215	460	230	0.9	3/4	85	TITUS DESV	
TU-2-102	1152 CONFERENCE	VVR	14	685	1370	685	2.7	3/4	85	TITUS DESV	
TU-2-103	1153 OFFICE	VVR	8	140	330	165	0.6	3/4	85	TITUS DESV	
TU-2-104	1531 HALL	VVR	10	230	750	375	1.5	3/4	85	TITUS DESV	
TU-2-105	1158 WELLNESS	VVR	6	75	270	135	0.5	3/4	85	TITUS DESV	
TU-2-106	1159A OPEN OFFICE A	VVR	12	310	1180	590	2.3	3/4	85	TITUS DESV	
TU-2-107	1159B OPEN OFFICE B	VVR	14	440	1510	755	2.9	1	85	TITUS DESV	
TU-2-108	1159C OPEN OFFICE C	VVR	14	440	1840	920	3.6	1	85	TITUS DESV	

GENERAL NOTES:
A. PRIMARY AIR TEMPERATURE 55 F.
B. AIR PRESSURE DROP THROUGH TERMINAL UNIT TO BE NO GREATER THAN 0.60 IN.WG.
C. REFER TO INSTALLATION DETAILS 3/M501 AND 4/M501.
D. LEAVING AIR TEMPERATURE SCHEDULED ABOVE IS FOR THE AIR LEAVING THE TERMINAL UNIT.
E. HYDRONIC HEATING COIL CAPACITY IS BASED ON 140F ENTERING WATER TEMPERATURE.
F. CONTROLS CONTRACTOR TO PROVIDE BACNET IP ETHERNET HOMERUN CABLING FOR EACH TERMINAL UNIT USING TCP/IP PROTOCOL. UP TO 10 UNITS DAISY CHAINED THEN CONNECTED TO CCC NETWORK.

KEY:
VVR = VARIABLE AIR VOLUME TERMINAL UNIT WITH REHEAT COIL.

TERMINAL UNIT SCHEDULE - AHU-1

TAG NUMBER	SERVICE	TYPE	PRIMARY AIR INLET (IN)	PRIMARY AIR MIN CFM	PRIMARY AIR MAX COOLING CFM	PRIMARY AIR HEATING CFM	GPM	PIPE SIZE (IN)	LAT	MANUFACTURER & MODEL	NOTES
TU-1-101	1129 STORAGE	VVR	6	70	220	110	0.5	3/4	85	TITUS DESV	
TU-1-102	1126 CONFERENCE	VVR	8	190	330	190	0.7	3/4	85	TITUS DESV	
TU-1-103	1125 OFFICE	VVR	6	70	230	115	0.5	3/4	85	TITUS DESV	
TU-1-104	1122 OFFICE	VVR	6	70	210	105	0.5	3/4	85	TITUS DESV	
TU-1-105	1120 QUIET ROOM	VVR	6	70	230	115	0.5	3/4	85	TITUS DESV	
TU-1-106	1130 OFFICE	VVR	6	70	200	100	0.5	3/4	85	TITUS DESV	
TU-1-107	1118A OPEN OFFICE A	VVR	14	490	1820	910	3.6	1	85	TITUS DESV	
TU-1-108	1118B OPEN OFFICE B	VVR	14	440	1420	710	2.8	3/4	85	TITUS DESV	
TU-1-109	1118C OPEN OFFICE C	VVR	12	310	1190	595	2.3	3/4	85	TITUS DESV	
TU-1-110	1134 CONFERENCE	VVR	6	145	270	145	0.6	3/4	85	TITUS DESV	
TU-1-111	1135 OFFICE	VVR	8	140	370	185	0.7	3/4	85	TITUS DESV	
TU-1-112	1117 OPEN OFFICE	VVR	10	285	800	400	1.6	3/4	85	TITUS DESV	
TU-1-113	1113 VISIT KITCHEN	VVR	12	310	900	450	1.8	3/4	85	TITUS DESV	
TU-1-114	1509 HALL	VVR	14	440	1270	635	2.5	3/4	85	TITUS DESV	
TU-1-115	1115 VIEW	VVR	10	365	680	365	1.4	3/4	85	TITUS DESV	
TU-1-116	1504 HALL	VVR	8	140	310	155	0.6	3/4	85	TITUS DESV	
TU-1-117	1111 VIEW	VVR	10	275	530	275	1.1	3/4	85	TITUS DESV	
TU-1-119	1109 INTERVIEW	VVR	10	310	590	310	1.2	3/4	85	TITUS DESV	
TU-1-120	1103 CHILD WELFARE RECEPTION	VVR	12	470	1000	500	2.0	3/4	85	TITUS DESV	
TU-1-121	1143 BREAK ROOM	VVR	24x16	1100	2150	1100	4.3	1	85	TITUS DESV	
TU-1-122	1142 OFFICE SUPPLIES	VVR	6	70	200	100	0.5	3/4	85	TITUS DESV	
TU-1-123	1144 CONFERENCE	VVR	10	295	530	295	1.2	3/4	85	TITUS DESV	
TU-1-124	1525 HALL	VVR	10	230	680	340	1.3	3/4	85	TITUS DESV	
TU-1-125	1102 SSP RECEPTION	VVR	10	255	750	375	1.5	3/4	85	TITUS DESV	
TU-1-126	1101A LOBBY A	VVR	14	440	1650	825	3.2	1	85	TITUS DESV	
TU-1-127	1101B LOBBY B	VVR	14	440	1650	825	3.2	1	85	TITUS DESV	
TU-1-128	1145 CONFERENCE	VVR	24x16	1335	2760	1380	5.4	1-1/4	85	TITUS DESV	
TU-1-129	1146 OPEN OFFICE	VVR	12	310	1040	520	2.0	3/4	85	TITUS DESV	
TU-1-130	1171 MOTHERS	VVR	10	375	670	375	1.5	3/4	85	TITUS DESV	
TU-1-131	1169 INTERVIEW	VVR	12	310	960	480	1.9	3/4	85	TITUS DESV	
TU-1-132	1166 INTERVIEW	VVR	8	140	320	160	0.6	3/4	85	TITUS DESV	
TU-1-133	1160A OPEN OFFICE A	VVR	12	310	1000	500	2.0	3/4	85	TITUS DESV	
TU-1-134	1160B OPEN OFFICE B	VVR	12	310	950	475	1.9	3/4	85	TITUS DESV	
TU-1-134	1141 RESTROOM	VVR	12	310	950	475	1.9	3/4	85	TITUS DESV	

GENERAL NOTES:
A. PRIMARY AIR TEMPERATURE 55 F.
B. AIR PRESSURE DROP THROUGH TERMINAL UNIT TO BE NO GREATER THAN 0.60 IN.WG.
C. REFER TO INSTALLATION DETAILS 3/M501 AND 4/M501.
D. LEAVING AIR TEMPERATURE SCHEDULED ABOVE IS FOR THE AIR LEAVING THE TERMINAL UNIT.
E. HYDRONIC HEATING COIL CAPACITY IS BASED ON 140F ENTERING WATER TEMPERATURE.
F. CONTROLS CONTRACTOR TO PROVIDE BACNET IP ETHERNET HOMERUN CABLING FOR EACH TERMINAL UNIT USING TCP/IP PROTOCOL. UP TO 10 UNITS DAISY CHAINED THEN CONNECTED TO CCC NETWORK.

KEY:
VVR = VARIABLE AIR VOLUME TERMINAL UNIT WITH REHEAT COIL.

EXISTING AIR HANDLING UNIT SCHEDULE

GENERAL NOTES:
A. EXISTING TO REMAIN UNIT INFO PROVIDED FOR REFERENCE ONLY.
B. TAB AGENT TO CONFIRM MINIMUM OUTSIDE AIRFLOW AT UNITS AND ADJUST DMAPER SETTINGS AS NECESSARY DURING FINAL BALANCING.
NOTES:
1. UNIT IS EXISTING TO REMAIN. ALL COMPONENTS EXISTING TO REMAIN OTHER THAN NEW DX COIL.
2. PROVIDE NEW BELIMO ACTUATORS ON ALL EXISTING DAMPERS.

TAG	LOCATION	SERVICE	MIXING BOX MIN OSA (CFM)	FILTERS PRE (MER...	FILTERS FINAL (MERV)	SUPPLY FAN AIRFLOW (CFM)	SUPPLY FAN TSP (IN WG)	SUPPLY FAN ESP (IN WG)	SUPPLY FAN SPEED (RPM)	SUPPLY FAN MOTOR RATING (HP)	SUPPLY FAN MOTOR VOLT/ PHASE	SUPPLY FAN MOTOR VFD (Y/N)	SUPPLY FAN MOTOR VFD QTY	RETURN FAN AIRFLOW CFM	RETURN FAN TSP (IN WG)	RETURN FAN ESP (IN WG)	RETURN FAN SPEED (RPM)	RETURN FAN MOTOR RATING (HP)	RETURN FAN MOTOR VOLT/ PHASE	RETURN FAN MOTOR VFD (Y/N)	RETURN FAN MOTOR VFD QTY	HYDRONIC HEATING COIL EAT (°F)	HYDRONIC HEATING COIL LAT (°F)	HYDRONIC HEATING COIL GPM	HYDRONIC HEATING COIL EWT (°F)	HYDRONIC HEATING COIL MIN WTD (°F)	DX COIL COOLING EAT (°F DB/WB)	DX COIL COOLING LAT (°F DB/WB)	DX COIL COOLING TOTAL CAPACITY (MBH)	DX COIL COOLING SENSIBLE CAPACITY (MBH)	DX COIL COOLING QTY	REFRIGERANT TYPE	REFRIGERANT CHARGE (LBS)	ELECTRICAL VOLT/ PHASE	MANUFACTURER & MODEL	NOTES
(E) AHU-1	220 MECH	BLDG WEST	11,335	8	13	33,000	4.9	3.0	1,190	40.0	460/3	Y	1	32,000	3.0	2.0	650	30.0	460/3	Y	1	46	72	47.3	180	40	78.8/63.5	55/54	563	478	2	R32	19.2	460/3	MCQUAY CAH050	1, 2
(E) AHU-2	1062 MECH	BLDG EAST	4,350	8	13	14,500	4.1	2.5	1,750	20.0	208/3	Y	1	14,000	2.1	2.0	1,750	10.0	208/3	Y	1	46	72	21.0	180	40	78.8/63.5	55/54	220	182	2	R32	6.2	208/3	MCQUAY CAH030	1, 2

AIR COOLED CONDENSER UNIT SCHEDULE

GENERAL NOTES:
A. MINIMUM EFFICIENCY IS AT ARI STANDARD CONDITIONS.
B. SIZE REFRIGERANT PIPING PER MANUFACTURER'S INSTRUCTIONS.
C. REFRIGERANT CHARGE INDICATED IS FOR THE EQUIPMENT ONLY. PROVIDE NECESSARY REFRIGERANT QUANTITY TO MEET THE REQUIREMENTS FOR THE SPECIFIC INSTALLATION.
D. PROVIDE MINIMUM OF ONE VARIABLE SPEED COMPRESSOR PER AIR COOLED CONDENSING UNIT.
NOTES:
1. CONDENSING UNIT SERVES NEW DX COIL IN EXISTING AIR HANDLING UNIT.
2. REUSE EXISTING HOUSEKEEPING PAD.

TAG	LOCATION	SERVICE	COOLING DESIGN CAPACITY (TON)	COOLING AMBIENT TEMP (°F DB/WB)	CONDENSER COMPRESSORS QTY (#)	CONDENSER COMPRESSORS TYPE	CONDENSER COMPRESSORS RLA (A)	CONDENSER COMPRESSORS VFD (Y/N)	CONDENSER FAN QTY. (#)	MIN EFFICIENCY EER	MIN EFFICIENCY IEER	REFRIGERANT TYPE	REFRIGERANT CHARGE (LBS)	ELECTRICAL VOLT/ PHASE	ELECTRICAL MCA (A)	ELECTRICAL MOCP (A)	ELECTRICAL SCCR (A)	ELECTRICAL BACKUP POWER (Y/N)	APPROX. WEIGHT (LBS)	MANUFACTURER & MODEL	NOTES
CU-1A	ROOF	AHU-1	50	92/67	4	SCROLL	4.2	Y	4	11.3	16.3	R-32	28.6/29.6	208/3	205	250	10k	N	4,000	DAIKIN DCSA050	1, 2
CU-1B	ROOF	AHU-1	50	92/67	4	SCROLL	4.2	Y	4	11.3	16.3	R-32	28.6/29.6	208/3	205	250	10k	N	4,000	DAIKIN DCSA050	1, 2
CU-2	EXTERIOR	AHU-2	37	92/67	3	SCROLL	4.2	Y	4	11.6	16.6	R-32	29.0/29.7	208/3	168	225	10k	N	3,500	DAIKIN DCSA040	1, 2

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REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON JAN. 03, 2014 WEDZIB BIBERIC
4/25/2025
EXPIRES: 12/31/2025

project: CCC - YVC CAMPUS BUILDING 2 - DHS TI
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PERMIT SET

consultants: PAE pae-engineers.com

revisions:
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project: 00524
drawn by: RNW
checked by: NB

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EQUIPMENT SCHEDULE - MECHANICAL

sheet: M-004
of:

MINIMUM DUCT AND PLENUM INSULATION

GENERAL NOTES:

A. REFER TO SPECIFICATION 23 07 13 DUCT INSULATION AND OREGON ENERGY EFFICIENCY SPECIALTY CODE TABLE 6.8.2 FOR ADDITIONAL REQUIREMENTS.
B. INSULATION R-VALUE AND THICKNESS ARE FOR THE INSULATION AS INSTALLED WITH MAXIMUM THERMAL CONDUCTIVITY OF 0.27 BTU·IN/(H·SF·°F) FOR FIBERGLASS WRAP BASED ON 25% COMPRESSION AND 0.24 BTU·IN/(H·SF·°F) FOR FIBERGLASS LINER WHEN TESTED IN ACCORDANCE WITH ASTM C518 AT 75°F MEAN TEMPERATURE.
C. EXTERIOR TO BUILDING ENVELOPE INCLUDES ATTICS ABOVE INSULATED CEILINGS, PARKING GARAGES AND CRAWL SPACES.
D. UNCONDITIONED SPACE INCLUDES ENCLOSED SPACES WITHIN THE BUILDING THAT ARE NOT DIRECTLY OR INDIRECTLY CONDITIONED FROM ADJACENT SPACES.

NOTES:

1. INSULATION THICKNESS FOR SOUND ATTENUATION, PROVIDE INSULATION THICKNESS NO LESS THAN AS REQUIRED FOR THERMAL INSULATION AND SOUND ATTENUATION.
MINIMUM SOUND ABSORPTION COEFFICIENTS:
1-INCH THICKNESS: MINIMUM NRC 0.70
1.5-INCH THICKNESS: MINIMUM NRC 0.85
2-INCH THICKNESS: MINIMUM NRC 0.95

SYSTEM	LOCATION	INSULATION TYPE	INSULATION THICKNESS (IN)	NOTES
EXHAUST AIR	ALL LOCATIONS	NOT INSULATED	-	
SUPPLY AIR	DOWNSTREAM OF AIR TERMINAL UNITS	FIBERGLASS WRAP	1-1/2	
RETURN AIR	WITHIN 10FT OF GRILLE OR UP TO CONNECTION TO MAIN BRANCH	FIBERGLASS DUCT LINER	1	1
TRANSFER AIR	ALL LOCATIONS	NOT INSULATED	-	

MINIMUM PIPE INSULATION

GENERAL NOTES:

A. REFER TO SPECIFICATION 23 07 19 HVAC PIPING INSULATION AND OREGON ENERGY EFFICIENCY SPECIALTY CODE 6.8.3 FOR ADDITIONAL REQUIREMENTS.
B. FOR PIPING SMALLER THAN 1-1/2 INCH AND LOCATED IN PARTITIONS WITHIN CONDITIONED SPACES, REDUCTION FOR THESE THICKNESSES BY 1 INCH (25 MM) IS PERMITTED (BEFORE THICKNESS ADJUSTMENT REQUIRED IN GENERAL NOTE D) BUT NOT TO A THICKNESS LESS THAN 1 INCH.
C. MINIMUM PIPE INSULATION THICKNESSES BASED ON THERMAL CONDUCTIVITY RANGES STIPULATED IN ASHRAE 90.1 TABLE 6.8.3-1,2.
FOR INSULATION OUTSIDE THE STATED CONDUCTIVITY RANGE, DETERMINE THE MINIMUM THICKNESS (T) AS FOLLOWS:
T = r{(1 + t/r)^(K/k) - 1}
WHERE:
T = MINIMUM INSULATION THICKNESS
r = ACTUAL OUTSIDE RADIUS OF THE PIPE
t = INSULATION THICKNESS LISTED IN THE TABLE FOR APPLICABLE FLUID TEMPERATURE AND PIPE SIZE
K = CONDUCTIVITY OF ALTERNATE MATERIAL AT MEAN RATING TEMPERATURE INDICATED FOR THE APPLICABLE FLUID TEMPERATURE (BTU-IN/(HR-SF-°F))
k = THE UPPER VALUE OF THE CONDUCTIVITY RANGE LISTED INTHE TABLE FOR THE APPLCIABLE FLUID TEMPERATURE
D. COVER ALL PIPING WITH ALUMINUM PIPE JACKET WHERE EXPOSED TO WEATHER AND OVER HEAT TRACE CABLE WHERE INSTALLED.
ELASTOMERIC INSULATION NOT ALLOWED OVER HEAT TRACE CABLE.

PIPE SYSTEM	FLUID TEMPERATURE (DEGREES F)	INSULATION TYPE	PIPE SIZE (IN)	INSULATION THICKNESS (IN)
HEATING WATER	100-180	FIBERGLASS	< 1-1/2	1-1/2
			≥ 1-1/2	2
CONDENSATE OR OTHER COLD WATER DRAINS (WITHIN THE BUILDING)	-	ELASTOMERIC	ALL	1/2
REFRIGERANT HIGH PRESSURE VAPOR (SUCTION)	-	ELASTOMERIC	ALL	2-1/2
REFRIGERANT LOW PRESSURE VAPOR (SUCTION)	-	ELASTOMERIC	< 1-1/2	1/2
			≥ 1-1/2	1

2021 OEESC - COMMISSIONING

GENERAL

COMMISSIONING SHALL BE PERFORMED ON BUILDING SYSTEMS, CONTROLS, AND THE BUILDING ENVELOPE BY THE COMMISSIONING PROVIDER IN ACCORDANCE WITH OEESC 4.2.5.2 USING ASHRAE/IES STANDARD 202 OR OTHER GENERALLY ACCEPTED ENGINEERING STANDARDS ACCEPTABLE TO THE BUILDING OFFICIAL.

THE COMMISSIONING TEAM SHALL CONSIST OF THE COMMISSIONING PROVIDER AND THE VERIFICATION AND TESTING PROVIDERS.

PROJECT COMMISSIONING DOCUMENTS

THE COMMISSIONING PROVIDER SHALL CERTIFY COMPLETION ON THE REQUIRED COMMISSIONING PROCESS AND PROVIDE THE FOLLOWING DOCUMENTS TO THE OWNER AND THE DESIGN TEAM IN ACCORDANCE WITH OEESC 4.2.5.2.2.

COMMISSIONING PLAN
IDENTIFY FPT OR VERIFICATION PROCEDURES FOR SYSTEMS TO BE VERIFIED, COMMISSIONED, OR TESTED.
DESIGN REVIEW REPORT
DETAIL COMPLIANCE OF THE DESIGN WITH THE OWNER'S PROJECT REQUIREMENTS (OPR) AND PROVISIONS OF THE OEESC.
PRELIMINARY COMMISSIONING REPORT
INCLUDE REQUIRED PERFORMANCE OF COMMISSIONED EQUIPMENT, SYSTEMS, AND ASSEMBLIES, AND RESULTS OF FPT AND VERIFICATION.
SUMMARY OF COMPLIANCE OF THE BUILDING AND ITS COMPONENTS, ASSEMBLIES, CONTROLS, AND SYSTEMS WITH REQUIRED PROVISIONS OF THE OEESC.
ISSUES AND RESOLUTION LOGS, INCLUDING ITEMIZATION OF DEFICIENCIES FOUND DURING VERIFICATION, TESTING, AND COMMISSIONING THAT HAVE NOT BEEN CORRECTED AT THE TIME OF REPORT PREPARATION.
DEFERRED TESTS THAT CANNOT BE PERFORMED AT THE TIME OF REPORT PREPARATION.
DOCUMENTATION OF THE TRAINING OF OPERATING PERSONNEL AND BUILDING OCCUPANTS ON COMMISSIONED SYSTEMS, AND A PLAN FOR THE COMPLETION OF ANY DEFERRED TRAININGS NOT COMPLETED AT THE TIME OF REPORT PREPARATION.
PLAN FOR THE COMPLETION OF COMMISSIONING AND TRAINING, INCLUDING CLIMATIC AND OTHER CONDITIONS REQUIRED FOR PERFORMANCE OF THE DEFERRED TESTS.
FINAL COMMISSIONING REPORT
COMMISSIONING PROVIDER SHALL PROVIDE FINAL COMMISSIONING REPORT TO THE ONWER BEFORE COMPLETION OF THE CONTRACTOR'S GENERAL WARRANTY PERIOD.

HVAC SYSTEMS COMMISSIONING

THE PERFORMANCE OF THE MECHANICAL SYSTEMS SHALL BE COMMISSIONED IN ACCORDANCE WITH OEESC 4.2.5.2.

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project: 00524
drawn by: RNW
checked by: NB

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EQUIPMENT SCHEDULE - MECHANICAL

sheet: M-005
of:

VENTILATION SCHEDULE - MULTIPLE SPACES - OREGON

AHU-1

LOCATION	FLOOR AREA (SF)	PRIMARY AIRFLOW RATE (CFM)	OCCUPANCY CLASSIFICATION	PEOPLE OUTDOOR AIRFLOW RATE Rp (CFM/PERSON)	AREA OUTDOOR AIRFLOW RATE Ra (CFM/SF)	DEFAULT OCCUPANT DENSITY (PEOPLE/1000SF)	CODE POPULATION	DESIGN POPULATION	OUTDOOR AIRFLOW RATE Vbz (CFM)	ZONE AIR DISTRIBUTION EFFECTIVENESS Ez	OUTDOOR AIR INTAKE Voz (CFM)	PRIMARY OUTDOOR AIR FRACTION Zp
1101A LOBBY A	1100	1650	Office - Main entry lobbies	5	0.06	10	11	11	121	0.8	198	0.12
1101B LOBBY B	1100	1650	Office - Main entry lobbies	5	0.06	10	11	11	121	0.8	198	0.12
1102 SSP RECEPTION	495	750	Office - Reception areas	5	0.06	30	15	15	104	0.8	169	0.23
1103 CHILD WELFARE RECEPTION	913	1000	Office - Reception areas	5	0.06	30	27	27	192	0.8	312	0.31
1106 DV INTERVIEW	149	210	General - Conference/meeting	5	0.06	50	7	7	46	0.8	76	0.36
1107 KIDS	100	80	Office - Office space	5	0.06	5	1	1	11	0.8	19	0.24
1108 INTERVIEW	106	150	General - Conference/meeting	5	0.06	50	5	5	33	0.8	55	0.37
1109 INTERVIEW	107	150	General - Conference/meeting	5	0.06	50	5	5	33	0.8	55	0.37
1111 VIEW	133	100	Office - Office space	5	0.06	5	1	1	13	0.8	23	0.23
1112 VISIT	315	430	General - Conference/meeting	5	0.06	50	16	16	98	0.8	160	0.37
1113 VISIT KITCHEN	294	900	Food - Kitchen (cooking)	8	0.18	20	6	6	97	0.8	159	0.18
1114 VISIT	234	320	General - Conference/meeting	5	0.06	50	12	12	73	0.8	119	0.37
1115 VIEW	100	80	Office - Office space	5	0.06	5	1	1	11	0.8	19	0.24
1116 VISIT	204	280	General - Conference/meeting	5	0.06	50	10	10	63	0.8	104	0.37
1117 OPEN OFFICE	1346	800	Office - Office space	5	0.06	5	7	7	114	0.8	188	0.24
1118A OPEN OFFICE A	2109	1690	Office - Office space	5	0.06	5	11	11	179	0.8	293	0.17
1118B OPEN OFFICE B	1767	1420	Office - Office space	5	0.06	5	9	9	150	0.8	245	0.17
1118C OPEN OFFICE C	1483	1190	Office - Office space	5	0.06	5	7	7	126	0.8	206	0.17
1119 RESTROOM	496	600	Non-ventilated	0	0.00	0	0	-	0	0.8	0	0.00
1120 QUIET ROOM	135	230	Office - Office space	5	0.06	5	1	1	13	0.8	23	0.10
1121 OFFICE	121	100	Office - Office space	5	0.06	5	1	1	12	0.8	21	0.21
1122 OFFICE	126	110	Office - Office space	5	0.06	5	1	1	13	0.8	21	0.19
1123 CLOSET	20	10	Non-ventilated	0	0.00	0	0	-	0	0.8	0	0.00
1123 OFFICE	126	110	Office - Office space	5	0.06	5	1	1	13	0.8	21	0.19
1124 OFFICE	126	110	Office - Office space	5	0.06	5	1	1	13	0.8	21	0.19
1125 OFFICE	126	110	Office - Office space	5	0.06	5	1	1	13	0.8	21	0.19
1126 CONFERENCE	243	330	General - Conference/meeting	5	0.06	50	12	12	75	0.8	124	0.38
1127 CW RECORDS	245	130	Office - Occupiable storage for dry materials	5	0.06	2	0	1	20	0.8	33	0.25
1128 WELLNESS	115	130	Office - Office space	5	0.06	5	1	1	12	0.8	20	0.15
1129 STORAGE	153	90	Office - Occupiable storage for dry materials	5	0.06	2	0	1	14	0.8	24	0.27
1130 OFFICE	121	100	Office - Office space	5	0.06	5	1	1	12	0.8	21	0.21
1131 OFFICE	123	100	Office - Office space	5	0.06	5	1	1	12	0.8	21	0.21
1134 CONFERENCE	187	270	General - Conference/meeting	5	0.06	50	9	9	58	0.8	95	0.35
1135 OFFICE	125	180	Office - Office space	5	0.06	5	1	1	13	0.8	21	0.12
1136 FOSTER	101	140	Office - Office space	5	0.06	5	1	1	11	0.8	19	0.14
1137 CLOSET	110	50	Non-ventilated	0	0.00	0	0	-	0	0.8	0	0.00
1139 MOTHERS	88	180	Office - Breakrooms	5	0.12	50	4	4	33	0.8	54	0.30
1141 RESTROOM	498	800	Non-ventilated	0	0.00	0	0	-	0	0.8	0	0.00
1143 BREAK ROOM	1352	2150	General - Break rooms	5	0.06	25	34	34	250	0.8	407	0.19
1144 CONFERENCE	385	530	General - Conference/meeting	5	0.06	50	19	19	119	0.8	195	0.37
1145 CONFERENCE	1763	2760	General - Conference/meeting	5	0.06	50	88	88	547	0.8	890	0.32
1142 OFFICE SUPPLIES	205	200	Office - Occupiable storage for dry materials	5	0.06	2	0	1	17	0.8	29	0.15
1146 OPEN OFFICE	415	340	Office - Office space	5	0.06	5	2	2	35	0.8	59	0.17
1147 STORAGE	275	700	Office - Occupiable storage for dry materials	5	0.06	2	1	1	22	0.8	36	0.05
1160A OPEN OFFICE A	1244	1000	Office - Office space	5	0.06	5	6	6	106	0.8	173	0.17
1160B OPEN OFFICE B	660	950	Office - Office space	5	0.06	5	3	3	56	0.8	93	0.10
1162 BREAK	61	90	General - Break rooms	5	0.06	25	2	2	11	0.8	20	0.22
1163 FAMILY MEETING	297	410	General - Conference/meeting	5	0.06	50	15	15	92	0.8	151	0.37
1164 INTERVIEW	132	180	General - Conference/meeting	5	0.06	50	7	7	41	0.8	68	0.38
1165 INTERVIEW	132	180	General - Conference/meeting	5	0.06	50	7	7	41	0.8	68	0.38
1166 INTERVIEW	134	320	General - Conference/meeting	5	0.06	50	7	7	42	0.8	68	0.21
1167 INTERVIEW	76	150	General - Conference/meeting	5	0.06	50	4	4	24	0.8	39	0.26
1168 INTERVIEW	76	150	General - Conference/meeting	5	0.06	50	4	4	24	0.8	39	0.26
1169 INTERVIEW	76	150	General - Conference/meeting	5	0.06	50	4	4	24	0.8	39	0.26
1170 INTERVIEW	76	150	General - Conference/meeting	5	0.06	50	4	4	24	0.8	39	0.26
1171 MOTHERS	91	80	General - Break rooms	5	0.06	25	2	2	17	0.8	29	0.36
1172 INTERVIEW	130	180	General - Conference/meeting	5	0.06	50	7	7	40	0.8	67	0.37
1503 HALL	321	170	General - Corridors	0	0.06	0	0	-	19	0.8	33	0.19
1504 HALL	54	30	General - Corridors	0	0.06	0	0	-	3	0.8	7	0.23
1509 HALL	241	670	General - Corridors	0	0.06	0	0	-	14	0.8	25	0.04
1513 HALL	98	60	General - Corridors	0	0.06	0	0	-	6	0.8	11	0.18
1513 HALL	98	60	General - Corridors	0	0.06	0	0	-	6	0.8	11	0.18
1514 HALL	103	60	General - Corridors	0	0.06	0	0	-	6	0.8	11	0.18
1515 HALL	180	90	General - Corridors	0	0.06	0	0	-	11	0.8	19	0.21
1516 HALL	81	50	General - Corridors	0	0.06	0	0	-	5	0.8	10	0.20
1517 HALL	93	100	General - Corridors	0	0.06	0	0	-	6	0.8	10	0.10
1520 HALL	98	50	General - Corridors	0	0.06	0	0	-	6	0.8	11	0.22
1521 HALL	180	90	General - Corridors	0	0.06	0	0	-	11	0.8	19	0.21
1522 HALL	358	180	General - Corridors	0	0.06	0	0	-	21	0.8	36	0.20
1523 HALL	288	150	General - Corridors	0	0.06	0	0	-	17	0.8	29	0.19
1524 HALL	196	100	General - Corridors	0	0.06	0	0	-	12	0.8	20	0.20
1525 HALL	300	150	General - Corridors	0	0.06	0	0	-	18	0.8	30	0.20
TOTALS:	25709	29410					408	503	3612		5949	Zp max = 0.38

GENERAL NOTES:

A. SYSTEM OUTDOOR AIR CALCULATION IS BASED ON THE SECTION 403 OF THE 2019 OREGON MECHANICAL SPECIALTY CODE.

B. REFER TO AIR HANDLING UNIT SCHEDULE FOR ACTUAL OUTDOOR AIR FLOW RATE.

NOTES:

1. EXISTING AIR HANDLER IS ASSUMED TO BE AT MINIMUM 25 PERCENT OUTSIDE AIR. NOTIFY ARCHITECT IF ACTUAL OUTSIDE AIR MINIMUM IS LOWER.

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4/25/2025

EXPIRES: 12/31/2025

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revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: RNW
checked by: NB

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EQUIPMENT SCHEDULE - MECHANICAL

sheet: M-006

of:

VENTILATION SCHEDULE - MULTIPLE SPACES - OREGON

AHU-2

LOCATION	FLOOR AREA (SF)	PRIMARY AIRFLOW RATE (CFM)	OCCUPANCY CLASSIFICATION	PEOPLE OUTDOOR AIRFLOW RATE Rp (CFM/PERSON)	AREA OUTDOOR AIRFLOW RATE Ra (CFM/SF)	DEFAULT OCCUPANT DENSITY (PEOPLE/1000SF)	CODE POPULATION	DESIGN POPULATION	OUTDOOR AIRFLOW RATE Vbz (CFM)	ZONE AIR DISTRIBUTION EFFECTIVENESS Ez	OUTDOOR AIR INTAKE Voz (CFM)	PRIMARY OUTDOOR AIR FRACTION Zp
1056A SHOWER	48	100	Non-ventilated	0	0.00	0	0	-	0	0.8	0	0.00
1056A SHOWER	48	100	Non-ventilated	0	0.00	0	0	-	0	0.8	0	0.00
114 OFFICE	115	100	Office - Office space	5	0.06	5	1	1	12	0.8	20	0.20
1150 JOBS	225	370	General - Conferenceo/meeting	5	0.06	50	11	11	70	0.8	115	0.31
1151 STORAGE	96	50	Office - Occupiable storage for dry materials	5	0.06	2	0	1	11	0.8	19	0.38
1152 CONFERENCE	900	1370	General - Conference/meeting	5	0.06	50	45	45	279	0.8	454	0.33
1153 OFFICE	131	110	Office - Office space	5	0.06	5	1	1	13	0.8	23	0.21
1154 OFFICE	131	110	Office - Office space	5	0.06	5	1	1	13	0.8	23	0.21
1155 OFFICE	130	110	Office - Office space	5	0.06	5	1	1	13	0.8	21	0.19
1156 RESTROOM	156	250	Non-ventilated	0	0.00	0	0	-	0	0.8	0	0.00
1157 RESTROOM	157	250	Non-ventilated	0	0.00	0	0	-	0	0.8	0	0.00
1158 WELLNESS	208	170	Office - Office space	5	0.06	5	1	1	18	0.8	30	0.18
1159A OPEN OFFICE A	1471	1180	Office - Office space	5	0.06	5	7	7	125	0.8	205	0.17
1159B OPEN OFFICE B	1882	1510	Office - Office space	5	0.06	5	9	9	160	0.8	260	0.17
1159C OPEN OFFICE C	1528	1840	Office - Office space	5	0.06	5	8	8	130	0.8	212	0.12
1530 HALL	71	40	General - Corridors	0	0.06	0	0	-	4	0.8	8	0.20
1531 HALL	438	250	General - Corridors	0	0.06	0	0	-	26	0.8	43	0.17
TOTALS:	7735	7910					84	87	873		1433	Zp max = 0.38

GENERAL NOTES:
A. SYSTEM OUTDOOR AIR CALCULATION IS BASED ON THE SECTION 403 OF THE 2019 OREGON MECHANICAL SPECIALTY CODE.
B. REFER TO AIR HANDLING UNIT SCHEDULE FOR ACTUAL OUTDOOR AIR FLOW RATE.

NOTES:
1. EXISTING AIR HANDLER IS ASSUMED TO BE AT MINIMUM 25 PERCENT OUTSIDE AIR. NOTIFY ARCHITECT IF ACTUAL OUTSIDE AIR MINIMUM IS LOWER.
77

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revisions:

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project: 00524
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checked by: NB

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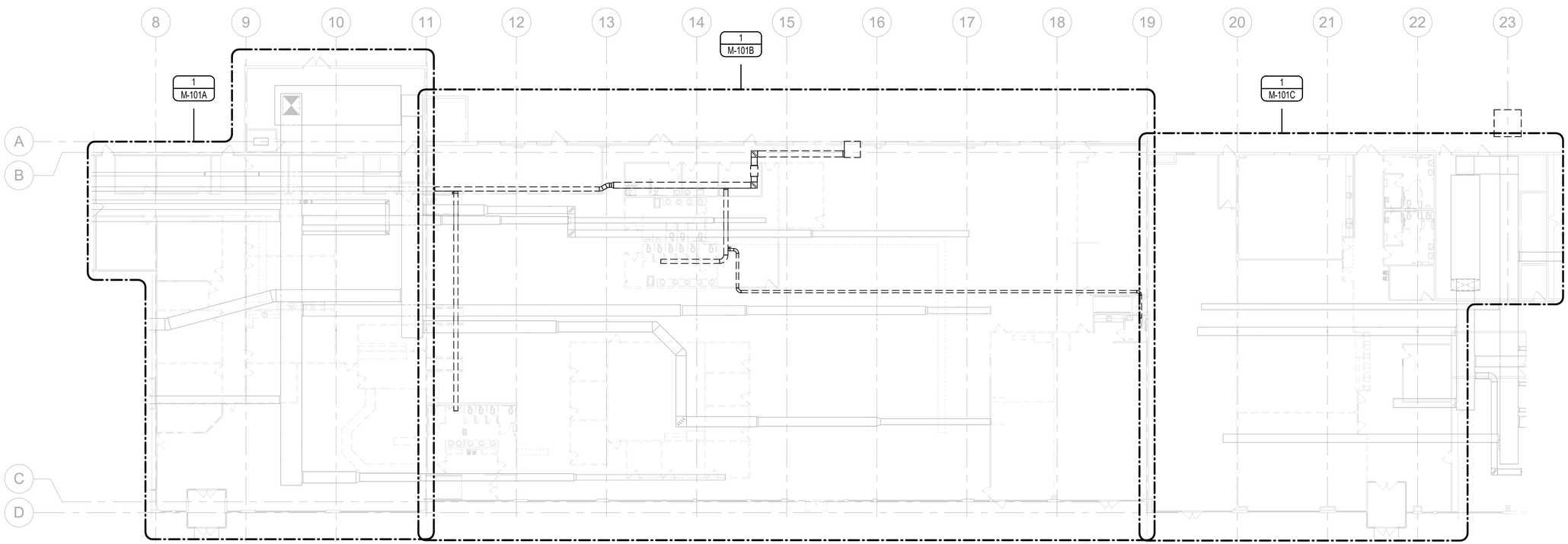
EQUIPMENT SCHEDULE - MECHANICAL

sheet: M-007
of:

GENERAL NOTES:

A. REFER TO SECTOR PLANS FOR SCOPE OF WORK.

B. WORK WILL BE COMPLETED IN TWO PHASES. SCOPE EAST OF GRIDLINE 19 WILL BE COMPLETED IN FIRST PHASE, WEST OF GRIDLINE 19 WILL BE COMPLETED IN SECOND PHASE. SCOPE SHOWN ON THESE DRAWINGS IS REPRESENTED WITHOUT PHASING FOR CLARITY. CONTRACTOR TO CREATE PHASING PLAN TO DOCUMENT APPROACH TO PROPOSED PHASES AND INCLUDE PROVISIONS TO KEEP AREAS OUTSIDE PROJECT SCOPE FULLY FUNCTIONAL.



DEMOLITION FLOOR PLAN - MECHANICAL
1/16" = 1'-0"

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REGISTERED PROFESSIONAL ENGINEER
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consultants:
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pae-engineers.com

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: RNW
checked by: NB

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DEMOLITION FLOOR PLAN - MECHANICAL

sheet: M-101

of:

GENERAL NOTES:

A. EXISTING MECHANICAL PLANS SHOWN FOR REFERENCE ONLY. ALL EXISTING CONDITIONS SHALL BE FIELD VERIFIED BY CONTRACTOR.

B. ALL EQUIPMENT AND SYSTEM WIDE SHUTDOWNS SHALL BE COORDINATED WITH THE OWNER.

C. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS.

D. DEMOLITION WORK SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING: REMOVAL OF EQUIPMENT, SUPPORTS, ANCHORS, PIPING, DUCTWORK, AND ALL APPURTENANCES WHERE INDICATED ON PLANS.

E. REMOVE MECHANICAL EQUIPMENT, DUCTWORK, PIPING, AND ASSOCIATED ITEMS AS SHOWN OR RELATED TO EQUIPMENT TO BE REMOVED. CAP DUCTWORK OR PIPING AT NEAREST LIVE BRANCH. DO NOT ABANDON IN PLACE ANY EQUIPMENT, DUCTWORK OR PIPING THAT IS NO LONGER REQUIRED.

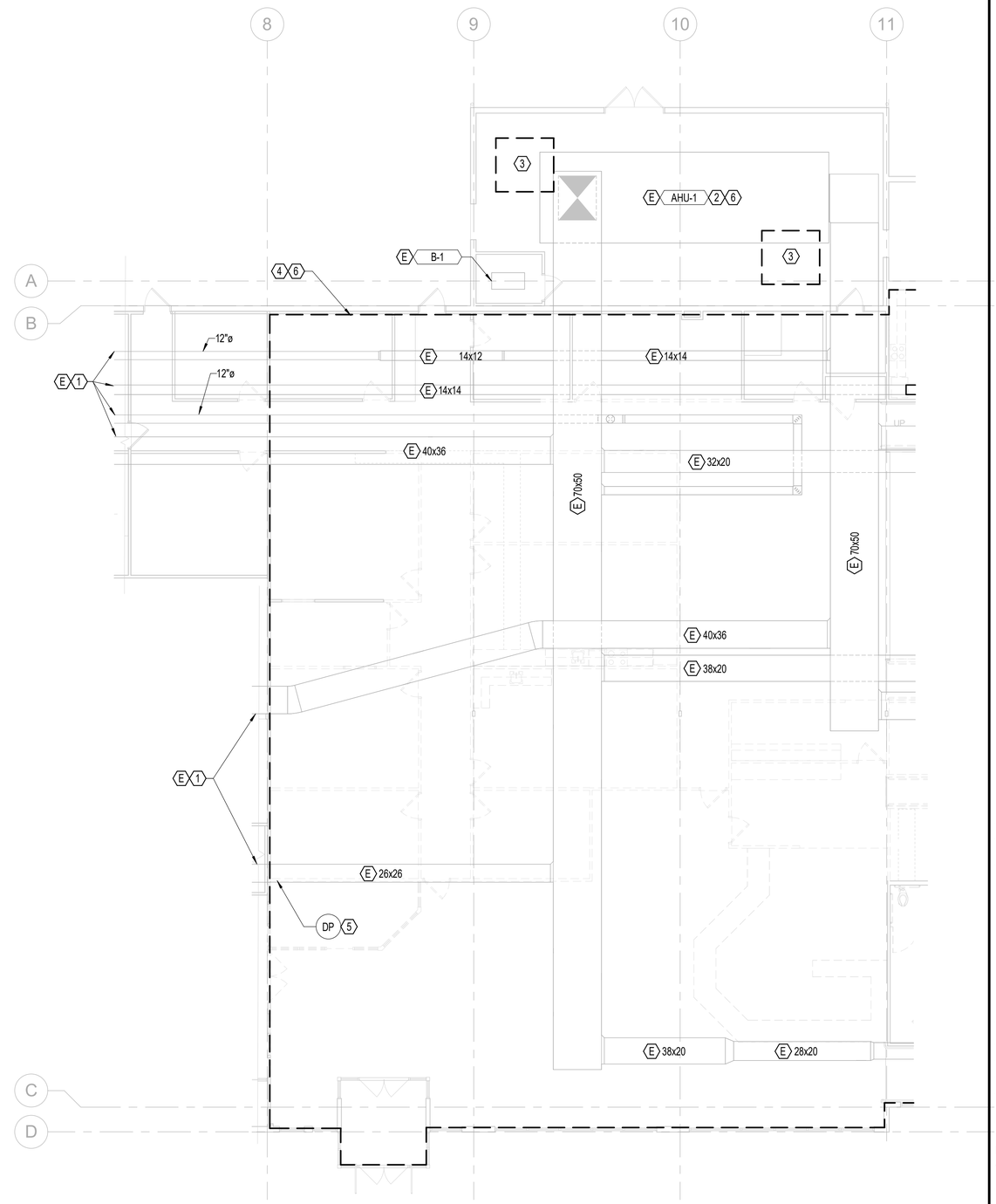
F. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. MAINTAIN ALL EXISTING SYSTEMS TO THE AREAS OUTSIDE THE PROJECT BOUNDARIES.

G. ALL DUCTWORK AND PIPE OPENINGS WITHIN THE PROJECT AREA SHALL BE PROTECTED FROM CONSTRUCTION DEBRIS.

H. AT CONTRACTORS DISCRETION AND WITH APPROVAL OF COMMISSIONING AGENT AND OWNER, CONTRACTOR TO HAVE OPTION TO ISOLATE AREA BY PROVIDING BLANK OFF PANEL OR CAPPING DUCT IN ORDER TO ISOLATE DUCT BRANCH TO PERFORM WORK.

NOTES:

1. EXISTING DUCTWORK SERVING AREAS OUT OF SCOPE, DUCTWORK TO REMAIN, AND AIRFLOW TO REMAIN CONSTANT FROM BEFORE TO AFTER CONSTRUCTION. CONTRACTOR TO PROVIDE TEMPORARY MEANS OF VENTILATION DURING CONSTRUCTION. PROVIDE TEMPORARY BLANK OFF DAMPERS DURING CONSTRUCTION.
2. DEMOLISH EXISTING DX COIL WITHIN AIR HANDLING UNIT. REMOVE ALL PIPING TO AND FROM OUTDOOR CONDENSING UNIT.
3. REMOVE CONDENSING UNITS ON ROOF. ROOF CURB TO REMAIN. REMOVE ALL PIPING TO AND FROM INDOOR UNIT.
4. DEMOLISH ALL DIFFUSERS, GRILLES, LOW PRESSURE DUCTWORK, TERMINAL UNITS, AND MEDIUM PRESSURE DUCTWORK BACK TO MAINS. MEDIUM PRESSURE MAINS TO REMAIN AS SHOWN. DEMOLISH BRANCH PIPING TO TERMINAL UNITS AND ALL ASSOCIATED VALVING. MAIN HYDRONIC HEATING LOOP TO REMAIN.
5. INSTALL TEMPORARY DP SENSOR DURING DEMO PHASE TO CONTROL AIR HANDLER DURING CONSTRUCTION.
6. EXISTING DDC CONTROLS FOR AHU-1 TO BE REMOVED. EXISTING DDC CONTROLS FOR DEMOLISHED EQUIPMENT TO BE REMOVED. DDC CONTROLS FOR ALL EXISTING TO REMAIN EQUIPMENT IS TO REMAIN.



DEMOLITION FLOOR PLAN - AREA A - MECHANICAL
1/8" = 1'-0"

FACET ARCHITECTS
Formerly Carlson Veit Junge Architects
3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED PROFESSIONAL ENGINEER
74533PE
OREGON
JAN. 03, 2014
NEDZIB BIBERIC
4/25/2025
EXPIRES: 12/31/2025

PERMIT SET

project:
CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
MCMININNVILLE, OR 97128

consultants:
PAE
pae-engineers.com

revisions:

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DEMOLITION FLOOR PLAN - AREA A - MECHANICAL

sheet: M-101A
of:

GENERAL NOTES:

A. EXISTING MECHANICAL PLANS SHOWN FOR REFERENCE ONLY. ALL EXISTING CONDITIONS SHALL BE FIELD VERIFIED BY CONTRACTOR.

B. ALL EQUIPMENT AND SYSTEM WIDE SHUTDOWNS SHALL BE COORDINATED WITH THE OWNER.

C. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS.

D. DEMOLITION WORK SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING: REMOVAL OF EQUIPMENT, SUPPORTS, ANCHORS, PIPING, DUCTWORK, AND ALL APPURTENANCES WHERE INDICATED ON PLANS.

E. REMOVE MECHANICAL EQUIPMENT, DUCTWORK, PIPING, AND ASSOCIATED ITEMS AS SHOWN OR RELATED TO EQUIPMENT TO BE REMOVED. CAP DUCTWORK OR PIPING AT NEAREST LIVE BRANCH. DO NOT ABANDON IN PLACE ANY EQUIPMENT, DUCTWORK OR PIPING THAT IS NO LONGER REQUIRED.

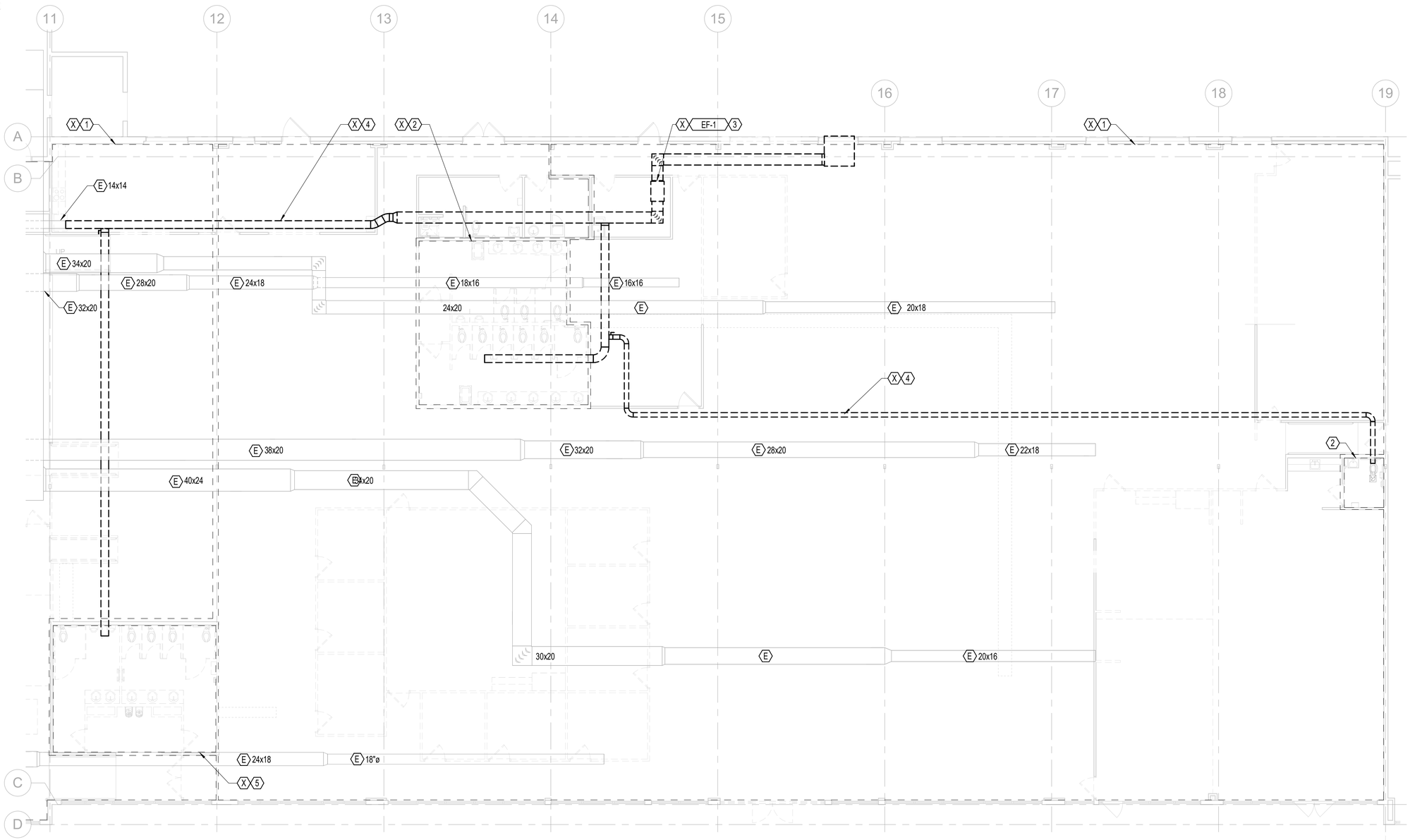
F. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. MAINTAIN ALL EXISTING SYSTEMS TO THE AREAS OUTSIDE THE PROJECT BOUNDARIES.

G. ALL DUCTWORK AND PIPE OPENINGS WITHIN THE PROJECT AREA SHALL BE PROTECTED FROM CONSTRUCTION DEBRIS.

H. AT CONTRACTORS DISCRETION AND WITH APPROVAL OF COMMISSIONING AGENT AND OWNER, CONTRACTOR TO HAVE OPTION TO ISOLATE AREA BY PROVIDING BLANK OFF PANEL OR CAPPING DUCT IN ORDER TO ISOLATE DUCT BRANCH TO PERFORM WORK.

NOTES:

1. DEMOLISH ALL DIFFUSERS, GRILLES, LOW PRESSURE DUCTWORK, TERMINAL UNITS, AND MEDIUM PRESSURE DUCTWORK BACK TO MAINS. MEDIUM PRESSURE MAINS TO REMAIN AS SHOWN. DEMOLISH BRANCH PIPING TO TERMINAL UNITS AND ALL ASSOCIATED VALVING. HYDRONIC HEATING LOOP TO REMAIN.
2. DEMOLISH EXISTING EXHAUST DUCTWORK AND GRILLES.
3. DEMOLISH EXISTING EXHAUST FAN AND ASSOCIATED SUPPORTS.
4. DEMOLISH EXISTING EXHAUST DUCTWORK, TO BE UPSIZED IN NEXT PHASE.



DEMOLITION FLOOR PLAN - AREA B - MECHANICAL

1/8" = 1'-0"

FACET ARCHITECTS
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REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON JAN. 03, 2014 NEDZIB BIBERIC

4/25/2025

EXPIRES: 12/31/2025

PERMIT SET

project:
CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:
PAE
pae-engineers.com

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project: 00524
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DEMOLITION FLOOR PLAN - AREA B - MECHANICAL

sheet M-101B

of:

GENERAL NOTES:

A. EXISTING MECHANICAL PLANS SHOWN FOR REFERENCE ONLY. ALL EXISTING CONDITIONS SHALL BE FIELD VERIFIED BY CONTRACTOR.

B. ALL EQUIPMENT AND SYSTEM WIDE SHUTDOWNS SHALL BE COORDINATED WITH THE OWNER.

C. PATCH AND REPAIR ALL OPENINGS MADE BY REMOVALS.

D. DEMOLITION WORK SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING: REMOVAL OF EQUIPMENT, SUPPORTS, ANCHORS, PIPING, DUCTWORK, AND ALL APPURTENANCES WHERE INDICATED ON PLANS.

E. REMOVE MECHANICAL EQUIPMENT, DUCTWORK, PIPING, AND ASSOCIATED ITEMS AS SHOWN OR RELATED TO EQUIPMENT TO BE REMOVED. CAP DUCTWORK OR PIPING AT NEAREST LIVE BRANCH. DO NOT ABANDON IN PLACE ANY EQUIPMENT, DUCTWORK OR PIPING THAT IS NO LONGER REQUIRED.

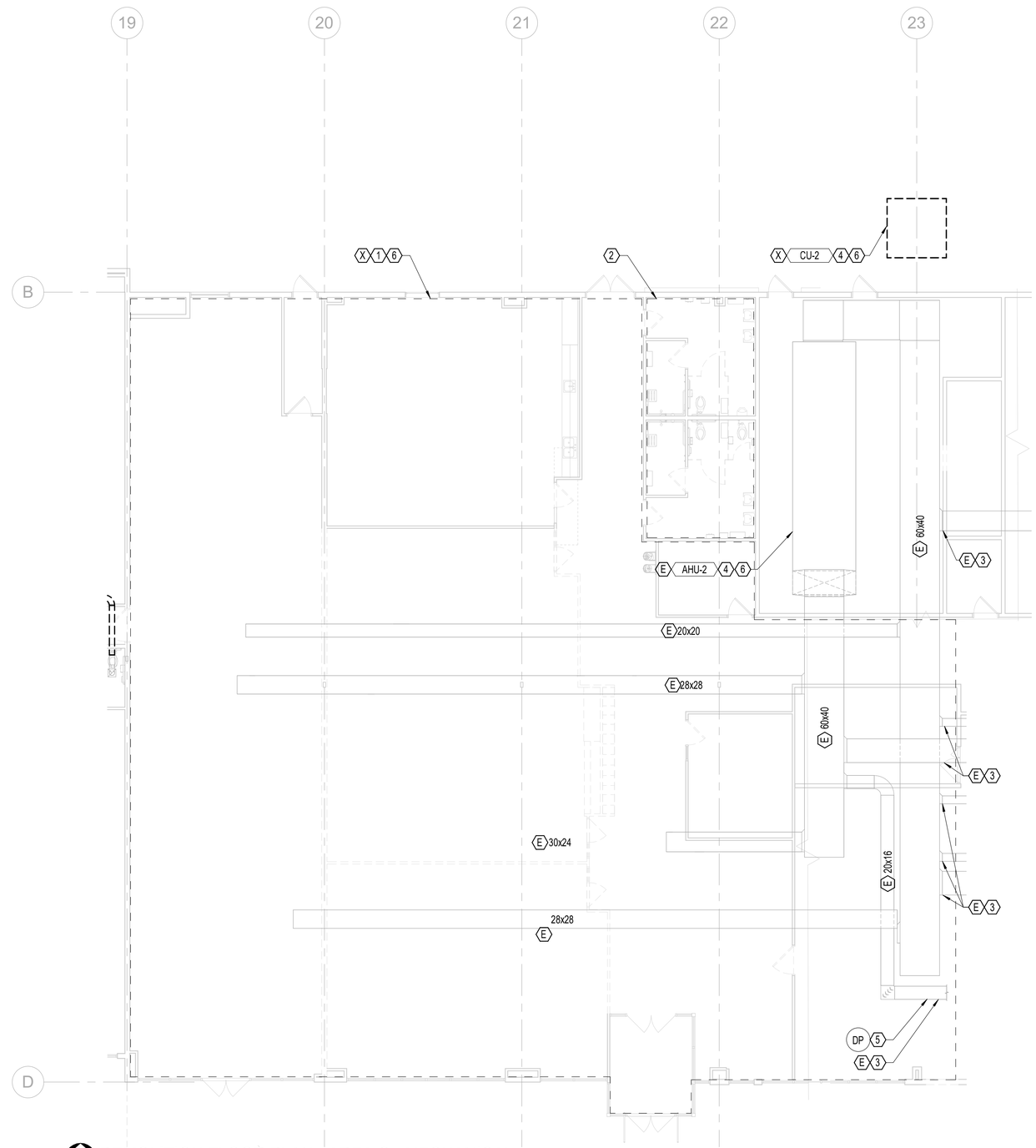
F. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. MAINTAIN ALL EXISTING SYSTEMS TO THE AREAS OUTSIDE THE PROJECT BOUNDARIES.

G. ALL DUCTWORK AND PIPE OPENINGS WITHIN THE PROJECT AREA SHALL BE PROTECTED FROM CONSTRUCTION DEBRIS.

H. AT CONTRACTORS DISCRETION AND WITH APPROVAL OF COMMISSIONING AGENT AND OWNER, CONTRACTOR TO HAVE OPTION TO ISOLATE AREA BY PROVIDING BLANK OFF PANEL OR CAPPING DUCT IN ORDER TO ISOLATE DUCT BRANCH TO PERFORM WORK.

NOTES:

1. DEMOLISH ALL DIFFUSERS, GRILLES, LOW PRESSURE DUCTWORK, TERMINAL UNITS, AND MEDIUM PRESSURE DUCTWORK BACK TO MAINS. MEDIUM PRESSURE MAINS TO REMAIN AS SHOWN. DEMOLISH BRANCH PIPING TO TERMINAL UNITS AND ALL ASSOCIATED VALVING. HYDRONIC HEATING LOOP TO REMAIN.
2. EXHAUST DUCTWORK DISTRIBUTION AND GRILLES TO REMAIN.
3. EXISTING DUCTWORK SERVING AREAS OUT OF SCOPE. DUCTWORK TO REMAIN, AND AIRFLOW TO REMAIN CONSTANT FROM BEFORE TO AFTER CONSTRUCTION. CONTRACTOR TO PROVIDE TEMPORARY MEANS OF VENTILATION DURING CONSTRUCTION. PROVIDE TEMPORARY BLANK OFF DAMPERS DURING CONSTRUCTION.
4. DEMOLISH EXISTING DX COIL WITHIN AIR HANDLING UNIT. REMOVE ALL PIPING TO AND FROM OUTDOOR CONDENSING UNIT. REMOVE CONDENSING UNITS AT BUILDING EXTERIOR.
5. INSTALL TEMPORARY DP SENSOR DURING DEMO PHASE TO CONTROL AIR HANDLER DURING CONSTRUCTION.
6. EXISTING DDC CONTROLS FOR AHU-2 TO BE REMOVED. EXISTING DDC CONTROLS FOR DEMOLISHED EQUIPMENT TO BE REMOVED. DDC CONTROLS FOR ALL EXISTING TO REMAIN EQUIPMENT IS TO REMAIN.



DEMOLITION FLOOR PLAN - AREA C - MECHANICAL
1/8" = 1'-0"

FACET ARCHITECTS
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REGISTERED PROFESSIONAL ENGINEER
74533PE
OREGON
JAN. 03, 2014
MEDZIB BIBERIC
4/25/2025
EXPIRES: 12/31/2025

project:
CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
MCMININNVILLE, OR 97128

consultants:
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Description Date

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project: 00524
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checked by: NB
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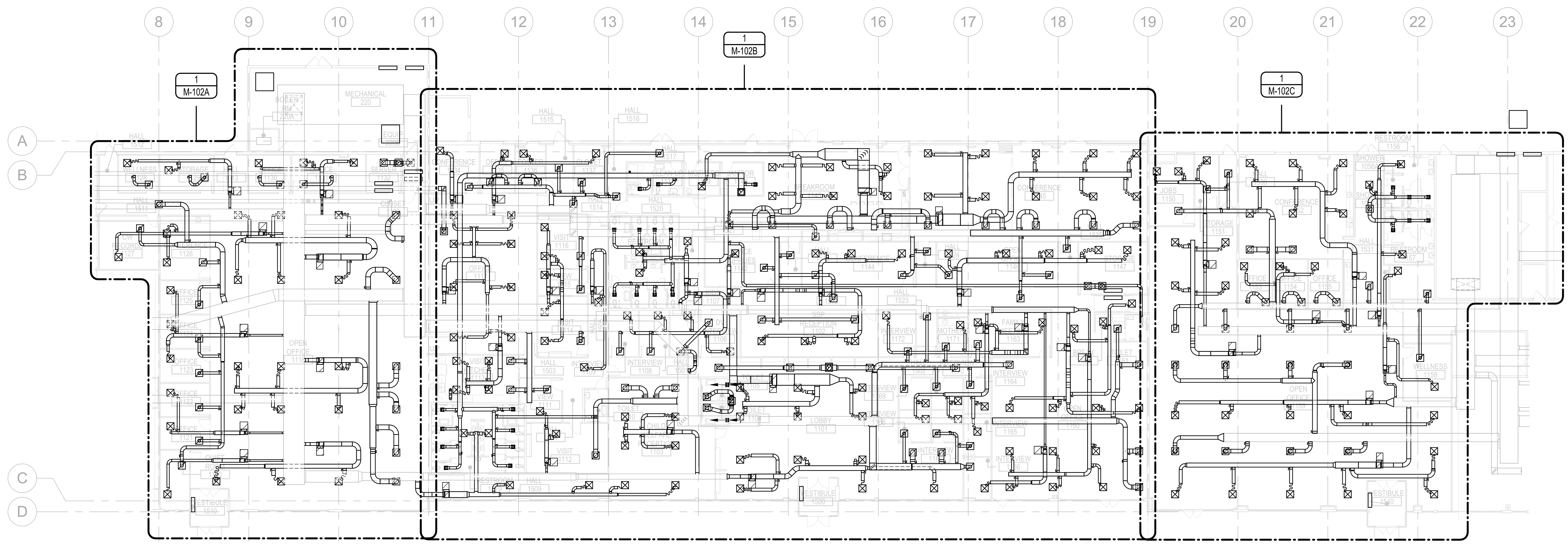
DEMOLITION FLOOR PLAN - AREA C - MECHANICAL

sheet:
M-101C
of:

GENERAL NOTES:

A. REFER TO SECTOR PLANS FOR SCOPE OF WORK.

B. WORK WILL BE COMPLETED IN TWO PHASES. SCOPE EAST OF GRIDLINE 19 WILL BE COMPLETED IN FIRST PHASE, WEST OF GRIDLINE 19 WILL BE COMPLETED IN SECOND PHASE. SCOPE SHOWN ON THESE DRAWINGS IS REPRESENTED WITHOUT PHASING FOR CLARITY. CONTRACTOR TO CREATE PHASING PLAN TO DOCUMENT APPROACH TO PROPOSED PHASES.



OVERALL FLOOR PLAN - MECHANICAL

1/16" = 1'-0"

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3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON JAN. 03, 2011 NEDZIB BIBERIC

4/25/2025

EXPIRES: 12/31/2025

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project: CCC - YVC CAMPUS BUILDING 2 - DHS TI

368 NE NORTON LN
MCMININNVILLE, OR 97128

consultants:

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revisions:

#	Description	Date

date: 04/25/25

project: 00524

drawn by: RNW

checked by: NB

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OVERALL FLOOR PLAN - MECHANICAL

sheet: M-102

of:

GENERAL NOTES:

A. EXISTING MECHANICAL PLANS SHOWN FOR REFERENCE ONLY. ALL EXISTING CONDITIONS SHALL BE FIELD VERIFIED BY CONTRACTOR.

B. ALL EQUIPMENT AND SYSTEM WIDE SHUTDOWNS SHALL BE COORDINATED WITH THE OWNER.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. MAINTAIN ALL EXISTING SYSTEMS TO THE AREAS OUTSIDE THE PROJECT BOUNDARIES.

D. ALL DUCTWORK AND PIPE OPENINGS WITHIN THE PROJECT AREA SHALL BE PROTECTED FROM CONSTRUCTION DEBRIS.

E. ALL WORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN DUCTS AND TRANSITIONS AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO OWNER.

F. VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS AND EXISTING CONDITIONS. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.

G. ALL DETAILS APPLY TO THIS SHEET WHETHER TAGGED OR NOT.

H. ALL EQUIPMENT STARTUPS TO BE COMPLETED FOLLOWING THE MANUFACTURER'S RECOMMENDATIONS. NOTIFY CX AGENT AT LEAST FIVE DAYS IN ADVANCE OF EQUIPMENT STARTUP.

I. PROVIDE BALANCING DAMPER IN EACH DUCT BRANCH TO DIFFUSER OR GRILLE.

J. DUCTS ARE TO BE FREE OF CONSTRUCTION DEBRIS AND CONSISTENT WITH SMACNA LEVEL 'C', THE ADVANCED LEVEL OF CLEANLINESS.

K. WITHIN PROJECT AREA, EXISTING DUCTWORK TO BE REPAIRED/REPLACED WHERE DAMAGED AND WHERE INSULATION IS MISSING. EXISTING DUCTWORK TO BE INSULATED PER DUCTWORK INSULATION SCHEDULE.

L. FIELD COORDINATE LOCATION OF ALL EQUIPMENT, DAMPERS, AND VALVES LOCATED ABOVE CEILING TO ACCOMODATE UNOSTRUCTED ACCESS FOR INSPECTION AND SERVICE. IN AREAS WITH HARD LID CEILINGS, CONTRACTOR TO PROVIDE 24-INCH BY 24-INCH ACCESS PANEL.

M. CONTRACTOR TO LABEL CEILING GRID AND ACCESS PANELS AT LOCATION WHERE EQUIPMENT IS INSTALLED ABOVE CEILING. PROVIDE ENGRAVED NAMEPLATES AND SECURE TO CEILING WITH SHEET METAL SCREWS.

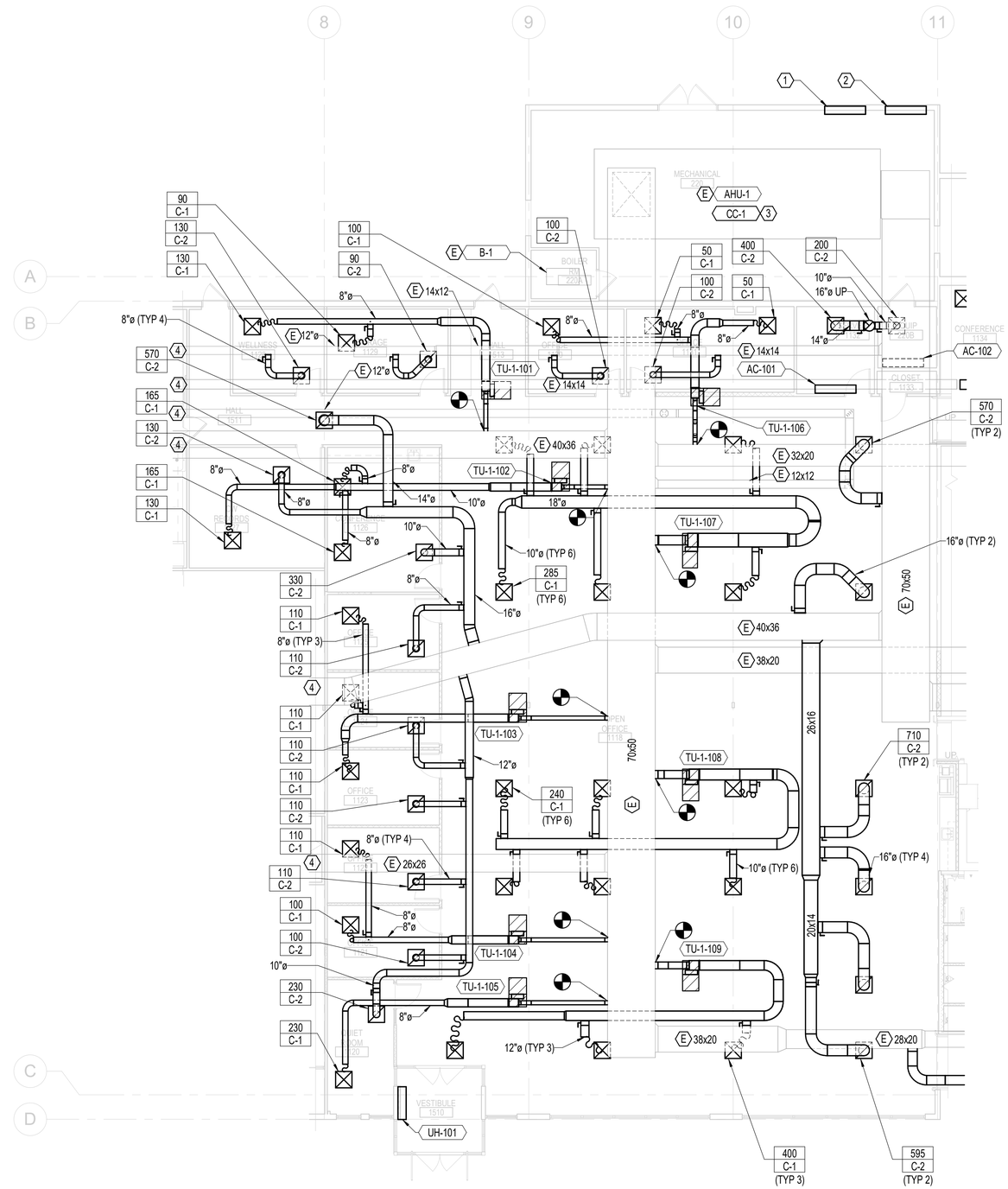
NOTES:

1. NEW DDC CONTROL PANEL. PANEL DEDICATED FOR AIR HANDLING UNIT. WILL BE PROVIDED WITH SPARE CAPACITY SUFFICIENT FOR FUTURE CONVERSION OF HEATING WATER PUMPS, BOILERS, AND OTHER EXISTING EQUIPMENT THAT IS CURRENTLY ON DDC CONTROLS.

2. NEW DDC CONTROL PANEL. PANEL DEDICATED FOR TERMINAL UNITS. NEW PANEL SHALL HAVE SUFFICIENT SPACE ON DAY 1 TO ACCOMODATE ADDITIONAL CONVERSION OF EXISTING TO REMAIN TERMINAL UNITS (20) AND EXHAUST FANS (2).

3. NEW DX COOLING COIL IN EXISTING AIR HANDLER. PROVIDING PIPING TO AND FROM NEW CONDENSING UNITS ACCU-1A AND ACCU-1B PER MANUFACTURER'S RECOMMENDATIONS.

4. AIRFLOW AT EXISTING TERMINAL UNITS AND ALL AIR REGISTERS OUT OF PROJECT SCOPE TO BE ADJUSTED AS NEEDED IN ORDER TO MATCH THE AIRFLOW RATES PRIOR TO CONSTRUCTION.



FLOOR PLAN - AREA A - MECHANICAL
1/8" = 1'-0"

FACET ARCHITECTS
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3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED PROFESSIONAL ENGINEER 74933PE OREGON JAN. 03, 2014 MEDZIB BIBERIC
4/25/2025
EXPIRES: 12/31/2025

project: CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants: PAE pae-engineers.com

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date: 04/25/25
project: 00524
drawn by: RNW
checked by: NB

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FLOOR PLAN - AREA A - MECHANICAL

sheet: M-102A
of:

GENERAL NOTES:

A. EXISTING MECHANICAL PLANS SHOWN FOR REFERENCE ONLY. ALL EXISTING CONDITIONS SHALL BE FIELD VERIFIED BY CONTRACTOR.

B. ALL EQUIPMENT AND SYSTEM WIDE SHUTDOWNS SHALL BE COORDINATED WITH THE OWNER.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. MAINTAIN ALL EXISTING SYSTEMS TO THE AREAS OUTSIDE THE PROJECT BOUNDARIES.

D. ALL DUCTWORK AND PIPE OPENINGS WITHIN THE PROJECT AREA SHALL BE PROTECTED FROM CONSTRUCTION DEBRIS.

E. ALL WORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN DUCTS AND TRANSITIONS AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO OWNER.

F. VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS AND EXISTING CONDITIONS. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.

G. ALL DETAILS APPLY TO THIS SHEET WHETHER TAGGED OR NOT.

H. ALL EQUIPMENT STARTUPS TO BE COMPLETED FOLLOWING THE MANUFACTURER'S RECOMMENDATIONS. NOTIFY CX AGENT AT LEAST FIVE DAYS IN ADVANCE OF EQUIPMENT STARTUP.

I. PROVIDE BALANCING DAMPER IN EACH DUCT BRANCH TO DIFFUSER OR GRILLE.

J. DUCTS ARE TO BE FREE OF CONSTRUCTION DEBRIS AND CONSISTENT WITH SMACNA LEVEL 'C', THE ADVANCED LEVEL OF CLEANLINESS.

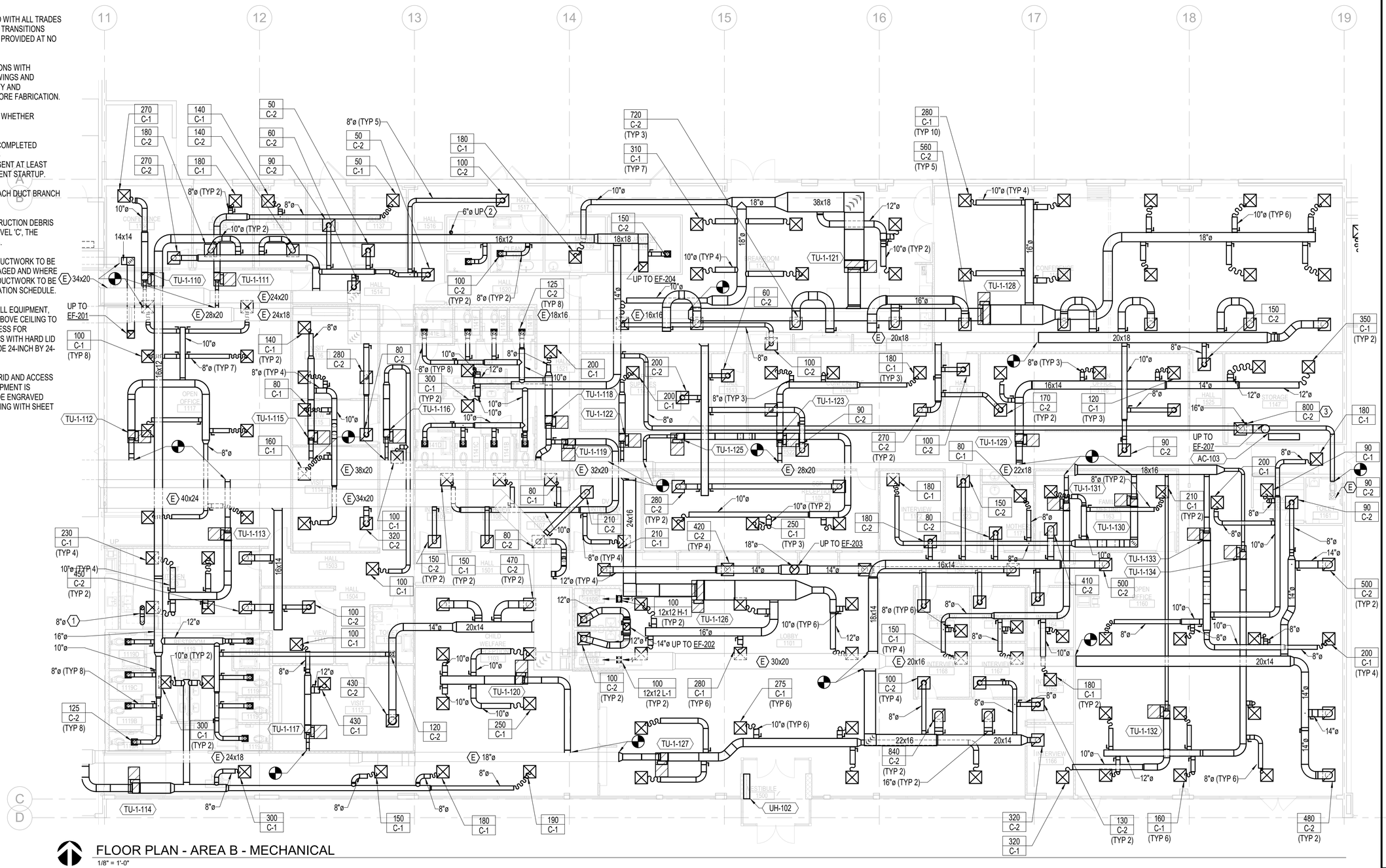
K. WITHIN PROJECT AREA, EXISTING DUCTWORK TO BE REPAIRED/REPLACED WHERE DAMAGED AND WHERE INSULATION IS MISSING. EXISTING DUCTWORK TO BE INSULATED PER DUCTWORK INSULATION SCHEDULE.

L. FIELD COORDINATE LOCATION OF ALL EQUIPMENT, DAMPERS, AND VALVES LOCATED ABOVE CEILING TO ACCOMODATE UNOSTRUCTED ACCESS FOR INSPECTION AND SERVICE. IN AREAS WITH HARD LID CEILINGS, CONTRACTOR TO PROVIDE 24-INCH BY 24-INCH ACCESS PANEL.

M. CONTRACTOR TO LABEL CEILING GRID AND ACCESS PANELS AT LOCATION WHERE EQUIPMENT IS INSTALLED ABOVE CEILING. PROVIDE ENGRAVED NAMEPLATES AND SECURE TO CEILING WITH SHEET METAL SCREWS.

NOTES:

1. CONNECTION TO NEW EXHAUST HOOD. DUCT DIRECTLY TO ROOF. PROVIDE SCREEN AND CAP AT DUCT TERMINATION.
2. EXHAUST CONNECTION TO NEW DRYER. PROVIDE LINT TRAP AT CONNECTION TO EQUIPMENT. TERMINATE ABOVE ROOF LEVEL WITH GOOSENECK FITTING. FLEXIBLE DUCT SHALL NOT BE USED FOR DRYER EXHAUST. SHEET METAL SCREWS SHALL NOT PENETRATE DUCTWORK. PROVIDE BACKDRAFT DAMPER AT EXHAUST TERMINATION. NO SCREENS TO BE INSTALLED AT DUCT TERMINATION.
3. LOCATE EXHAUST GRILLE ABOVE IT RACK/BATTERY STORAGE AREA.



FLOOR PLAN - AREA B - MECHANICAL

1/8" = 1'-0"

FACET ARCHITECTS

Formerly Carlson Veit Junge Architects

3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON JAN. 03, 2014 MEDZIB BIBERIC

4/25/2025

EXPIRES: 12/31/2025

PERMIT SET

project: CCC - YVC CAMPUS BUILDING 2 - DHS TI

368 NE NORTON LN
MCMINNINVILLE, OR 97128

consultants: PAE pae-engineers.com

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FLOOR PLAN - AREA B - MECHANICAL

sheet M-102B

of:

GENERAL NOTES:

A. EXISTING MECHANICAL PLANS SHOWN FOR REFERENCE ONLY. ALL EXISTING CONDITIONS SHALL BE FIELD VERIFIED BY CONTRACTOR.

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C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. MAINTAIN ALL EXISTING SYSTEMS TO THE AREAS OUTSIDE THE PROJECT BOUNDARIES.

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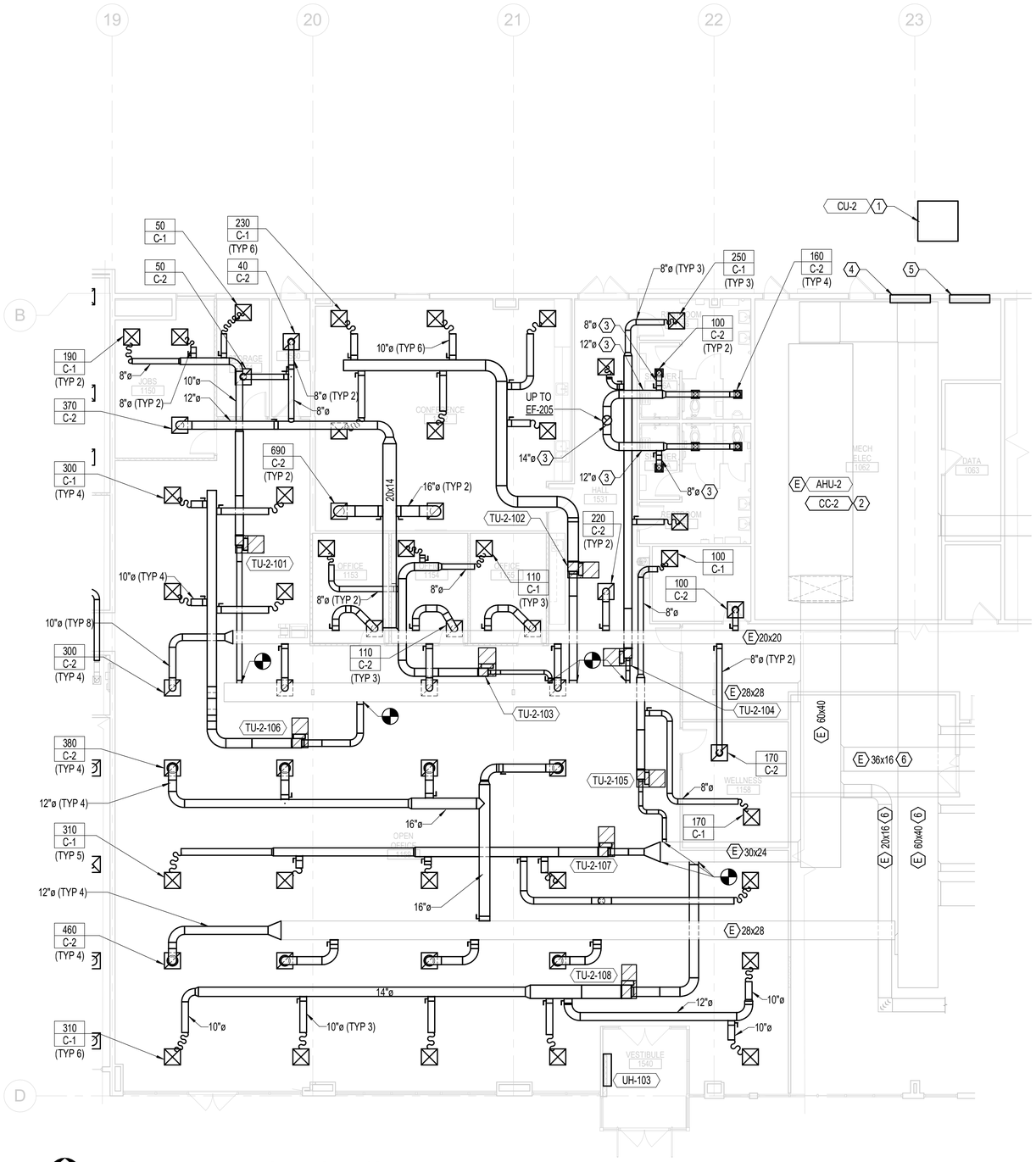
M. CONTRACTOR TO LABEL CEILING GRID AND ACCESS PANELS AT LOCATION WHERE EQUIPMENT IS INSTALLED ABOVE CEILING. PROVIDE ENGRAVED NAMEPLATES AND SECURE TO CEILING WITH SHEET METAL SCREWS.

NOTES:

1. NEW AIR COOLED CONDENSING UNIT ON ROOF. REUSE EXISTING HOUSEKEEPING PAD. PROVIDE NEW PIPING TO AND FROM AHU-1 COOLING COIL, SIZED PER MANUFACTURER'S RECOMMENDATIONS.
2. NEW DX COOLING COIL IN EXISTING AIR HANDLER. PROVIDING PIPING TO AND FROM NEW CONDENSING UNITS ACCU-1A AND ACCU-1B PER MANUFACTURER'S RECOMMENDATIONS.
3. PROVIDE ALUMINUM DUCTWORK FOR SHOWER EXHAUST. SLOPE DUCTWORK BACK TO GRILLE.
4. NEW DDC CONTROL PANEL. PANEL DEDICATED FOR AIR HANDLING UNIT. WILL BE PROVIDED WITH SPARE CAPACITY SUFFICIENT FOR EXISTING EQUIPMENT THAT IS CURRENTLY ON DDC CONTROLS.
5. NEW DDC CONTROL PANEL. PANEL DEDICATED FOR TERMINAL UNITS. NEW PANEL SHALL HAVE SUFFICIENT SPACE ON DAY 1 TO ACCOMODATE ADDITIONAL CONVERSION OF EXISTING TO REMAIN TERMINAL UNITS (20) AND EXHAUST FANS (2).
6. AIRFLOW AT EXISTING TERMINAL UNITS AND ALL AIR REGISTERS OUT OF PROJECT SCOPE TO BE ADJUSTED AS NEEDED IN ORDER TO MATCH THE AIRFLOW RATES PRIOR TO CONSTRUCTION.



FLOOR PLAN - AREA C - MECHANICAL
1/8" = 1'-0"

FACET ARCHITECTS
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3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED PROFESSIONAL ENGINEER 74533PE OREGON JAN. 03, 2014 NEDZIB BIBERIC
4/25/2025
EXPIRES: 12/31/2025

PERMIT SET

project:
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368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:
PAE pae-engineers.com

revisions:

	Description	Date

date: 04/25/25
project: 00524
drawn by: RNW
checked by: NB

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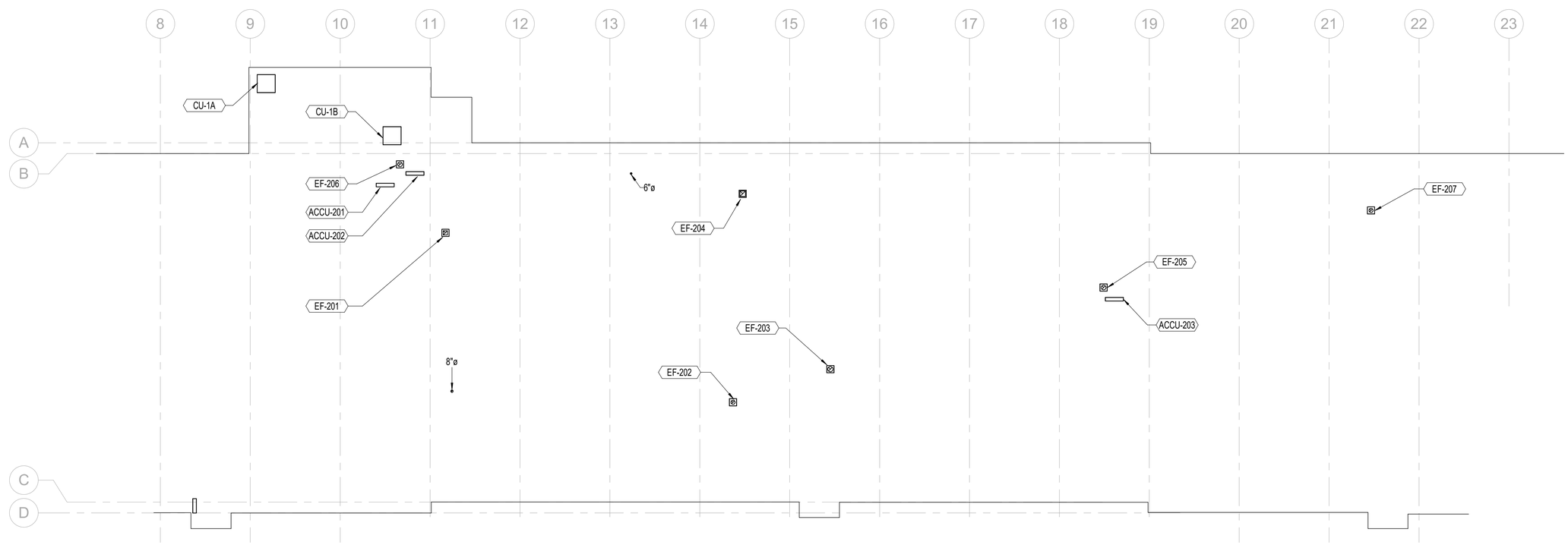
FLOOR PLAN - AREA C - MECHANICAL

sheet M-102C
of:

GENERAL NOTES:

A. VERIFY EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. FIELD VERIFY AND COORDINATE DIMENSIONS PRIOR TO FABRICATION.

B. LOCATE ROOF MOUNTED EQUIPMENT A MINIMUM OF 15 FEET AWAY FROM ROOF EDGE.



OVERALL ROOF PLAN - MECHANICAL
1/16" = 1'-0"

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74533PE
OREGON
JAN. 03, 2014
WEDZIB BIBERIC
4/25/2025
EXPIRES: 12/31/2025

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project:
CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:
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revisions:

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ROOF PLAN - MECHANICAL

sheet: M-103
of:

GENERAL NOTES:

A. REFER TO TERMINAL UNIT SCHEDULE FOR BRANCH PIPING SIZES.

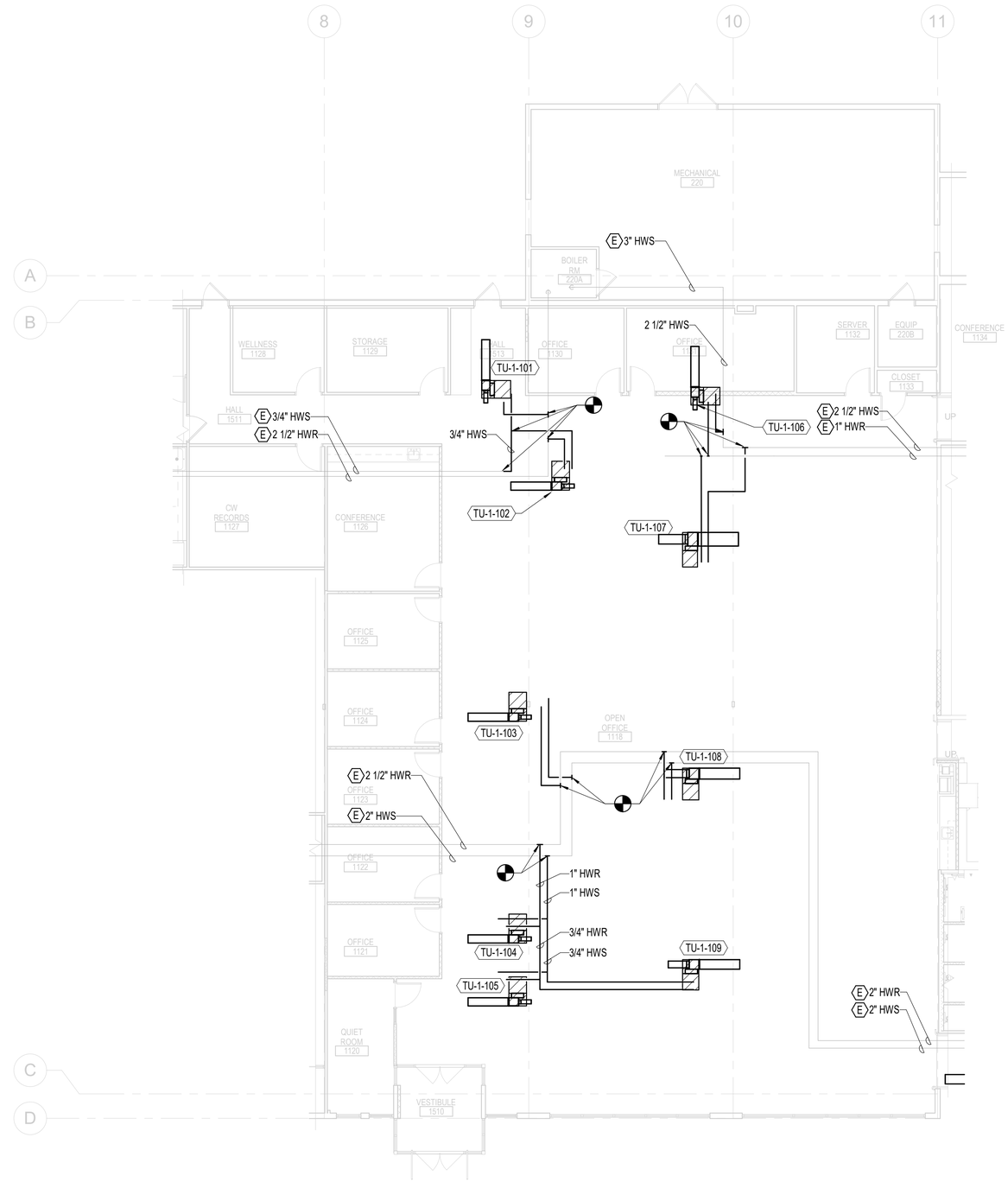
B. RUN PIPING CONCEALED, UNLESS SPECIFIED OTHERWISE, AND CLEAR OF CEILING INSERTS.

C. VERIFY EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. FIELD VERIFY AND COORDINATE DIMENSIONS PRIOR TO FABRICATION.

D. WITHIN PROJECT AREA, EXISTING PIPING INSULATION SHALL BE REPAIRED OR REPLACED WHERE DAMAGED AND WHERE INSULATION IS MISSING. THE EXISTING PIPING SHALL BE INSULATED PER THE PIPE INSULATION SCHEDULE.

E. WITHIN PROJECT AREA, PIPE LABELS SHALL BE ADDED TO EXISTING PIPING.

F. ALL PIPING TO BE FLUSHED BEFORE CONNECTING TO NEW TERMINAL UNIT COILS. FLUSH UNTIL MAKEUP WATER CONDUCTIVITY MATCHES LOOP WATER CONDUCTIVITY. ALL STRAINERS TO BE CLEANED.



FLOOR PLAN - AREA A - MECHANICAL PIPING
1/8" = 1'-0"

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FLOOR PLAN - AREA A - MECHANICAL PIPING

sheet: M-302A
of:

GENERAL NOTES:

A. REFER TO TERMINAL UNIT SCHEDULE FOR BRANCH PIPING SIZES.

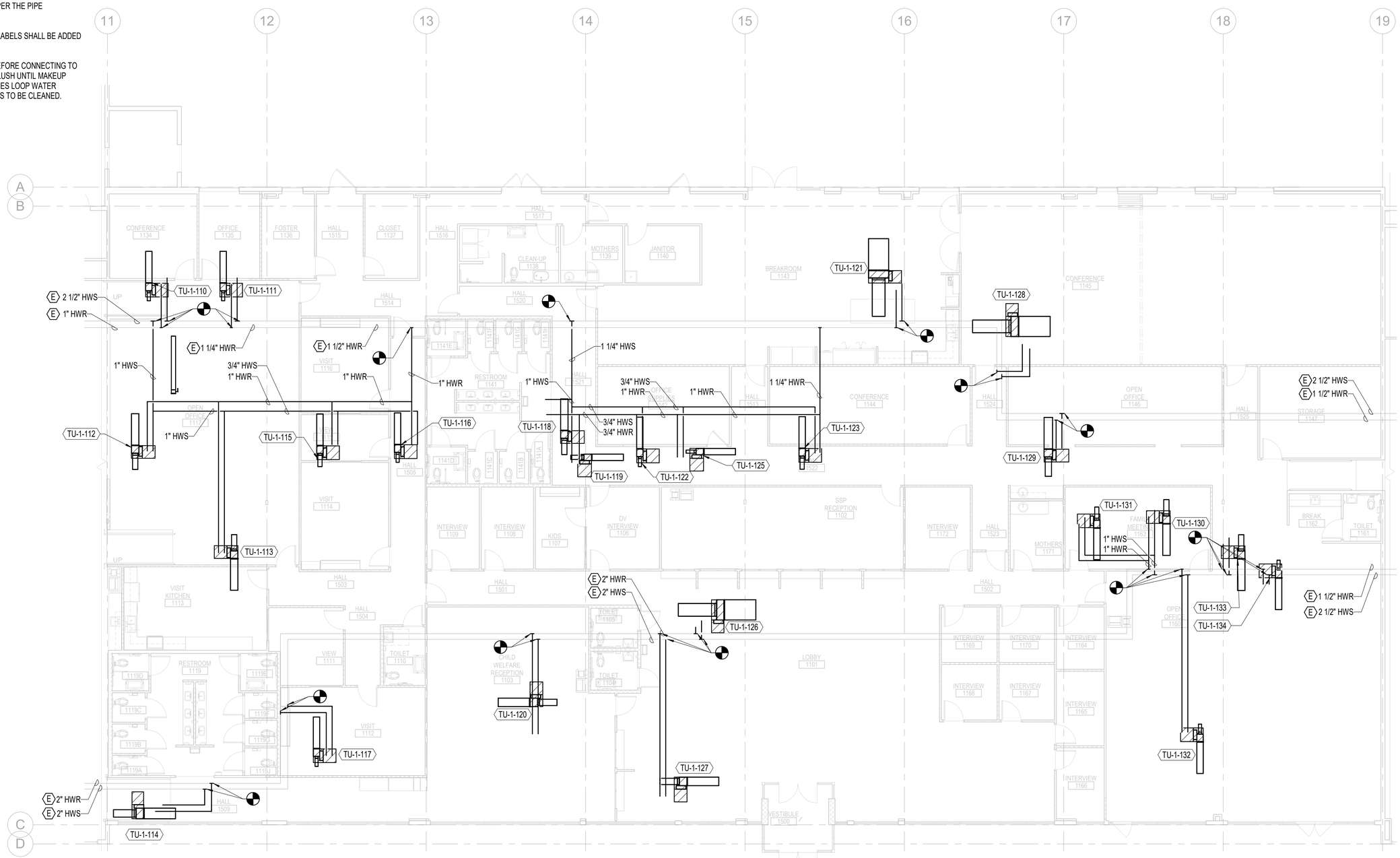
B. RUN PIPING CONCEALED, UNLESS SPECIFIED OTHERWISE, AND CLEAR OF CEILING INSERTS.

C. VERIFY EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. FIELD VERIFY AND COORDINATE DIMENSIONS PRIOR TO FABRICATION.

D. WITHIN PROJECT AREA, EXISTING PIPING INSULATION SHALL BE REPAIRED OR REPLACED WHERE DAMAGED AND WHERE INSULATION IS MISSING. THE EXISTING PIPING SHALL BE INSULATED PER THE PIPE INSULATION SCHEDULE.

E. WITHIN PROJECT AREA, PIPE LABELS SHALL BE ADDED TO EXISTING PIPING.

F. ALL PIPING TO BE FLUSHED BEFORE CONNECTING TO NEW TERMINAL UNIT COILS. FLUSH UNTIL MAKEUP WATER CONDUCTIVITY MATCHES LOOP WATER CONDUCTIVITY. ALL STRAINERS TO BE CLEANED.



FLOOR PLAN - AREA B - MECHANICAL PIPING

1/8" = 1'-0"

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FLOOR PLAN - AREA B - MECHANICAL PIPING

sheet M-302B

of:

GENERAL NOTES:

A. REFER TO TERMINAL UNIT SCHEDULE FOR BRANCH PIPING SIZES.

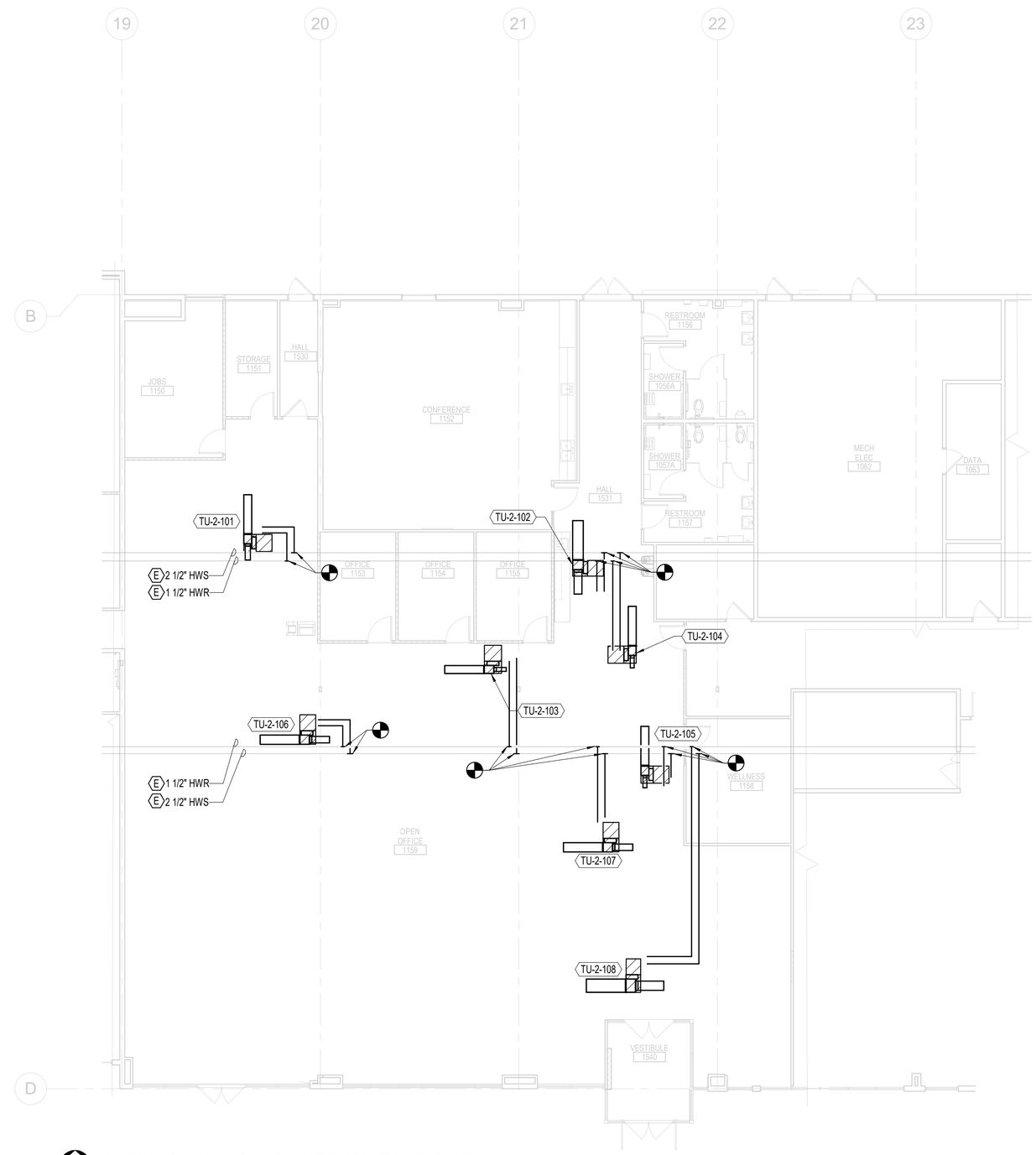
B. RUN PIPING CONCEALED, UNLESS SPECIFIED OTHERWISE, AND CLEAR OF CEILING INSERTS.

C. VERIFY EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. FIELD VERIFY AND COORDINATE DIMENSIONS PRIOR TO FABRICATION.

D. WITHIN PROJECT AREA, EXISTING PIPING INSULATION SHALL BE REPAIRED OR REPLACED WHERE DAMAGED AND WHERE INSULATION IS MISSING. THE EXISTING PIPING SHALL BE INSULATED PER THE PIPE INSULATION SCHEDULE.

E. WITHIN PROJECT AREA, PIPE LABELS SHALL BE ADDED TO EXISTING PIPING.

F. ALL PIPING TO BE FLUSHED BEFORE CONNECTING TO NEW TERMINAL UNIT COILS. FLUSH UNTIL MAKEUP WATER CONDUCTIVITY MATCHES LOOP WATER CONDUCTIVITY. ALL STRAINERS TO BE CLEANED.



FLOOR PLAN - AREA C - MECHANICAL PIPING
1/8" = 1'-0"

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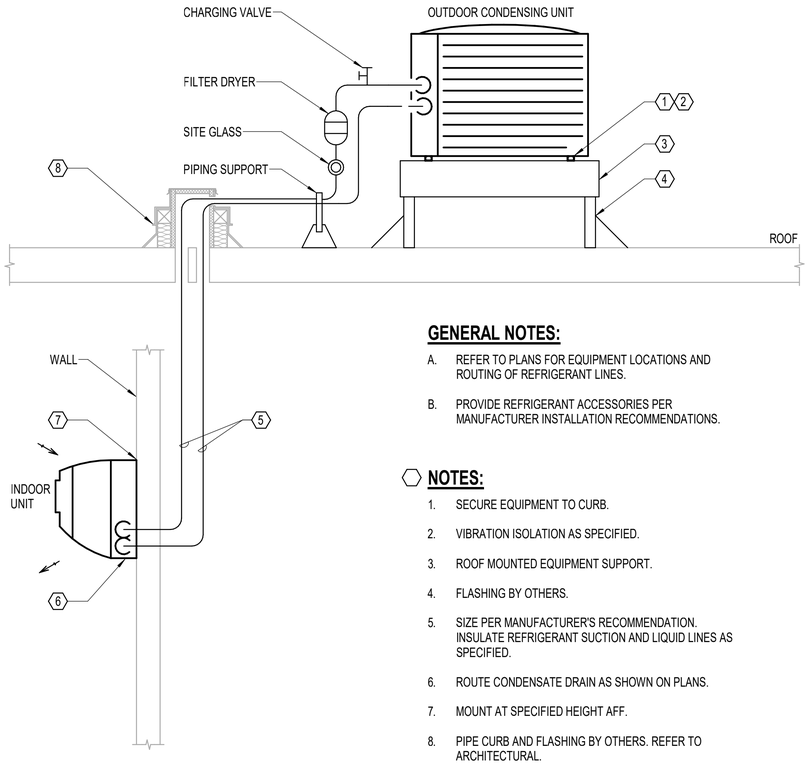
FLOOR PLAN - AREA C - MECHANICAL PIPING

sheet: M-302C
of:



GENERAL NOTES:

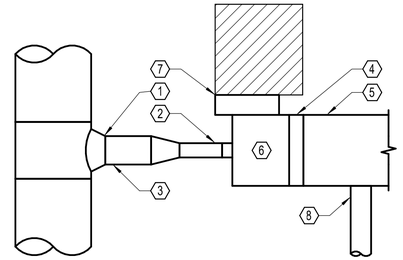
A. REFER TO PLANS FOR EQUIPMENT LOCATIONS AND ROUTING OF REFRIGERANT LINES.

B. PROVIDE REFRIGERANT ACCESSORIES PER MANUFACTURER INSTALLATION RECOMMENDATIONS.

NOTES:

1. SECURE EQUIPMENT TO CURB.
2. VIBRATION ISOLATION AS SPECIFIED.
3. ROOF MOUNTED EQUIPMENT SUPPORT.
4. FLASHING BY OTHERS.
5. SIZE PER MANUFACTURER'S RECOMMENDATION. INSULATE REFRIGERANT SUCTION AND LIQUID LINES AS SPECIFIED.
6. ROUTE CONDENSATE DRAIN AS SHOWN ON PLANS.
7. MOUNT AT SPECIFIED HEIGHT AFF.
8. PIPE CURB AND FLASHING BY OTHERS. REFER TO ARCHITECTURAL.

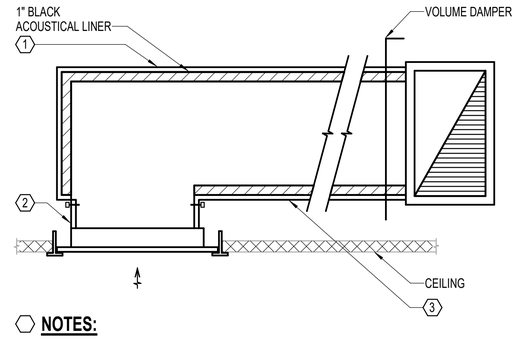
7 SPLIT SYSTEM DETAIL
NONE



NOTES:

1. CONICAL TEE.
2. INLET DUCT. MINIMUM STRAIGHT LENGTH = 3'-0" OR 4 DUCT DIAMETERS FROM MAIN DUCT, WHICHEVER IS LARGER. FLEXIBLE CONNECTIONS ARE NOT ALLOWED.
3. MEDIUM PRESSURE MAIN DUCT. IF UNDER 10"-0" IN LENGTH, DUCT SIZE TO BE THE SAME SIZE AS TERMINAL UNIT INLET CONNECTION, IF LENGTH IS 10'-0" OR GREATER DUCT SIZE TO BE AS SHOWN ON PLAN.
4. HEATING COIL, WHERE INDICATED (ELECTRIC OR HYDRONIC). MAINTAIN NATIONAL ELECTRIC CODE CLEARANCE REQUIRED FOR ELECTRIC REHEAT COILS.
5. DISCHARGE DUCT TO BE SHEET METAL, MINIMUM 8'-0" LONG, SAME SIZE AS TERMINAL UNIT OUTLET, OR AS SHOWN ON PLAN, WHICHEVER IS LARGER.
6. INSTALL TERMINAL UNIT WITHIN 2' ABOVE CEILING PLANE TO MAINTAIN SERVICE ACCESS.
7. CONTROL ENCLOSURE. PROVIDE 36" CLEARANCE DIRECTLY IN FRONT OF ENCLOSURE, MOUNT CONTROL PANEL AND COIL VALVE ASSEMBLY ON SAME SIDE OF UNIT.
8. FIRST BRANCH DUCT TAP MAY NOT BE WITHIN FIRST 5'-0" OF PLENUM.

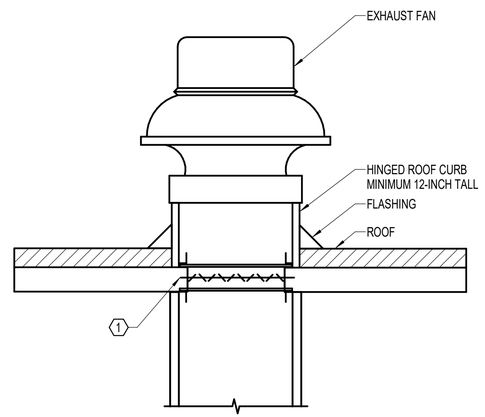
3 TYPICAL TERMINAL UNIT
NONE



NOTES:

1. SHEET METAL DUCT. SEE PLANS FOR SIZE.
2. NECK SIZE PER SCHEDULE.
3. EXTEND AND CONNECT TO RETURN/EXHAUST SYSTEM.

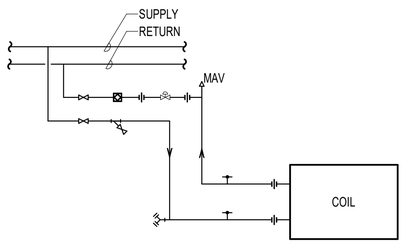
1 DUCTED RETURN/EXHAUST GRILLE
NONE



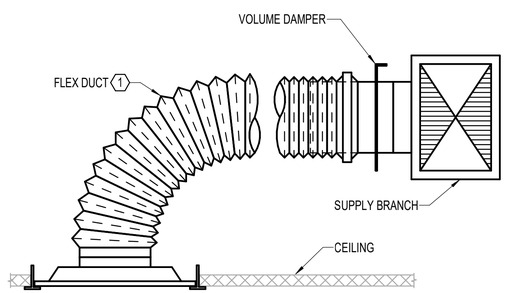
NOTES:

1. AUTOMATIC MOTORIZED CONTROL DAMPER. ACTUATOR TO BE INSTALLED BELOW ROOF AND ACCESSIBLE FROM THE SPACE BELOW. COORDINATE WORK WITH CONTROLS CONTRACTOR.

2 ROOF EXHAUST FAN
NONE



4 HYDRONIC COIL PIPING DETAIL - TWO-WAY
NONE



NOTES:

1. 1.5 DIA MINIMUM FLEX DUCT RADIUS (7" MAX LENGTH).

6 DIFFUSER DETAIL - ROUND CONNECTION
NONE

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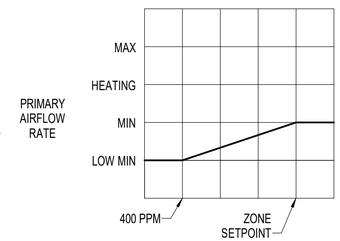
DETAILS - MECHANICAL

sheet: M-501
of:

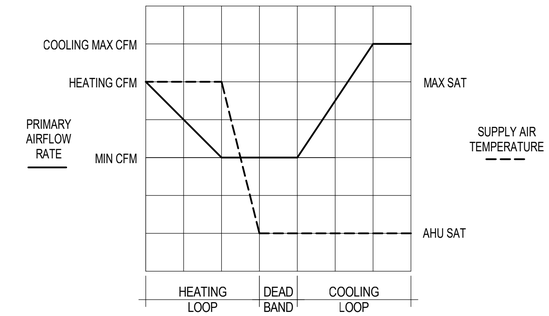
TERMINAL UNIT - VARIABLE VOLUME WITH REHEAT

- GENERAL
  - TERMINAL UNIT OPERATES AS VARIABLE VOLUME TO MAINTAIN ZONE TEMPERATURE SETPOINT
  - TERMINAL UNIT OPERATES AS VARIABLE VOLUME TO MAINTAIN ZONE CARBON DIOXIDE SETPOINT
  - MAXIMUM RATE OF CHANGE FOR DAMPER OPERATION IS 10% PER MINUTE
  - MAXIMUM RATE OF CHANGE FOR VALVE OPERATION IS 10% PER MINUTE
- SCHEDULE OF OPERATION
  - TERMINAL UNIT SCHEDULE MATCHES ASSOCIATED AIR HANDLER SEQUENCE OF OPERATION
- OCCUPIED MODE
  - ZONE TEMPERATURE CONTROL
    - ZONE TEMPERATURE BELOW HEATING SETPOINT
      - FIRST STAGE OF HEATING INCREASES SUPPLY AIR TEMPERATURE, SECOND STAGE OF HEATING INCREASES SUPPLY AIRFLOW
      - LEAVING AIR TEMPERATURE SETPOINT SET TO MAXIMUM VALUE
      - HEATING COIL MODULATES TO MAINTAIN LEAVING AIR TEMPERATURE SETPOINT
      - DAMPER MODULATES TO MAINTAIN MINIMUM AIRFLOW RATE
      - IF ZONE TEMPERATURE BELOW HEATING SETPOINT FOR 5 MINUTES
        - DAMPER MODULATES LINARLY BETWEEN MINIMUM AIRFLOW RATE AND HEATING AIRFLOW RATE TO MAINTAIN ZONE HEATING SETPOINT
      - WHEN ZONE TEMPERATURE IS EQUAL TO HEATING SETPOINT
        - REVERSE SEQUENCE IDENTIFIED ABOVE
    - ZONE TEMPERATURE BETWEEN HEATING AND COOLING SETPOINTS
      - LEAVING AIR TEMPERATURE SETPOINT SET TO ASSOCIATED AIR HANDLER LEAVING AIR TEMPERATURE
      - HEATING COIL OFF
      - DAMPER MODULATES TO MAINTAIN LOW MINIMUM AIRFLOW RATE
    - ZONE TEMPERATURE ABOVE COOLING SETPOINT
      - LEAVING AIR TEMPERATURE SETPOINT SET TO ASSOCIATED AIR HANDLER LEAVING AIR TEMPERATURE
      - HEATING COIL OFF
      - DAMPER MODULATES LINEARLY BETWEEN MINIMUM AIRFLOW RATE AND MAXIMUM AIRFLOW RATE TO MAINTAIN ZONE COOLING SETPOINT
        - WHEN ZONE TEMPERATURE IS EQUAL TO COOLING SETPOINT
          - REVERSE SEQUENCE IDENTIFIED ABOVE
  - ZONE CARBON DIOXIDE CONTROL
    - DAMPER MODULATES LINEARLY BASED ON CARBON DIOXIDE LEVEL
    - CARBON DIOXIDE LEVEL AT 700 PPM OR LESS
      - DAMPER MODULATES TO MAINTAIN LOW MINIMUM AIRFLOW RATE
    - CARBON DIOXIDE LEVEL AT SETPOINT OR HIGHER
      - DAMPER MODULATES TO MAINTAIN MINIMUM AIRFLOW RATE.
      - IF CO2 LEVEL IN SPACE RISES THE DDC MODULATES THE AIRFLOW BETWEEN THE MINIMUM AND MAXIMUM ZONE AIRFLOW
  - ZONE OCCUPANCY SENSOR CONTROL
    - DAMPER MODULATES BASED ON OCCUPANCY SENSOR FROM LIGHTING CONTROLS
    - ZONE OCCUPANCY IS UNOCCUPIED
      - DAMPER MODULATES TO MAINTAIN LOW MINIMUM AIRFLOW RATE
    - ZONE OCCUPANCY IS OCCUPIED
      - TERMINAL UNIT OPERATES AS IN OCCUPIED MODE TO MAINTAIN TEMPERATURE
- UNOCCUPIED MODE
  - AS SIGNALED BY OCCUPANCY SENSOR OR SCHEDULE
  - HEATING COIL OFF
  - DAMPER OPEN
- ALARMS/SAFETIES
  - LOW AIRFLOW ALARM: AIRFLOW RATE IS LESS THAN 50% OF SETPOINT FOR 5 MINUTES
  - LOW LEAVING AIR TEMPERATURE ALARM: LEAVING AIR TEMPERATURE IS MORE THAN 10 DEGREES BELOW SETPOINT FOR 5 MINUTES
- POINTS FOR MONITORING
  - DAMPER POSITION
  - DAMPER POSITION
  - HEATING COIL VALVE POSITION
  - DISCHARGE AIR TEMPERATURE
- NOTES
  - SETPOINTS AND VARIABLES ARE TO BE INDIVIDUALLY ADJUSTABLE THROUGH CONTROL SYSTEM GRAPHICAL USER INTERFACE

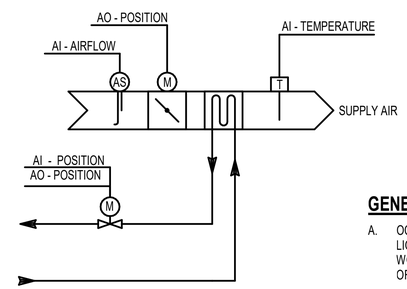
1 TERMINAL UNIT - VVR
NONE

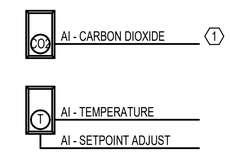


ZONE CARBON DIOXIDE LEVEL



ZONE TEMPERATURE





GENERAL NOTES:

A. OCCUPANCY SENSOR PROVIDED INTEGRAL TO LIGHTING. CONTROLS CONTRACTOR TO COORDINATE WORK WITH LIGHTING CONTRACTOR FOR INTEGRATION OF LIGHTING AND BAS TO MONITOR IN ZONES.

NOTES:

1. REFER TO ZONING PLANS FOR LOCATIONS AND QUANTITIES.

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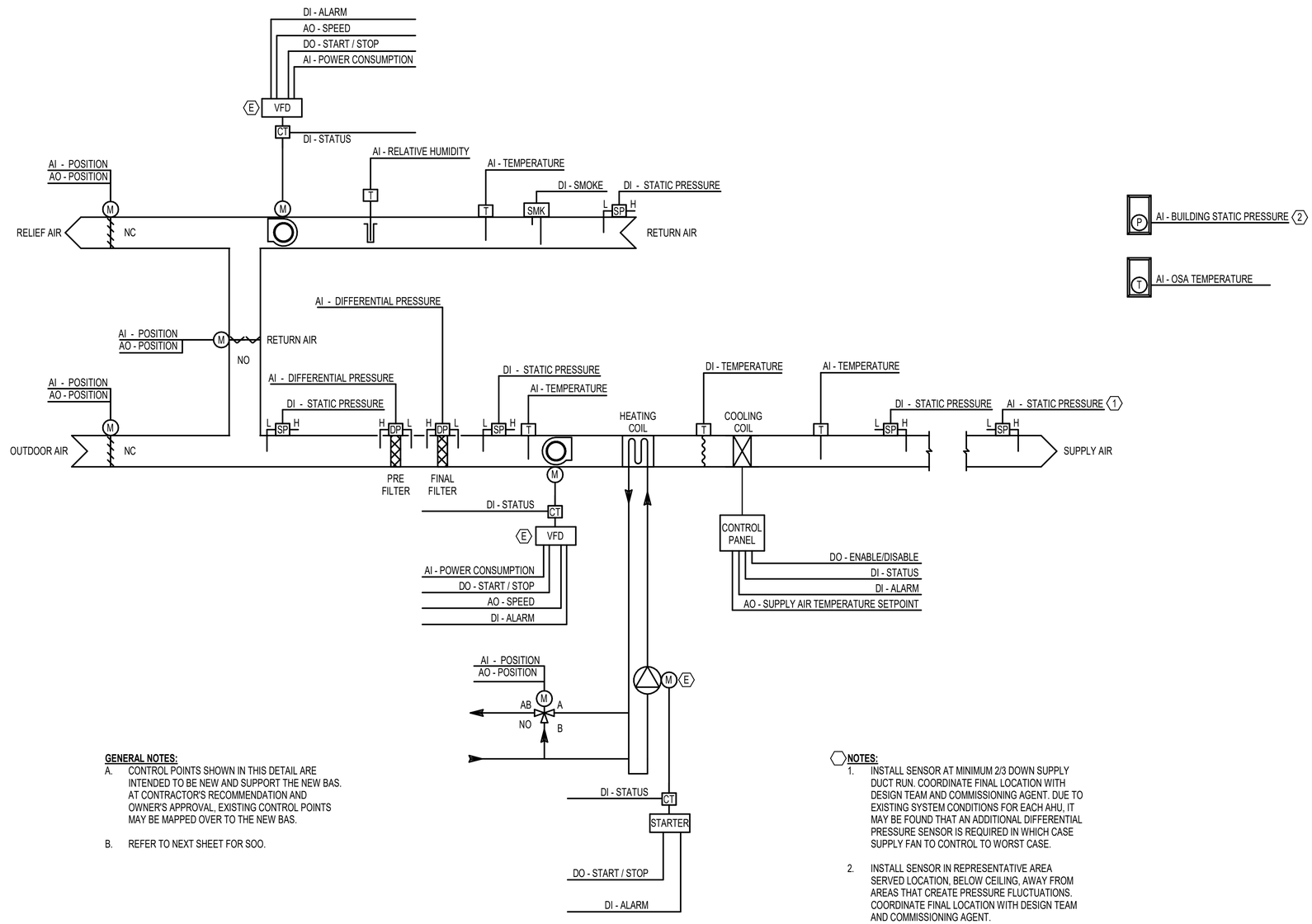
CONTROL DIAGRAMS - MECHANICAL

sheet: M-701

of:



GENERAL NOTES:

A. CONTROL POINTS SHOWN IN THIS DETAIL ARE INTENDED TO BE NEW AND SUPPORT THE NEW BAS. AT CONTRACTOR'S RECOMMENDATION AND OWNER'S APPROVAL, EXISTING CONTROL POINTS MAY BE MAPPED OVER TO THE NEW BAS.

B. REFER TO NEXT SHEET FOR SOO.

NOTES:

1. INSTALL SENSOR AT MINIMUM 2/3 DOWN SUPPLY DUCT RUN. COORDINATE FINAL LOCATION WITH DESIGN TEAM AND COMMISSIONING AGENT. DUE TO EXISTING SYSTEM CONDITIONS FOR EACH AHU, IT MAY BE FOUND THAT AN ADDITIONAL DIFFERENTIAL PRESSURE SENSOR IS REQUIRED IN WHICH CASE SUPPLY FAN TO CONTROL TO WORST CASE.

2. INSTALL SENSOR IN REPRESENTATIVE AREA SERVED LOCATION, BELOW CEILING, AWAY FROM AREAS THAT CREATE PRESSURE FLUCTUATIONS. COORDINATE FINAL LOCATION WITH DESIGN TEAM AND COMMISSIONING AGENT.

1 AHU-1, AHU-2 - VAV - MULTIPLE ZONE - DX
NONE

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CONTROL DIAGRAMS - MECHANICAL

sheet: M-702
of:

AIR HANDLING UNIT - VAV - MULTIPLE ZONE - DX (PART I)

- GENERAL
  - MULTIPLE ZONE AIR HANDLING UNIT OPERATES AT VARIABLE VOLUME
  - DX COOLING SYSTEM CONTROLLED BY AIR HANDLING UNIT MANUFACTURER PROVIDED CONTROLS

- SCHEDULE OF OPERATION
  - UNIT OPERATES 24 HOURS A DAY 7 DAYS A WEEK
  - UNIT OPERATES WHEN COMMANDED BY CONTROL SYSTEM
  - UNIT OPERATES VIA LOCAL OCCUPANCY SENSOR
- MIXING BOX DAMPER SETPOINTS
  - COORDINATE WITH TESTING, ADJUSTING AND BALANCING CONTRACTOR TO DETERMINE THE REQUIRED PLENUM STATIC PRESSURE TO MAINTAIN PROPER BUILDING PRESSURIZATION AND OUTDOOR AIRFLOW RATES UNDER THE FOLLOWING CONDITIONS:
    - AHU AIRFLOW (25%, 50%, 75%, 100%)
    - DAMPER POSITIONS (25%, 50%, 75%, 100%)
    - DIFFERENTIAL PRESSURE (OUTSIDE AIR PRESSURE - MIXED AIR PRESSURE)
  - PROGRAM DAMPER POSITION CURVES FOR EACH DAMPER BASED ON THESE EMPIRICALLY DETERMINED TESTS
    - OUTSIDE AIR DAMPER
    - RELIEF AIR DAMPER
    - RETURN AIR DAMPER
- OPTIMUM START
  - PROVIDE CONTROL ALGORITHM TO AUTOMATICALLY START THE SYSTEM TO ACHIEVE SPACE TEMPERATURE SETPOINT AT THE TIME OF OCCUPANCY AS A FUNCTION OF THE FOLLOWING VARIABLES (AS A MINIMUM):
    - DIFFERENCE BETWEEN SPACE TEMPERATURE AND OCCUPIED ZONE TEMPERATURE SETPOINT
    - OUTSIDE AIR TEMPERATURE
    - AMOUNT OF TIME PRIOR TO SCHEDULED OCCUPANCY
  - SUPPLY AIR TEMPERATURE SETPOINT MINIMUM = 55 DEGREES F
  - SUPPLY AIR TEMPERATURE SETPOINT MAXIMUM = 80 DEGREES F
  - SUPPLY FAN CONTROL
    - SAME AS IN OCCUPIED MODE
  - RETURN FAN CONTROL
    - MODULATE RETURN FAN SPEED TO MATCH SUPPLY FAN AIRFLOW RATE
  - WARM UP
    - AIR HANDLING UNIT OPERATES IN FULL RECIRCULATION MODE AND ADDS HEAT TO ACHIEVE ZONE TEMPERATURE HEATING SETPOINT
    - ZONE TEMPERATURE BELOW HEATING SETPOINT
      - MIXING BOX CONTROL
        - OUTSIDE AIR DAMPER CLOSED
        - RELIEF AIR DAMPER CLOSED
        - RETURN AIR DAMPER OPEN
      - SUPPLY FAN CONTROL
        - FAN STARTS AND RAMPS UP TO 50% STATIC PRESSURE SETPOINT
      - RETURN FAN CONTROL
        - FAN STARTS AND RAMPS UP TO 50% STATIC PRESSURE SETPOINT
      - HEATING
        - SUPPLY AIR TEMPERATURE SETPOINT RESET 1 DEGREE F PER MINUTE UNTIL MAXIMUM VALUE IS REACHED
          - HEATING COIL MODULATES TO MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT
        - WHEN ZONE TEMPERATURE MEETS HEATING SETPOINT FOR 5 MINUTES
          - ENTER OCCUPIED MODE
- COOL DOWN
  - AIR HANDLING UNIT OPERATES IN FULL ECONOMIZER MODE TO ACHIEVE ZONE TEMPERATURE COOLING SETPOINT
  - ZONE TEMPERATURES ABOVE COOLING SETPOINT AND OUTDOOR AIR TEMPERATURE IS 2 DEGREES F OR MORE BELOW ZONE TEMPERATURE
    - MIXING BOX CONTROL
      - OUTSIDE AIR DAMPER OPEN
      - RELIEF AIR DAMPER OPEN
      - RETURN AIR DAMPER MODULATES TO MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT
    - SUPPLY FAN CONTROL
      - FAN STARTS AND RAMPS UP TO 50% STATIC PRESSURE SETPOINT
    - RETURN FAN CONTROL
      - FAN STARTS AND RAMPS UP TO 50% STATIC PRESSURE SETPOINT
    - COOLING
      - DX COOLING SYSTEM DISABLED
      - SUPPLY AIR TEMPERATURE SETPOINT RESET 1 DEGREE F PER MINUTE UNTIL MINIMUM SETPOINT VALUE IS REACHED
        - WHEN ZONE TEMPERATURES MEET COOLING SETPOINT OR SUPPLY FAN SPEED REACHES 100% FOR 5 MINUTES
          - ENTER OCCUPIED MODE
  - ZONE TEMPERATURE ABOVE COOLING SETPOINT AND OUTDOOR AIR TEMPERATURE 2 DEGREES F BELOW ZONE TEMPERATURE OR WARMER
    - MIXING BOX CONTROL
      - OUTSIDE AIR DAMPER CLOSED
      - RELIEF AIR DAMPER CLOSED
      - RETURN AIR DAMPER OPEN
    - SUPPLY FAN CONTROL
      - FAN STARTS AND RAMPS UP TO 50% STATIC PRESSURE SETPOINT
    - COOLING
      - DX COOLING SYSTEM ENABLED
      - SUPPLY AIR TEMPERATURE SETPOINT RESET 1 DEGREE F PER MINUTE UNTIL MINIMUM SETPOINT VALUE IS REACHED
        - DX COOLING SYSTEM MODULATES AND STAGES COMPRESSORS TO MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT
        - WHEN ZONE TEMPERATURES MEET COOLING SETPOINT OR SUPPLY FAN SPEED REACHES 100% FOR 5 MINUTES
          - ENTER OCCUPIED MODE

AIR HANDLING UNIT - VAV - MULTIPLE ZONE - DX (PART II)

- OCCUPIED MODE
  - SUPPLY AIR TEMPERATURE SETPOINT MINIMUM = 55 DEGREES F
  - SUPPLY AIR TEMPERATURE SETPOINT MAXIMUM = 65 DEGREES F
  - AIR HANDLING UNIT BEGINS OPERATION AT MINIMUM OUTDOOR AIRFLOW AND MINIMUM FAN SPEED
  - MIXING BOX CONTROL
    - OUTSIDE AIR DAMPER MODULATES TO MINIMUM POSITION
    - RELIEF AIR DAMPER MODULATES TO MINIMUM POSITION
    - RETURN AIR DAMPER MODULATES TO MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT
    - OUTDOOR AIR TEMPERATURE CONTROL
      - AIR SIDE ECONOMIZER ENABLED: OUTDOOR AIR TEMPERATURE BELOW RETURN AIR TEMPERATURE
        - DDC SHALL MODULAT OUTSIDE AIR DAMPER, RELIEF, AND RETURN DAMPER TO MAINTAIN SUPPLY AIR TEMPERATURE
        - MODULATE THE OSA DAMPER AND THE RETURN AIR DAMPER TO MAINTAIN THE STATIC PRESSURE SETPOINT IN THE MIXING BOX
      - AIR SIDE ECONOMIZER DISABLED. OPERATE UNIT AT MINIMUM OUTSIDE AIR MODE. AIR SIDE ECONOMIZERS SHALL BE DISABLED IF ONE OF THE FOLLOWING IS PRESENT:
        - AIR HANDLING UNIT IS IN COOLING MODE AND THE OSA TEMPERATURE IS HIGHER THAN THE RETURN AIR TEMPERATURE
        - THE UNIT IS IN DEHUMIDIFICATION MODE.
        - OUTSIDE AIR DAMPER OPEN AT THE MINIMUM POSITION (VALIDATED DURING FINAL BALANCING)
        - RELIEF AIR DAMPER OPEN AT MINIMUM POSITION
        - RETURN AIR DAMPER INTERLOCKED WITH OSA DAMPER POSITION TO MAINTAIN THE STATIC PRESSURE SETPOINT IN THE MIXING BOX
  - OUTDOOR AIRFLOW CONTROL
    - AIR SIDE ECONOMIZER ENABLED: OUTDOOR AIR TEMPERATURE BELOW RETURN AIR TEMPERATURE
      - DDC SHALL MODULAT OUTSIDE AIR DAMPER, RELIEF, AND RETURN DAMPER TO MAINTAIN SUPPLY AIR TEMPERATURE
      - MODULATE THE OSA DAMPER AND THE RETURN AIR DAMPER TO MAINTAIN THE STATIC PRESSURE SETPOINT IN THE MIXING BOX
    - AIR SIDE ECONOMIZER DISABLED. OPERATE UNIT AT MINIMUM OUTSIDE AIR MODE. AIR SIDE ECONOMIZERS SHALL BE DISABLED IF ONE OF THE FOLLOWING IS PRESENT:
      - AIR HANDLING UNIT IS IN COOLING MODE AND THE OSA TEMPERATURE IS HIGHER THAN THE RETURN AIR TEMPERATURE
      - THE UNIT IS IN DEHUMIDIFICATION MODE.
      - OUTSIDE AIR DAMPER OPEN AT THE MINIMUM POSITION (VALIDATED DURING FINAL BALANCING)
      - RELIEF AIR DAMPER OPEN AT MINIMUM POSITION
      - RETURN AIR DAMPER INTERLOCKED WITH OSA DAMPER POSITION TO MAINTAIN THE STATIC PRESSURE SETPOINT IN THE MIXING BOX
  - ZONE CARBON DIOXIDE CONTROL
    - AIR SIDE ECONOMIZER ENABLED: OUTDOOR AIR TEMPERATURE BELOW RETURN AIR TEMPERATURE
      - DDC SHALL MODULATE OUTSIDE AIR DAMPER, RELIEF, AND RETURN DAMPER TO MAINTAIN SUPPLY AIR TEMP
      - MODULATE THE OSA DAMPER AND THE RETURN AIR DAMPER TO MAINTAIN THE STATIC PRESSURE SETPOINT IN THE MIXING BOX
    - AIR SIDE ECONOMIZER DISABLED: OUTDOOR AIR TEMPERATURE ABOVE RETURN AIR TEMPERATURE
      - OUTSIDE AIR DAMPER OPEN AT THE MINIMUM POSITION (VALIDATED DURING FINAL BALANCING)
      - RELIEF AIR DAMPER OPEN AT MINIMUM POSITION
      - RETURN AIR DAMPER INTERLOCKED WITH OSA DAMPER POSITION TO MAINTAIN THE STATIC PRESSURE SETPOINT IN THE MIXING BOX
      - IF A ZONE (TU) IS AT ITS MAXIMUM AIRFLOW AND THE ZONE LEVEL CO2 LEVELS CONTINUE TO RISE FOR MORE THAN 5 MINUTES, THE AHU SHALL MODULATE OSA DAMPER AND RETURN AIR DAMPER FROM LOW MINIMUM POSITION TO MINIMUM POSITION
- SUPPLY FAN CONTROL
  - ALL FANS STARTS AT MINIMUM SPEED (AND ALL FANS RUN AT SAME SPEED ALWAYS)
    - MAXIMUM SUPPLY FAN SPEED SETPOINT RATE OF CHANGE: 2% PER MINUTE
  - FAN SPEED RESET – DUCT STATIC PRESSURE TRIM AND RESPOND
    - SUPPLY FAN SPEED MODULATES TO MAINTAIN SUPPLY DUCT STATIC PRESSURE SETPOINT
    - SUPPLY DUCT STATIC PRESSURE STARTING SETPOINT = 1 INCHES W.G.
    - SUPPLY DUCT STATIC PRESSURE SETPOINT IS RESET TO LOWEST POSSIBLE VALUE USING TRIM AND RESPOND LOGIC TO MAINTAIN CRITICAL TERMINAL UNITS AT 90% OPEN
      - EVERY 2 MINUTES SUPPLY STATIC PRESSURE SETPOINT IS REDUCED BY 0.05 INCHES W.G.
        - WHEN TWO OR MORE TERMINAL UNIT DAMPERS ARE MORE THAN 90% OPEN THE SUPPLY STATIC PRESSURE SETPOINT INCREASES BY 0.07 INCHES W.G.
      - MAXIMUM SUPPLY DUCT STATIC PRESSURE SETPOINT = 2.5 INCHES W.G.
      - MINIMUM SUPPLY DUCT STATIC PRESSURE SETPOINT = 0.5 INCHES W.G.

AIR HANDLING UNIT - VAV - MULTIPLE ZONE - DX (PART III)

- RETURN FAN CONTROL
  - FAN OPERATES AT MINIMUM SPEED
    - MAXIMUM RETURN FAN SPEED SETPOINT RATE OF CHANGE: 2% PER MINUTE
  - FAN SPEED RESET – SUPPLY FAN SPEED TRACKING
    - RETURN FAN SPEED SETPOINT IS RESET BASED ON SUPPLY FAN SPEED TO MAINTAIN CONSISTENT BUILDING PRESSURIZATION LEVEL ACROSS THE FULL EXPECTED RANGE OF OPERATION
    - RETURN FAN SPEED IS OFFSET FROM SUPPLY FAN SPEED BASED ON INPUT FROM TAB CONTRACTOR SITE TESTING OF AIR HANDLER SYSTEM
      - RETURN FAN SPEED OFFSET CURVE TO BE ESTABLISHED BASED AS A MINIMUM UPON MAINTAINING PROPER BUILDING PRESSURIZATION AT SUPPLY FAN SPEEDS OF 30%, 50%, 75% AND 100%
- SUPPLY AIR TEMPERATURE CONTROL
  - SUPPLY AIR TEMPERATURE SETPOINT SET TO CURRENT SUPPLY AIR TEMPERATURE READING
    - MAXIMUM SUPPLY AIR TEMPERATURE SETPOINT RATE OF CHANGE: 1 DEGREE F PER MINUTE
  - SUPPLY AIR TEMPERATURE BELOW SETPOINT
    - HEATING COIL MODULATES TO MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT
    - DX COOLING SYSTEM DISABLED
  - SUPPLY AIR TEMPERATURE AT SETPOINT
    - HEATING COIL VALVE CLOSED
    - DX COOLING SYSTEM DISABLED
  - SUPPLY AIR TEMPERATURE ABOVE SETPOINT
    - FIRST STAGE OF COOLING UTILIZES AIR SIDE ECONOMIZER OPERATION OF THE MIXING BOX
    - SECOND STAGE OF COOLING OCCURS WHEN AIR SIDE ECONOMIZER CANNOT MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT OR WHEN AIR SIDE ECONOMIZER IS NOT AVAILABLE
    - AIR SIDE ECONOMIZER ENABLED
      - HEATING COIL VALVE CLOSED
      - DX COOLING SYSTEM DISABLED
      - SUPPLY AIR TEMPERATURE SETPOINT RESETS UNTIL ONE OF THE FOLLOWING OCCURS
        - SUPPLY AIR TEMPERATURE IS WITHIN 1 DEGREE F OF OUTSIDE AIR TEMPERATURE
        - MINIMUM SETPOINT VALUE IS REACHED
      - MIXING BOX DAMPERS MODULATE TO ACHIEVE SUPPLY AIR TEMPERATURE SETPOINT
    - AIR SIDE ECONOMIZER DISABLED
      - HEATING COIL VALVE CLOSED
      - DX COOLING SYSTEM MODULATES AND STAGES COMPRESSORS TO MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT
- RETURN AIR HUMIDITY CONTROL
  - HUMIDITY SETPOINTS ESTABLISHED ON DESIGN SCHEDULE
  - WHEN RH IN RETURN AIR EXCEEDS 60%RH SETPOINT, ENABLE THE FOLLOWING DEHUMIDIFICATION CYCLE:
    - DISABLE OSA ECONOMIZER
    - MODULATE OSA, RETURN AIR, AND RELIEF AIR DAMPERS TO OPERATE IN LOW MINIMUM OSA MODE
    - ENABLE DX COOLING COIL TO OPERATE AT MAXIMUM CAPACITY
    - MODULATE THE HEATING COIL HOT WATER CONTROL VALVE TO MAINTAIN A DISCHARGE AIR TEMPERATURE OF 55F OR AS REQUIRED TO SATISFY THE COOLING DISCHARGE AIR TEMPERATURE OF THE WARMEST ZONE IN THE BUILDING.
- UNOCCUPIED MODE
  - AIR HANDLING UNIT SHUT OFF UNLESS ZONE TEMPERATURES EXCEED SETBACK SETPOINTS
  - ZONE TEMPERATURE BETWEEN SETBACK HEATING SETPOINT AND SETBACK COOLING SETPOINT
    - AIR HANDLER OFF, ALL COMPONENTS IN NORMAL DE-ENERGIZED POSITIONS
  - ZONE TEMPERATURE BELOW SETBACK HEATING SETPOINT
    - AIR HANDLING UNIT OPERATES IN OPTIMUM START, WARM UP MODE UNTIL ZONE TEMPERATURE REACHES SETBACK HEATING SETPOINT
      - WHEN ZONE TEMPERATURE MEETS SETBACK HEATING SETPOINT FOR 5 MINUTES
        - AIR HANDLER TURNS OFF, ALL COMPONENTS IN NORMAL DE-ENERGIZED POSITIONS
  - ZONE TEMPERATURE ABOVE SETBACK COOLING SETPOINT
    - AIR HANDLING UNIT OPERATES IN OPTIMUM START, COOL DOWN MODE UNTIL ZONE TEMPERATURE REACHES SETBACK COOLING SETPOINT
      - WHEN ZONE TEMPERATURE MEETS SETBACK COOLING SETPOINT FOR 5 MINUTES
        - AIR HANDLER TURNS OFF, ALL COMPONENTS IN NORMAL DE-ENERGIZED POSITIONS
- ALARMS/SAFETIES
  - HIGH LEAVING AIR TEMPERATURE ALARM: LEAVING AIR TEMPERATURE IS MORE THAN 10 DEGREES F ABOVE SETPOINT FOR 5 MINUTES
  - LOW LEAVING AIR TEMPERATURE ALARM: LEAVING AIR TEMPERATURE IS MORE THAN 10 DEGREES F BELOW SETPOINT FOR 5 MINUTES
  - FIRE ALARM SHUTDOWN SAFETY: UPON RECEIVING FIRE ALARM SIGNAL FROM FIRE ALARM SYSTEM TURN AIR HANDLER OFF, ALL COMPONENTS IN NORMAL DE-ENERGIZED POSITIONS
  - SMOKE DETECTION ALARM: UPON DETECTION OF SMOKE BY SMOKE DETECTOR LOCATED IN THE AIR HANDLER OR ASSOCIATED DUCTWORK, TURN AIR HANDLER OFF, ALL COMPONENTS IN NORMAL DE-ENERGIZED POSITIONS
  - FREEZE PROTECTION ALARM: LOW LIMIT THERMOSTAT LOCATED BETWEEN HEATING AND COOLING COILS SENSES A TEMPERATURE BELOW 40 DEGREES F, TURN AIR HANDLER OFF, ALL COMPONENTS IN NORMAL DE-ENERGIZED POSITIONS
  - PRE-FILTER CHANGE ALARM: WHEN DIFFERENTIAL PRESSURE MEASURED ACROSS FILTER BANK INDICATES THE STATIC PRESSURE DROP EXCEEDS 1.0 INCHES W.G.
  - FINAL-FILTER CHANGE ALARM: WHEN DIFFERENTIAL PRESSURE MEASURED ACROSS FILTER BANK INDICATES THE STATIC PRESSURE DROP EXCEEDS 1.5 INCHES W.G.
  - SUPPLY DUCT STATIC PRESSURE HIGH LIMIT ALARM: IN THE EVENT THE STATIC PRESSURE EXCEEDS 3.5 INCHES W.G.
  - SUPPLY FAN DISCHARGE PRESSURE HIGH LIMIT SAFETY: IN THE EVENT THE STATIC PRESSURE EXCEEDS 4 INCHES W.G. HARD WIRED MANUAL RESET PRESSURE SWITCH SHUTS DOWN FAN
  - RETURN FAN INLET PRESSURE LOW LIMIT SAFETY: IN THE EVENT THE STATIC PRESSURE EXCEEDS -2.5 INCHES W.G. HARD WIRED MANUAL RESET PRESSURE SWITCH SHUTS DOWN FAN
  - VARIABLE FREQUENCY DRIVE (VFD) ALARMS: PROVIDE INDIVIDUAL SIGNALS TO THE DDC CONTROLLER INDICATING ALARM CONDITION AND ALARM TYPE. IN THE EVENT OF VFD SHUTDOWN, TURN AIR HANDLER OFF, ALL COMPONENTS IN NORMAL DE-ENERGIZED POSITIONS
  - DX COOLING SYSTEM FAILURE ALARM: FAILURE SIGNAL FROM CONTROLLER
- POINTS FOR MONITORING
  - VARIABLE FREQUENCY DRIVE SPEED
  - VARIABLE FREQUENCY DRIVE CURRENT
  - VARIABLE FREQUENCY DRIVE ENERGY USE
- NOTES
  - SETPOINTS AND VARIABLES ARE TO BE INDIVIDUALLY ADJUSTABLE THROUGH CONTROL SYSTEM GRAPHICAL USER INTERFACE

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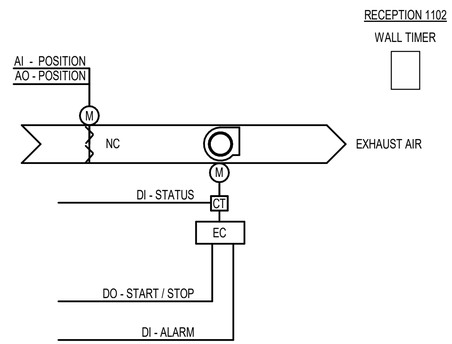
CONTROL DIAGRAMS - MECHANICAL

sheet: M-703

of:

EXHAUST FAN - LOBBY RESTROOMS

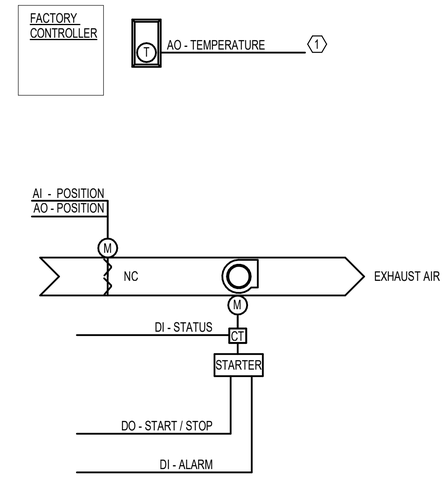
- GENERAL
  - FAN OPERATES AT CONSTANT SPEED
  - FAN RAMPS UP TO HIGH SPEED WHEN COMMANDED BY TIMER SWITCH.
- SCHEDULE OF OPERATION
  - FAN ENABLED WHEN COMMANDED BY CONTROL SYSTEM
- OCCUPIED MODE
  - OPEN DAMPER
  - UPON PROOF OF DAMPER OPEN POSITION, START FAN
  - FAN RAMP UP TO HIGH SPEED WHEN COMMANDED BY TIMER SWITCH.
  - FAN OPERATES CONTINUOUSLY
- UNOCCUPIED MODE
  - FAN OFF
  - AFTER TIME DELAY, DAMPER CLOSED
- ALARMS/SAFETIES
  - FAN STATUS
- POINTS FOR MONITORING
  - NONE
- NOTES
  - SETPOINTS AND VARIABLES ARE TO BE INDIVIDUALLY ADJUSTABLE THROUGH CONTROL SYSTEM GRAPHICAL USER INTERFACE



3 EF-202 - LOBBY RESTROOM EXHAUST
NONE

EXHAUST FAN AND SPLIT SYSTEM - ELEC ROOMS

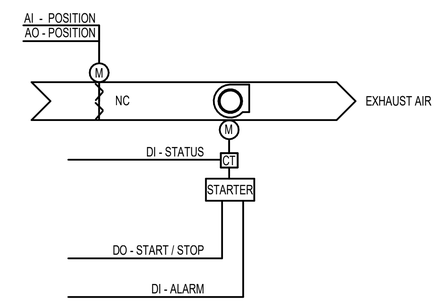
- GENERAL
  - FAN OPERATES AT CONSTANT SPEED
- SCHEDULE OF OPERATION
  - FAN OPERATES 24/7 EXCEPT WHEN SPLIT SYSTEM IS OPERATING
- UNOCCUPIED / OCCUPIED MODE
  - -ZONE TEMPERATURE CONTROL
    - OPEN EXHAUST DAMPER
    - UPON PROOF OF DAMPER OPEN POSITION, START FAN
    - WHEN TEMPERATURE REACHES 76F
      - FAN OFF
      - SPLIT SYSTEM ON
    - WHEN TEMPERATURE REACHES 72F
      - SPLIT SYSTEM OFF
      - FAN ON
- ALARMS/SAFETIES
  - FAN STATUS
- POINTS FOR MONITORING
  - NONE
- NOTES
  - SETPOINTS AND VARIABLES ARE TO BE INDIVIDUALLY ADJUSTABLE THROUGH CONTROL SYSTEM GRAPHICAL USER INTERFACE



1 AC-101, 102, EF-206 / AC-10, EF-205 CONTROL DIAGRAM
NONE

EXHAUST FAN - GENERAL

- GENERAL
  - FAN OPERATES AT CONSTANT SPEED
- SCHEDULE OF OPERATION
  - FAN ENABLED WHEN COMMANDED BY CONTROL SYSTEM
- OCCUPIED MODE
  - OPEN DAMPER
  - UPON PROOF OF DAMPER OPEN POSITION, START FAN
  - FAN OPERATES CONTINUOUSLY
- UNOCCUPIED MODE
  - FAN OFF
  - AFTER TIME DELAY, DAMPER CLOSED
- ALARMS\SAFETIES
  - FAN STATUS
- POINTS FOR MONITORING
  - NONE
- NOTES
  - SETPOINTS AND VARIABLES ARE TO BE INDIVIDUALLY ADJUSTABLE THROUGH CONTROL SYSTEM GRAPHICAL USER INTERFACE



2 EF-201, 203, 204, 207 - GENERAL EXHAUST
NONE

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CONTROL DIAGRAMS - MECHANICAL

sheet: M-704
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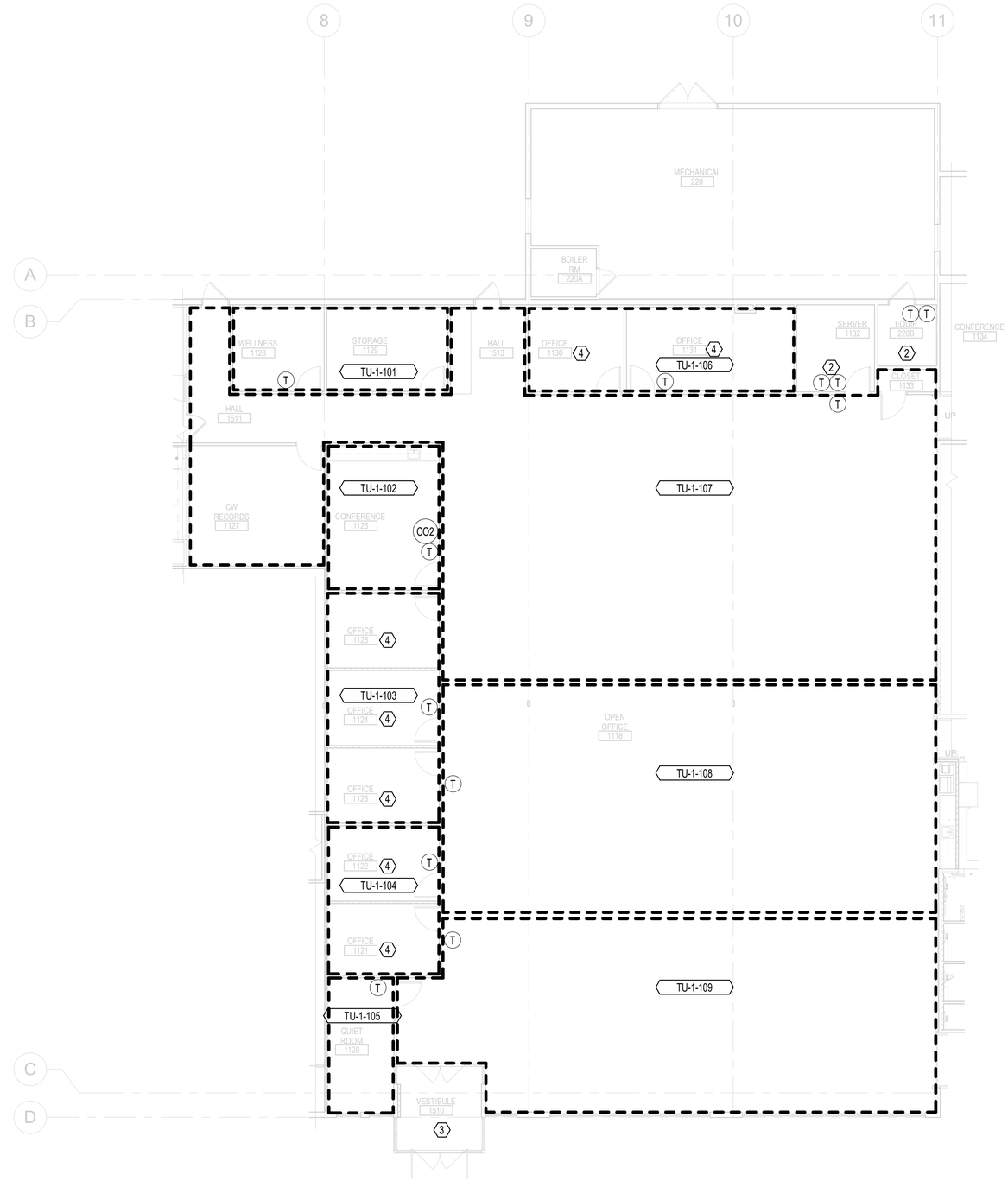
NOTES:

1. SPACE IS EXHAUSTED ONLY. CONDITIONING PROVIDED VIA TRANSFER AIR UNDER DOOR FROM ADJACENT ZONE.
2. SPACE PROVIDED WITH COOLING ONLY VIA WALL MOUNTED SPLIT SYSTEM. SPLIT SYSTEM PROVIDED WITH HARDWIRED FACTORY THERMOSTAT. PROVIDE SECOND THERMOSTAT TO REPORT TO DDC.
3. VESTIBULE PROVIDED WITH ELECTRIC UNIT HEATER.
4. OCCUPANCY SENSOR INTEGRATED INTO LIGHT. LIGHTING SYSTEM IN ROOM TO SIGNAL BAS WHEN SPACE IS UNOCCUPIED.



FLOOR PLAN - AREA A - MECHANICAL ZONES
1/8" = 1'-0"

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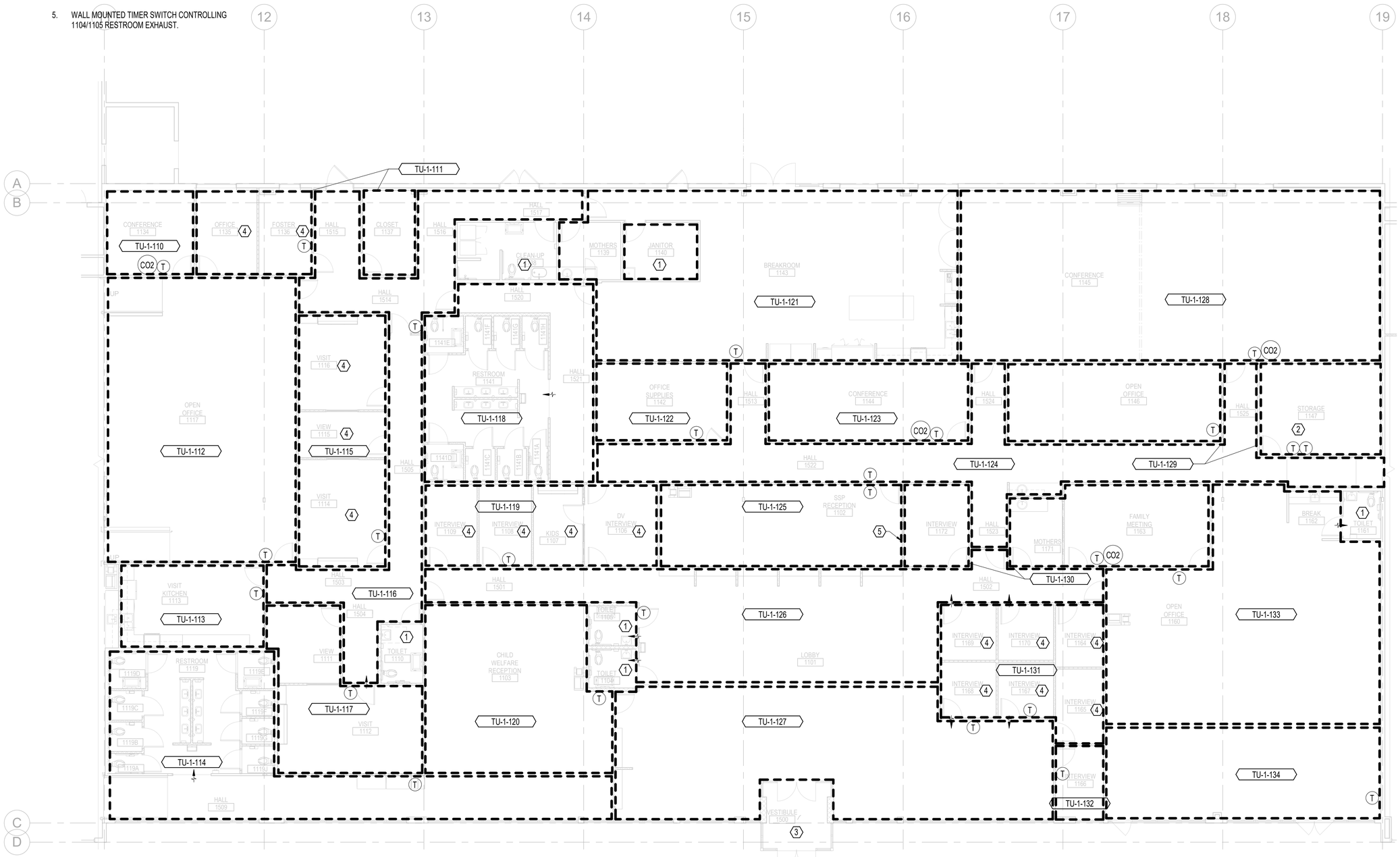
FLOOR PLAN - AREA A - MECHANICAL ZONES

sheet: M-901
of:

NOTES:

1. SPACE IS EXHAUSTED ONLY. CONDITIONING PROVIDED VIA TRANSFER AIR UNDER DOOR FROM ADJACENT ZONE.
2. SPACE PROVIDED WITH COOLING ONLY VIA WALL MOUNTED SPLIT SYSTEM. SPLIT SYSTEM PROVIDED WITH HARDWIRED FACTORY THERMOSTAT. PROVIDE SECOND THERMOSTAT TO REPORT TO DDC.
3. VESTIBULE PROVIDED WITH ELECTRIC UNIT HEATER.
4. OCCUPANCY SENSOR INTEGRATED INTO LIGHT. LIGHTING SYSTEM IN ROOM TO SIGNAL BAS WHEN SPACE IS UNOCCUPIED.
5. WALL MOUNTED TIMER SWITCH CONTROLLING 1104/1105 RESTROOM EXHAUST.



FLOOR PLAN - AREA B - MECHANICAL ZONES

1/8" = 1'-0"

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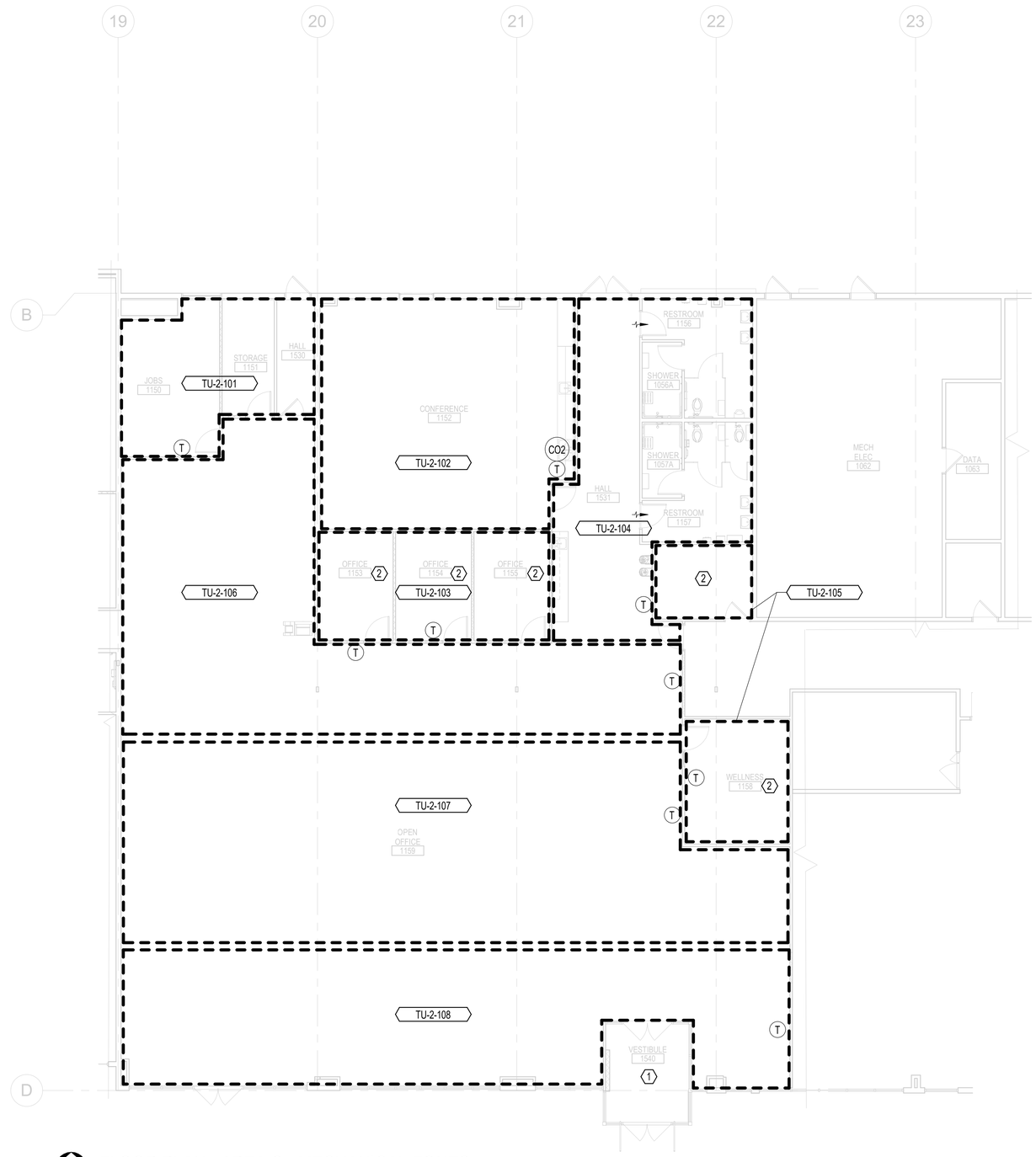
FLOOR PLAN - AREA B - MECHANICAL ZONES

sheet: M-902

of:

NOTES:

1. VESTIBULE PROVIDED WITH ELECTRIC UNIT HEATER.
2. OCCUPANCY SENSOR INTEGRATED INTO LIGHT. LIGHTING SYSTEM IN ROOM TO SIGNAL BAS WHEN SPACE IS UNOCCUPIED.



FLOOR PLAN - AREA C - MECHANICAL ZONES
1/8" = 1'-0"

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FLOOR PLAN - AREA C - MECHANICAL ZONES

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ABBREVIATIONS - ELECTRICAL

AFF	ABOVE FINISHED FLOOR	KVAR	KILOVOLT-AMPERE REACTIVE
ADA	AMERICANS DISABILITIES ACT	LA	LIGHTNING ARRESTOR
A	AMPERE (AMP)	LED	LIGHT EMITTING DIODE
AL	ALUMINUM	LRC	LIGHTING RELAY CONTROL PANEL
ARCH	ARCHITECT / ARCHITECTURAL	LTG	LIGHTING
ATS	AUTOMATIC TRANSFER SWITCH	LV	LOW VOLTAGE
AWG	AMERICAN WIRE GAUGE	MATV	MASTER ANTENNA TELEVISION
C	CONDUIT	MAX	MAXIMUM
CAT	CATEGORY CABLE	MCA	MINIMUM CIRCUIT AMPACITY
CB	CIRCUIT BREAKER	MCB	MAIN CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION	MCC	MOTOR CONTROL CENTER
CKT	CIRCUIT	MDP	MAIN DISTRIBUTION PANEL
CLG	CEILING	MECH	MECHANICAL
CT	CURRENT TRANSFORMER	MH	METAL HALIDE
CU	COPPER	MIN	MINIMUM
DDC	DIRECT DIGITAL CONTROL	MLO	MAIN LUGS ONLY
DN	DOWN	MOCP	MAXIMUM OVERCURRENT PROTECTION
DW	DISHWASHER	MTS	MANUAL TRANSFER SWITCH
EM	EMERGENCY	MV	MEDIUM VOLTAGE
EMT	ELECTRICAL METALLIC TUBING	MW	MICROWAVE
EP	EXPLOSION PROOF	NAC	NOTIFICATION APPLIANCE CIRCUIT
EPO	EMERGENCY POWER OFF	NIC	NOT IN CONTRACT
EWC	ELECTRIC WATER COOLER	NL	NIGHT LIGHT CIRCUIT
FA	FIRE ALARM	PA	PUBLIC ADDRESS
FACP	FIRE ALARM CONTROL PANEL	PDZ	PRIMARY DAYLIGHT ZONE
FLA	FULL LOAD AMPS	PE	PHOTOELECTRIC CELL
FLUOR	FLUORESCENT	PF	POWER FACTOR
FCIC	FURNISHED BY CONTRACTOR INSTALLED BY CONTRACTOR	PNL	PANELBOARD
		PVC	POLYVINYL CHLORIDE
FOIC	FURNISHED BY OWNER INSTALLED BY CONTRACTOR	PWR	POWER
		REF	REFRIGERATOR
FOIO	FURNISHED BY OWNER INSTALLED BY OWNER	SDP	SUB-DISTRIBUTION PANEL
		SDZ	SECONDARY DAYLIGHT ZONE
GD	GARBAGE DISPOSAL	STR	STARTER
GEN	GENERATOR	SV	SOLENOID VALVE
GFP	GROUND FAULT PROTECTION	SW	SWITCH
GFI	GROUND FAULT INDICATOR	TD	TIME DELAY
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	TP	TAMPERPROOF
GRC	GALVANIZED RIGID CONDUIT	TTB	TELEPHONE TERMINAL BOARD
GND	GROUND	TTC	TELEPHONE TERMINAL CABINET
HP	HORSEPOWER	TV	TELEVISION
HPS	HIGH PRESSURE SODIUM	TYP	TYPICAL
HV	HIGH VOLTAGE	UG	UNDERGROUND
HZ	HERTZ	UPS	UNINTERRUPTIBLE POWER SUPPLY
IG	ISOLATED GROUND	V	VOLTAGE
INC	INCANDESCENT	VA	VOLT-AMPERE
INV	INVERTER	VFD	VARIABLE FREQUENCY DRIVE
JB	JUNCTION BOX	VP	VAPORPROOF
KW	KILOWATT	W	WATTS
KWH	KILOWATT HOUR	WP	WEATHERPROOF
KV	KILOVOLT	XFMR	TRANSFORMER
KVA	KILOVOLT-AMPERE		

POWER - SINGLE LINE DIAGRAM & RISER

GFP — CIRCUIT BREAKER, WITH GROUND FAULT PROTECTION, DRAW OUT

DISTRIBUTION SWITCHBOARD / PANELBOARD, WITH INTERNAL BUS

UTILITY POLE

PANEL NAME MCB 225 — PANELBOARD
PANEL INCOMING DESIGNATOR: MLO UNLESS MARKED MCB
AMPACITY (AMPS)

T — TRANSFORMER

T T — SERVICE TRANSFORMER, WITH VAULT

G — GENERATOR, AUTOMATIC TRANSFER SWITCH

M — METER: UTILITY, BASIC, ADVANCED, POWER QUALITY

CT PT — TRANSDUCER: CURRENT, POTENTIAL (VOLTAGE), COMBINED

SPD — SURGE PROTECTIVE DEVICE, PUSH BUTTON

ELECTRICAL BUSWAY, BUSWAY PLUG-IN CIRCUIT BREAKER

X / XX.XX — XXXX — FEEDER CONTINUATION CALLOUT, FEEDER TAG

XX.XXX — CALCULATED AVAILABLE SHORT-CIRCUIT CURRENT

FEEDER: DROP, RISE, CAP, BREAK, CONTINUATION

SWITCH, FUSED SWITCH

F — DISCONNECT, FUSED DISCONNECT

MOTOR, MOTOR WITH CONTROLLER, MOTOR WITH STARTER

PV ARRAY, INVERTER

TELECOM/SECURITY

CR — CREDENTIAL READER

DA — DA W — CREDENTIAL READER; WALL

RB — DOOR RELEASE

OUTLET TYPE: DATA
PROVIDE TWO (1) CABLES PER OUTLET (UON)

WIFI ACCESS POINT CEILING MOUNT DUPLEX DATAPORT

POWER - PLANS

WALL RECEPTACLE: DUPLEX, QUADPLEX

SINGLE WALL RECEPTACLE, FACELESS GFCI REMOTE TEST BUTTON

G — DENOTES GFCI

W — DENOTES GFCI AND WEATHER PROOF

* — DENOTES RECEPTACLE ABOVE COUNTER

SPECIAL PURPOSE RECEPTACLE.

CEILING RECEPTACLE: DUPLEX, QUADPLEX

FBX — FLUSH FLOORBOX RECEPTACLE. "X" INDICATES TYPE PER SCHEDULE.
REFER TO SCHEDULE FOR QUANTITY AND TYPES OF DEVICES.

PTX — FLUSH POKE-THROUGH RECEPTACLE. "X" INDICATES TYPE PER SCHEDULE.
REFER TO SCHEDULE FOR QUANTITY AND TYPES OF DEVICES.

DENOTES SPLIT-WIRED, HALF SWITCHED / CONTROLLED VIA MANUAL CONTROL, MOTION CONTROL OR TIME-BASED CONTROL. SEE SPECIFICATIONS & PLANS.

DENOTES FULL SWITCHED / CONTROLLED VIA MANUAL CONTROL, MOTION CONTROL OR TIME-BASED CONTROL. SEE SPECIFICATIONS & PLANS.

FBX — SWITCHED / CONTROLLED FLUSH FLOORBOX RECEPTACLE
REFER TO SCHEDULE & PLANS FOR CONTROL INFORMATION.

PTX — SWITCHED / CONTROLLED FLUSH POKE-THROUGH RECEPTACLE
REFER TO SCHEDULE & PLANS FOR CONTROL INFORMATION.

FB X / PT X — LETTER DESIGNATOR:

E = EMERGENCY	IG = ISOLATED GROUND
U = UPS	P = SURGE PROTECTIVE DEVICE
S = STANDBY	A = AFCI
C = CRITICAL	B = WITH USB OUTLETS

2NP1:42. — DENOTES PANELBOARD AND CIRCUIT NUMBER.

42. — DENOTES CIRCUIT NUMBER.
REFER TO SHEET GENERAL NOTES FOR PANELBOARD.

PEDESTAL OUTLET: POWER & SIGNAL COMBINATION

SURFACE OUTLET STRIP: DIMENSION AS SHOWN. SEE SPECIFICATIONS.

1,3,5 — 1,3,5 — POWER POLE, POWER, COMBINATION
CIRCUITS AS INDICATED.

JUNCTION BOX

H 1,3,5 — JUNCTION BOX HOME RUN. CIRCUITS AS INDICATED.

F 1,3,5 — JUNCTION BOX HOME RUN & FURNITURE FEED. CIRCUITS AS INDICATED.

CONNECTION TO EQUIPMENT

PUSH BUTTON STATION: SINGLE, DOUBLE

ELECTRICAL EQUIPMENT

PANELBOARD: SURFACE, RECESSED

ENCLOSURE: SURFACE, RECESSED

T — TRANSFORMER

GROUND ROD, IN TEST WELL

GROUND PAD

DESIGNATION SYMBOLS

--- 123 — EQUIPMENT DESIGNATOR SEE SCHEDULE.

E X — EXISTING TO REMAIN, EXISTING TO BE REMOVED

R F — EXISTING TO BE RELOCATED, FUTURE

N — NEW, POINT OF CONNECTION

1 — NOTE

GENERAL NOTES:

A. THIS IS A STANDARD LEGEND SHEET, THEREFORE, SOME SYMBOLS MAY APPEAR ON THIS SHEET THAT DO NOT APPEAR ON THE DRAWINGS.

LIGHTING

EMERGENCY	NORMAL	
		DOWNLIGHT RECESSED: ROUND, SQUARE
		DOWNLIGHT RECESSED WALLWASH: ROUND, SQUARE
		DOWNLIGHT RECESSED ADJUSTABLE: ROUND, SQUARE
		DOWNLIGHT SURFACE: ROUND, SQUARE
		DOWNLIGHT SURFACE WALLWASH: ROUND, SQUARE
		DOWNLIGHT SURFACE ADJUSTABLE: ROUND, SQUARE
		PENDANT
		PENDANT WALLWASH
		LINEAR RECESSED
		LINEAR RECESSED WALLWASH
		LINEAR SURFACE
		LINEAR SURFACE WALLWASH
		LINEAR PENDANT
		LINEAR PENDANT WALLWASH
		LINEAR WALL MOUNTED
		LINEAR WALL MOUNTED ASYMMETRIC
		TAPE LIGHT (EM PER TAG)
		STEPLIGHT
		SCONCE
		FLOOD LIGHT
		INGRADE: ROUND, SQUARE
		INGRADE ADJUSTABLE: ROUND, SQUARE
		EMERGENCY LIGHT
		EXIT SIGN TOP MOUNT (ARROWS PER DRAWING)
		EXIT SIGN BACK MOUNT (ARROWS PER DRAWING)
		EXIT SIGN SIDE MOUNT (ARROWS PER DRAWING)
		BOLLARD: ROUND, SQUARE (ARROWS PER DRAWING)
		PEDESTRIAN POLE: ROUND, SQUARE
		POLE: ROUND, SQUARE
CSXX		CONTROL STATION. REFER TO LIGHTING CONTROL STATION SCHEDULE.
$	$2	WALL SWITCH: 1 POLE, 2 POLE
$3	$4	WALL SWITCH: 3 WAY, 4 WAY
$K	$M	WALL SWITCH: KEY LOCK, MOMENTARY
$LV	$P	WALL SWITCH: LOW VOLTAGE, PILOT
$T	$D	WALL SWITCH: TIMER, MANUAL DIMMER
$OS	$OSD	WALL COMBINATION OCCUPANCY SWITCH, OCCUPANCY DIMMER
$VS	$VSD	WALL COMBINATION VACANCY SWITCH, VACANCY DIMMER
PE	PE	PHOTOELECTRIC CELL: WALL MOUNTED, CEILING MOUNTED
OS X	OS X	OCCUPANCY SENSOR: WALL MOUNTED, CEILING MOUNTED
VS X	VS X	VACANCY SENSOR: WALL MOUNTED, CEILING MOUNTED
		"X" DESIGNATES DEVICE TYPE:
		DUAL TECHNOLOGY UNLESS OTHERWISE NOTED:
U	R	U: ULTRASONIC R: INFRARED
L#		DESIGNATES LUMINAIRE TYPE (SEE LUMINAIRE SCHEDULE)
EM		DESIGNATES EMERGENCY CIRCUIT
LS	CR	DESIGNATES LIFE SAFETY CIRCUIT, CRITICAL CIRCUIT
a,b,c,d,e...etc		DESIGNATES STANDALONE CONTROL ZONE.
42.	PNL:42.	DESIGNATES LIGHTING CIRCUIT, PANEL:CIRCUIT.
Z###		DESIGNATES NETWORK CONTROL ZONE. REFER TO LIGHTING MASTER CONTROL STATION SCHEDULE.
		REFER TO ZONE SCHEDULE FOR CIRCUITING OF NETWORKED LIGHTING.

ELECTRICAL SHEET LIST

SHEET #	SHEET NAME
E-001	SYMBOLS, LEGENDS, & ABBREVIATIONS - ELECTRICAL
E-002	ELECTRICAL SCHEDULES
E-101	DEMOLITION FLOOR PLAN - ELECTRICAL
E-101A	DEMOLITION FLOOR PLAN - AREA A - ELECTRICAL
E-101B	DEMOLITION FLOOR PLAN - AREA B - ELECTRICAL
E-101C	DEMOLITION FLOOR PLAN - AREA C - ELECTRICAL
E-102	OVERALL PLAN - LIGHTING - LIGHTING
E-102A	FLOOR PLAN - AREA A - LIGHTING
E-102B	FLOOR PLAN - AREA B - LIGHTING
E-102C	FLOOR PLAN - AREA C - LIGHTING
E-103	OVERALL PLAN - POWER
E-103A	FLOOR PLAN - AREA A - POWER
E-103B	FLOOR PLAN - AREA B - POWER
E-103C	FLOOR PLAN - AREA C - POWER
E-104	OVERALL PLAN - TECHNOLOGY
E-104A	FLOOR PLAN - AREA A - TECHNOLOGY
E-104B	FLOOR PLAN - AREA B - TECHNOLOGY
E-104C	FLOOR PLAN - AREA C - TECHNOLOGY
E-105	ROOF PLAN - POWER
E-401	ENLARGED PLANS - ELECTRICAL
E-701	DIAGRAMS - ELECTRICAL
E-801	PANEL SCHEDULES - ELECTRICAL
E-802	PANEL SCHEDULES - ELECTRICAL
Grand total: 23	

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revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: HLB
checked by: ELR

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SYMBOLS, LEGENDS, & ABBREVIATIONS - ELECTRICAL

sheet: E-001
of:

EQUIPMENT CONNECTION SCHEDULE

EQUIPMENT DESCRIPTIONS			ELECTRICAL CHARACTERISTICS							CONNECTION CHARACTERISTICS					FEEDER CHARACTERISTICS			PANEL INFO	NOTES
TAG	DESCRIPTION	LOCATION	KW	HP	FLA	MCA	MOCP	VOLTS	PHASE	VFD	1-POINT CONNECT	STARTER DIVISION	DISCONNECT DIVISION	GENERATOR BACKUP POWER REQUIRED	CONDUIT DIA (INCH)	PHASE CONDUCTORS	GROUND CONDUCTOR	PANEL NAME	
MECHANICAL (DEMO)																			
EF-1	EXHAUST FAN	JANITORS CLOSET 228		1 1/2						-	-	-	-	-	-	-	-		
CU-1	CONDENSING UNIT	MECH ROOM ROOF				246.40	350	208	3										
CU-2	CONDENSING UNIT	MECH ROOM ROOF				246.40	350	208	3										
CU-2	CONDENSING UNIT	BLDG EXTERIOR																	
MECHANICAL (NEW)																			
UH-101	UNIT HEATER	VESTIBULE 1510	4.00			19.20	30	208	1	-	Y	-	26	N	3/4"	(2) #10	(1) #10	2A1	
UH-102	UNIT HEATER	VESTIBULE 1500	4.00			19.20	30	208	1	-	Y	-	26	N	3/4"	(2) #10	(1) #10	2B	
UH-103	UNIT HEATER	VESTIBULE 1540	4.00			19.20	30	208	1	-	Y	-	26	N	3/4"	(2) #10	(1) #10	2C	
AC-101	WALL MOUNTED FAN COIL UNIT	1132 SERVER	POWERED BY OUTDOOR UNIT							-	-	-	26	N	-	-	-		1
ACCU-201	CONDENSING UNIT	ROOF				9.15	15	208	1	-	Y	23	26	N	3/4"	(3) #12	(1) #102	2A1	
AC-102	WALL MOUNTED FAN COIL UNIT	220B EQUIP	POWERED BY OUTDOOR UNIT							-	-	-	26	N	-	-	-		1
ACCU-202	CONDENSING UNIT	ROOF				9.15	15	208	1	-	Y	23	26	N	3/4"	(3) #12	(1) #12	2A1	
AC-103	WALL MOUNTED FAN COIL UNIT	1147 STORAGE	POWERED BY OUTDOOR UNIT							-	-	-	26	N	-	-	-		1
ACCU-203	CONDENSING UNIT	ROOF				9.15	15	208	1	-	Y	23	26	N	3/4"	(3) #12	(1) #12	2C	
EF-201	EXHAUST FAN	ROOF		1/4		2.60	15	208	1	N	Y	23	26	N	3/4"	(2) #12	(1) #12	2A1	
EF-202	EXHAUST FAN	ROOF		1/4		2.60	15	208	1	N	Y	23	26	N	3/4"	(2) #12	(1) #12	2B1	
EF-203	EXHAUST FAN	ROOF		1		10.00	15	208	1	N	Y	23	26	N	3/4"	(2) #12	(1) #12	2B1	
EF-204	EXHAUST FAN	ROOF		2		6.50	15	208	3	N	Y	23	26	N	3/4"	(3) #12	(1) #12	2B2	
EF-205	EXHAUST FAN	ROOF		1/4		2.60	15	208	1	N	Y	23	26	N	3/4"	(2) #12	(1) #12	2C	
EF-206	EXHAUST FAN	ROOF		1/4		2.60	15	208	1	N	Y	23	26	N	3/4"	(2) #12	(1) #12	2A1	
EF-207	EXHAUST FAN	ROOF		1/4		2.60	15	208	1	N	Y	23	26	N	3/4"	(2) #12	(1) #12	2C	
CU-1A	CONDENSING UNIT	MECH ROOM ROOF				205.20	250	208	3	N	Y	23	26	N	SEE ONELINE			MSP	
CU-1B	CONDENSING UNIT	MECH ROOM ROOF				205.20	250	208	3	N	Y	23	26	N	SEE ONELINE			MSP	
CU-2	CONDENSING UNIT	MECH ROOM ROOF				168.10	225	208	3	N	Y	23	26	N	SEE ONELINE			MSP	
PLUMBING (NEW)																			
BF-1	BOTTLE FILLER	VARIES			5.00			120	1	N	Y	-	-	N	3/4"	(2) #12	(1) #12	SEE PLANS	
IH-1	INSTA-HOT	BREAKROOM 1143	0.75					120	1	N	Y	-	-	N	3/4"	(2) #12	(1) #12	2B1	

GENERAL NOTES: (SOME MAY NOT BE USED ON THIS SHEET)

A. REFER TO ONE-LINE DIAGRAM OR PANEL SCHEDULES FOR OVERCURRENT PROTECTION CHARACTERISTICS AND CIRCUIT NUMBERS.

B. COORDINATE ALL EQUIPMENT CONNECTION REQUIREMENTS WITH INSTALLING CONTRACTOR PRIOR TO THE INSTALLATION OF ANY ELECTRICAL WORK.

C. VFD'S ARE FURNISHED BY DIVISION 23. INSTALL VFD AND PROVIDE PROVIDE LINE AND LOAD SIDE FEEDERS IN ELECTRICAL WORK.

D. COMBINATION STARTER/DISCONNECTS AND DISCONNECT SWITCHES SHALL BE LOCATED WITHIN SIGHT OF AND ADJACENT TO EQUIPMENT SERVED. COORDINATE DISCONNECT INSTALLATION AND LOCATION WITH EQUIPMENT INSTALLER.

E. NOT ALL EQUIPMENT IDENTIFIED HERE IS SHOWN ON FLOOR PLANS. REFER TO DRAWINGS IN OTHER DISCIPLINES FOR EQUIPMENT LOCATIONS.

NOTES:

1. REFER TO MECHANICAL PLANS FOR EQUIPMENT LOCATION.

LUMINAIRE SCHEDULE

TYPE	PRODUCT DESCRIPTION	PRODUCT	SIZE	INPUT WATTS	LIGHT SOURCE	POWER SUPPLY / DIMMING	VOLTAGE	MOUNTING	NOTES
L1A	RECESSED TROFFER WITH INTEGRAL LUTRON VIVE CONTROLS	HE WILLIAMS LT	24" x 24"	33 W	LED,3500K, 3900 LM	INTEGRAL 0-10V	120 V	RECESSED	
L1B	RECESSED TROFFER WITH INTEGRAL LUTRON VIVE CONTROLS	HE WILLIAMS LT	24" x 24"	38 W	LED,3500K, 4900 LM	INTEGRAL 0-10V	120 V	RECESSED	
L2A	SIMULATED SKYLIGHT	LIGHTGLASS	72" x 48"	103 W	LED, 12835 LM	INTEGRAL 0-10V	120 V	RECESSED	TUNEABLE WHITE, INTEGRAL 2-CHANNEL DRIVER
L2B	SIMULATED SKYLIGHT	LIGHTGLASS	48" x 24"	37 W	LED, 3628 LM	INTEGRAL 0-10V	120 V	RECESSED	TUNEABLE WHITE, INTEGRAL 2-CHANNEL DRIVER
L3	ROUND DOWNLIGHT W/ INTEGRAL LUTRON VIVE CONTROLS	HE WILLIAMS	6" ROUND	14 W	LED,3500K, 1500 LM	INTEGRAL 0-10V	120 V	RECESSED	
L4	RECESSED LINEAR	FOCAL POINT SEEM 1	PER ARCHITECTURAL RCP	15 W/LF	LED,3500K, 350 LM/LF	INTEGRAL 0-10V	120 V	RECESSED	
X1	SURFACE MOUNT EXIT SIGN	HE WILLIAMS LED EXIT SIGN	11.63"W x 1.19"H	3 W	LED LM	INTEGRAL	120 V	RECESSED/SURFACE	RED W/ WHITE HOUSING CONNECT EXIT SIGNS THROUGH UNSWITCHED LEG OF INVERTER

LIGHTING CONTROLS MATRIX

	CONTROL INTENT				
ROOM TYPE	TIMECLOCK 1	OCCUPANCY SENSOR	MANUAL CONTROL	DIMMING	NETWORKED
CONFERENCE		X	X	X	X
CIRCULATION	X	X 2		X	X
OPEN OFFICE	X	X 2	X	X	X
PRIVATE OFFICE		X	X	X	
MULTI USER RESTROOMS		X			X
SINGLE USER RESTROOMS		X	X	X	X
MOTHER'S ROOM		X	X	X	
BREAKROOM		X	X	X	X
TELECOM AND AV ROOMS			X		
MECH/ELEC			X		
STORAGE		X	X		

NOTES WITH RESPECT TO MODEL ENERGY CODES:

1. TYPICAL WORKING HOURS ARE ASSUMED TO BE 7AM-7PM. CONFIRM HOURS WITH DEPARTMENT MANAGERS PRIOR TO PROGRAMMING.
2. CIRCULATION, OPEN OFFICE, AND ALL EGRESS LIGHTS TO BE CONTROLLED BY OCCUPANCY SENSOR AFTER NORMAL HOURS OF OPERATION.

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4/25/2025
EXPIRES: 12/31/2026

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consultants: PAE pae-engineers.com

revisions:

Description Date

date: 04/25/25
project: 00524
drawn by: HLB
checked by: ELR

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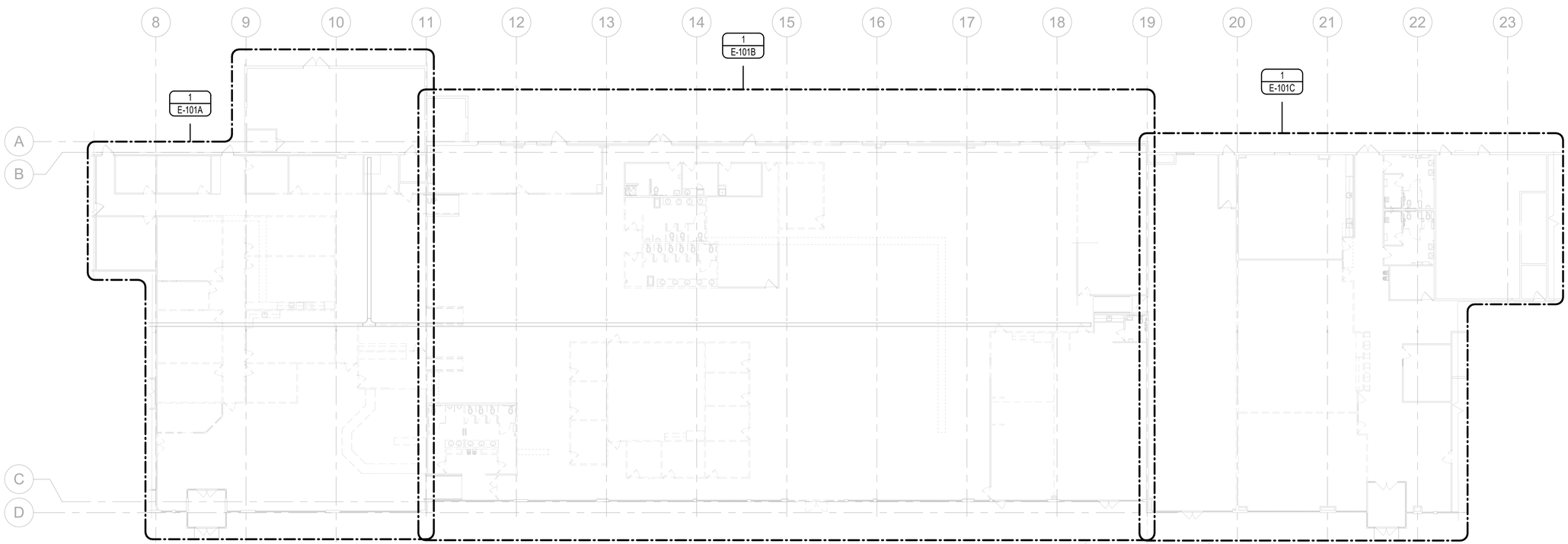
ELECTRICAL SCHEDULES

sheet: E-002

of:

GENERAL NOTES:

A. SHEET SHOWN FOR REFERENCE ONLY.



DEMOLITION FLOOR PLAN - ELECTRICAL

1/16" = 1'-0"

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DEMOLITION FLOOR PLAN - ELECTRICAL

sheet: E-101

of:

GENERAL NOTES:

A. A. IT IS THE INTENT OF THESE DOCUMENTS TO PROVIDE FOR ALL NECESSARY ADJUSTMENTS OF THE ELECTRICAL AND LOW VOLTAGE SYSTEMS TO MEET CODE AND TO ACCOMODATE THE INSTALLATION OF NEW WORK. VERIFY EXISTING CONDITIONS, PRIOR TO PROCEEDING WITH WORK, NOTIFY ARCHITECT ABOUT ANY DISCREPANCIES BETWEEN THE DESIGN DOCUMENTS AND FIELDCONDITIONS.

B. LOCATION OF DEVICES AND EQUIPMENT SHOWN ARE BASED ONR OUGH APPROXIMATIONS. THE PLANS DO NOT SHOW ALL OF THE DEMOLITION OR CONSTRUCTION CONDITIONS.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. PROVIDE NEW RACEWAY,CONDUCTORS, SUPPORTS, BRACING, ETC. AS REQUIRED TO MAINTAIN SERVICES. DO NOT DISTURB UTILITIES SERVING EQUIPMENT IN OTHER AREAS. CONTRACTOR TO ASSUME BRANCH CIRCUITS WILL NEED TO BE TRACED TO NOT DISTURB OTHER AREAS DURING CONSTRUCTION.

D. ALL MATERIAL INCLUDING EQUIPMENT, CONDUCTORS, CONTROLS,AND SIGNALING DEVICES SHALL BE LISTED FOR THEIR INTENDED USE.

E. REFER TO MECHANICAL/PLUMBING DRAWINGS FOR MECHANICAL AND PLUMBING EQUIPMENT FOR ADDITIONAL ELECTRICAL CONNECTIONS/REQUIREMENTS.

NOTES:

1. APPROXIMATE AREA OF LIGHTING DEMOLITION WORK: UNLESS SPECIFICALLY NOTED OTHERWISE DEMOLITION SCOPE IN THIS AREA INCLUDES DEMOLITION OF ALL LIGHTING AND LIGHTING CONTROL DEVICES. ALL ACCESSORIES AND COMPONENTS BACK TO ITS SOURCE.

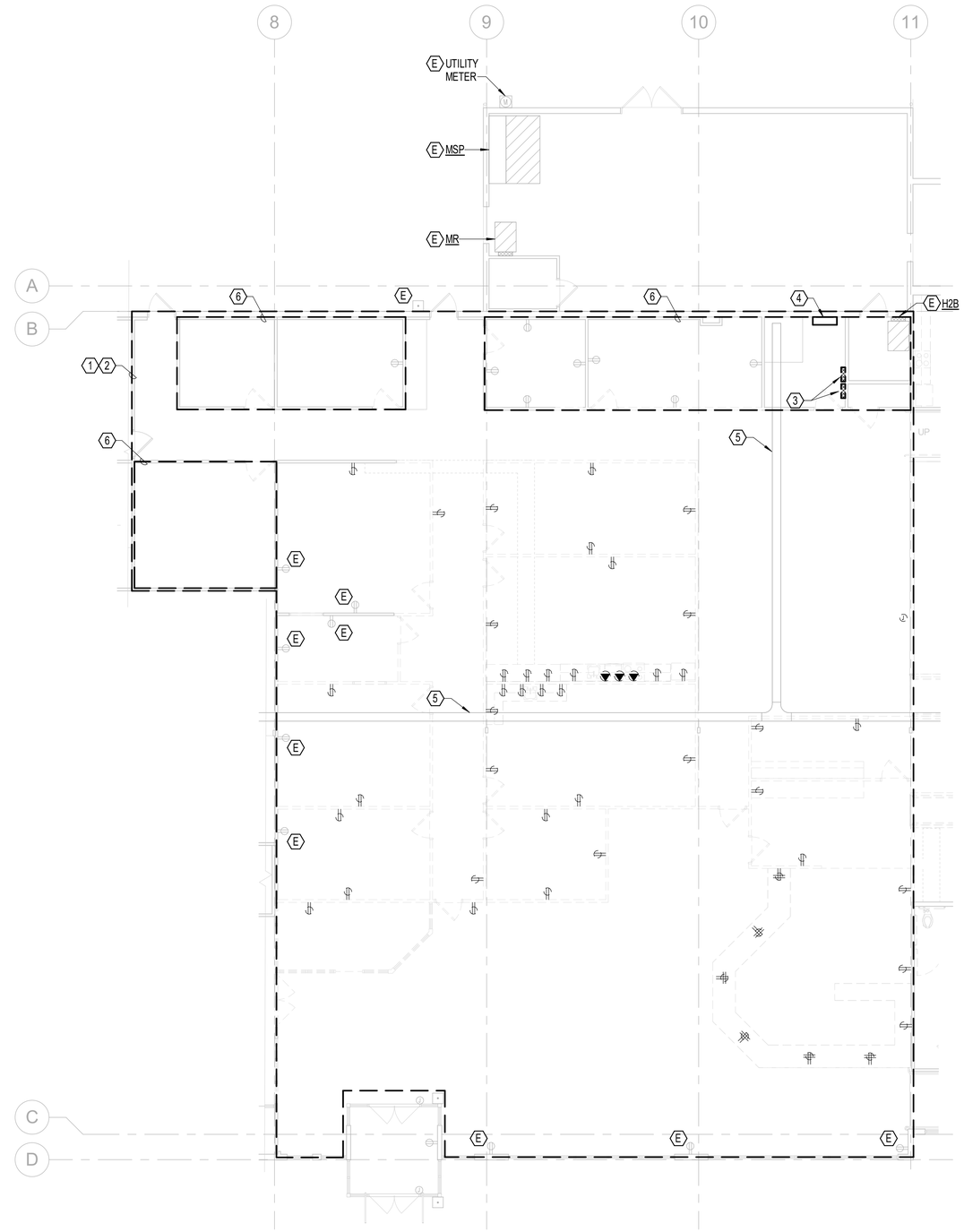
2. APPROXIMATE AREA OF POWER WORK: UNLESS SPECIFICALLY NOTED OTHERWISE. DEMOLITION SCOPE IN THIS AREA INCLUDES DEMOLITION OF ALL ELECTRICAL AND LOW VOLTAGE DEVICES UNLESS NOTED OTHWERWISE.

3. DEMOLISH EXISTING PANELBOARD, EXTEND ALL EXISTING CIRCUITS REMAINING TO NEW FLUSH MOUNTED PANELBOARDS OUTSIDE OF THE SERVER ROOM.

4. RELOCATE CHEMEKETA IT RACK. EXTEND CABLING AS REQUIRED.

5. LOW VOLTAGE CABLE TRAY IS EXISTING TO REMAIN. PROTECT IN PLACE.

6. EXISTING POWER TO REMAIN.



DEMOLITION FLOOR PLAN - AREA A - ELECTRICAL
1/8" = 1'-0"

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checked by: ELR

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DEMOLITION FLOOR PLAN - AREA A - ELECTRICAL

sheet: E-101A
of:

GENERAL NOTES:

A. IT IS THE INTENT OF THESE DOCUMENTS TO PROVIDE FOR ALL NECESSARY ADJUSTMENTS OF THE ELECTRICAL AND LOW VOLTAGE SYSTEMS TO MEET CODE AND TO ACCOMODATE THE INSTALLATION OF NEW WORK. VERIFY EXISTING CONDITIONS, PRIOR TO PROCEEDING WITH WORK, NOTIFY ARCHITECT ABOUT ANY DISCREPANCIES BETWEEN THE DESIGN DOCUMENTS AND FIELDCONDITIONS.

B. LOCATION OF DEVICES AND EQUIPMENT SHOWN ARE BASED ONR OUGH APPROXIMATIONS. THE PLANS DO NOT SHOW ALL OF THE DEMOLITION OR CONSTRUCTION CONDITIONS.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. PROVIDE NEW RACEWAY,CONDUCTORS, SUPPORTS, BRACING, ETC. AS REQUIRED TO MAINTAIN SERVICES. DO NOT DISTURB UTILITIES SERVING EQUIPMENT IN OTHER AREAS. CONTRACTOR TO ASSUME BRANCH CIRCUITS WILL NEED TO BE TRACED TO NOT DISTURB OTHER AREAS DURING CONSTRUCTION.

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NOTES:

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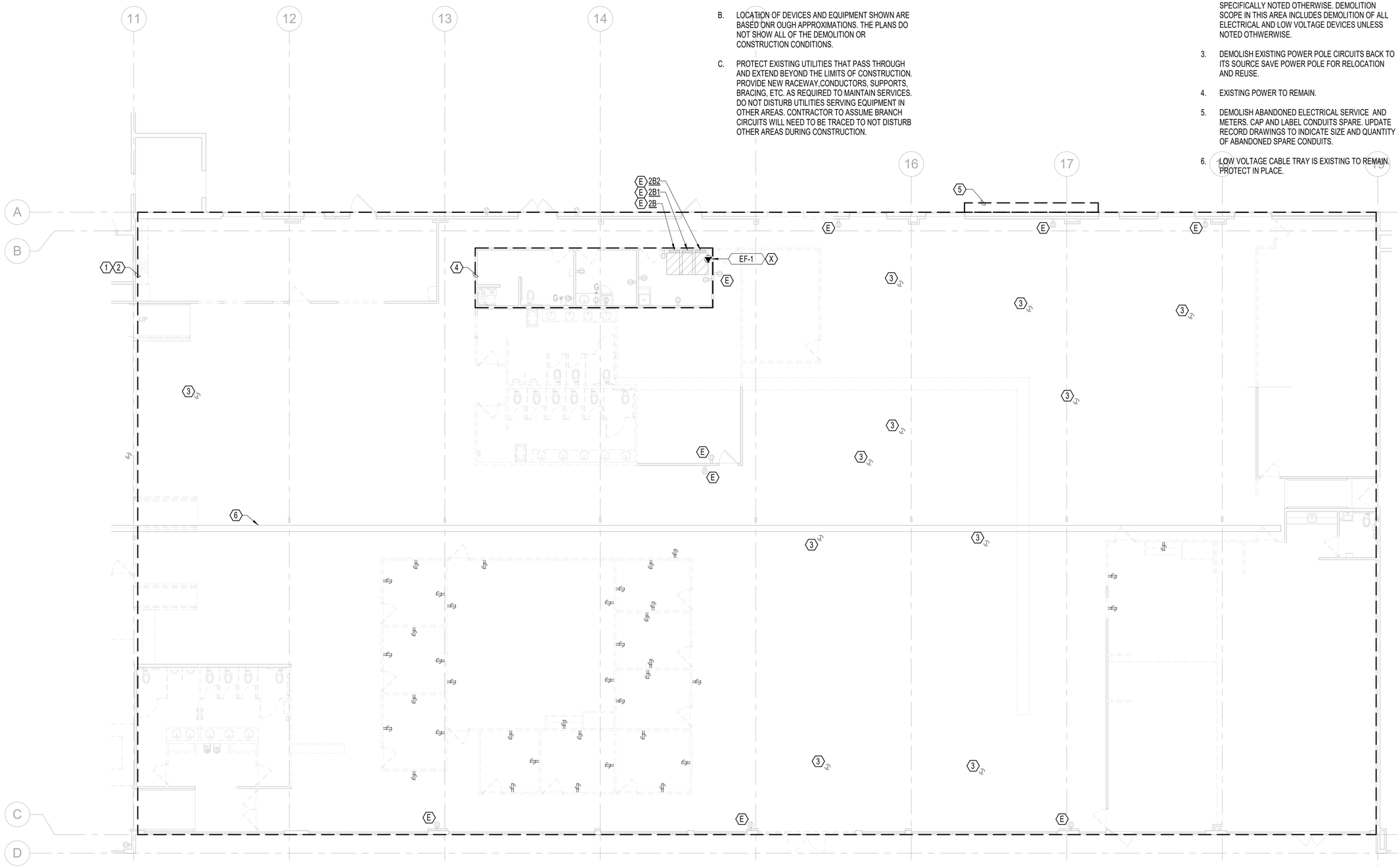
2. APPROXIMATE AREA OF POWER WORK: UNLESS SPECIFICALLY NOTED OTHERWISE. DEMOLITION SCOPE IN THIS AREA INCLUDES DEMOLITION OF ALL ELECTRICAL AND LOW VOLTAGE DEVICES UNLESS NOTED OTHWERWISE.
3. DEMOLISH EXISTING POWER POLE CIRCUITS BACK TO ITS SOURCE SAVE POWER POLE FOR RELOCATION AND REUSE.
4. EXISTING POWER TO REMAIN.
5. DEMOLISH ABANDONED ELECTRICAL SERVICE AND METERS. CAP AND LABEL CONDUITS SPARE. UPDATE RECORD DRAWINGS TO INDICATE SIZE AND QUANTITY OF ABANDONED SPARE CONDUITS.
6. LOW VOLTAGE CABLE TRAY IS EXISTING TO REMAIN. PROTECT IN PLACE.



DEMOLITION FLOOR PLAN - AREA B - ELECTRICAL
1/8" = 1'-0"

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4/25/2025
EXPIRES: 12/31/2026

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project:
CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:
PAE
pae-engineers.com

revisions:

	Description	Date

date: 04/25/25
project: 00524
drawn by: HLB
checked by: ELR

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DEMOLITION FLOOR PLAN - AREA B - ELECTRICAL

sheet: E-101B
of:

GENERAL NOTES:

A. A. IT IS THE INTENT OF THESE DOCUMENTS TO PROVIDE FOR ALL NECESSARY ADJUSTMENTS OF THE ELECTRICAL AND LOW VOLTAGE SYSTEMS TO MEET CODE AND TO ACCOMODATE THE INSTALLATION OF NEW WORK. VERIFY EXISTING CONDITIONS, PRIOR TO PROCEEDING WITH WORK, NOTIFY ARCHITECT ABOUT ANY DISCREPANCIES BETWEEN THE DESIGN DOCUMENTS AND FIELDCONDITIONS.

B. LOCATION OF DEVICES AND EQUIPMENT SHOWN ARE BASED ONR OUGH APPROXIMATIONS. THE PLANS DO NOT SHOW ALL OF THE DEMOLITION OR CONSTRUCTION CONDITIONS.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. PROVIDE NEW RACEWAY,CONDUCTORS, SUPPORTS, BRACING, ETC. AS REQUIRED TO MAINTAIN SERVICES. DO NOT DISTURB UTILITIES SERVING EQUIPMENT IN OTHER AREAS. CONTRACTOR TO ASSUME BRANCH CIRCUITS WILL NEED TO BE TRACED TO NOT DISTURB OTHER AREAS DURING CONSTRUCTION.

D. ALL MATERIAL INCLUDING EQUIPMENT, CONDUCTORS, CONTROLS,AND SIGNALING DEVICES SHALL BE LISTED FOR THEIR INTENDED USE.

E. REFER TO MECHANICAL/PLUMBING DRAWINGS FOR MECHANICAL AND PLUMBING EQUIPMENT FOR ADDITIONAL ELECTRICAL CONNECTIONS/REQUIREMENTS.

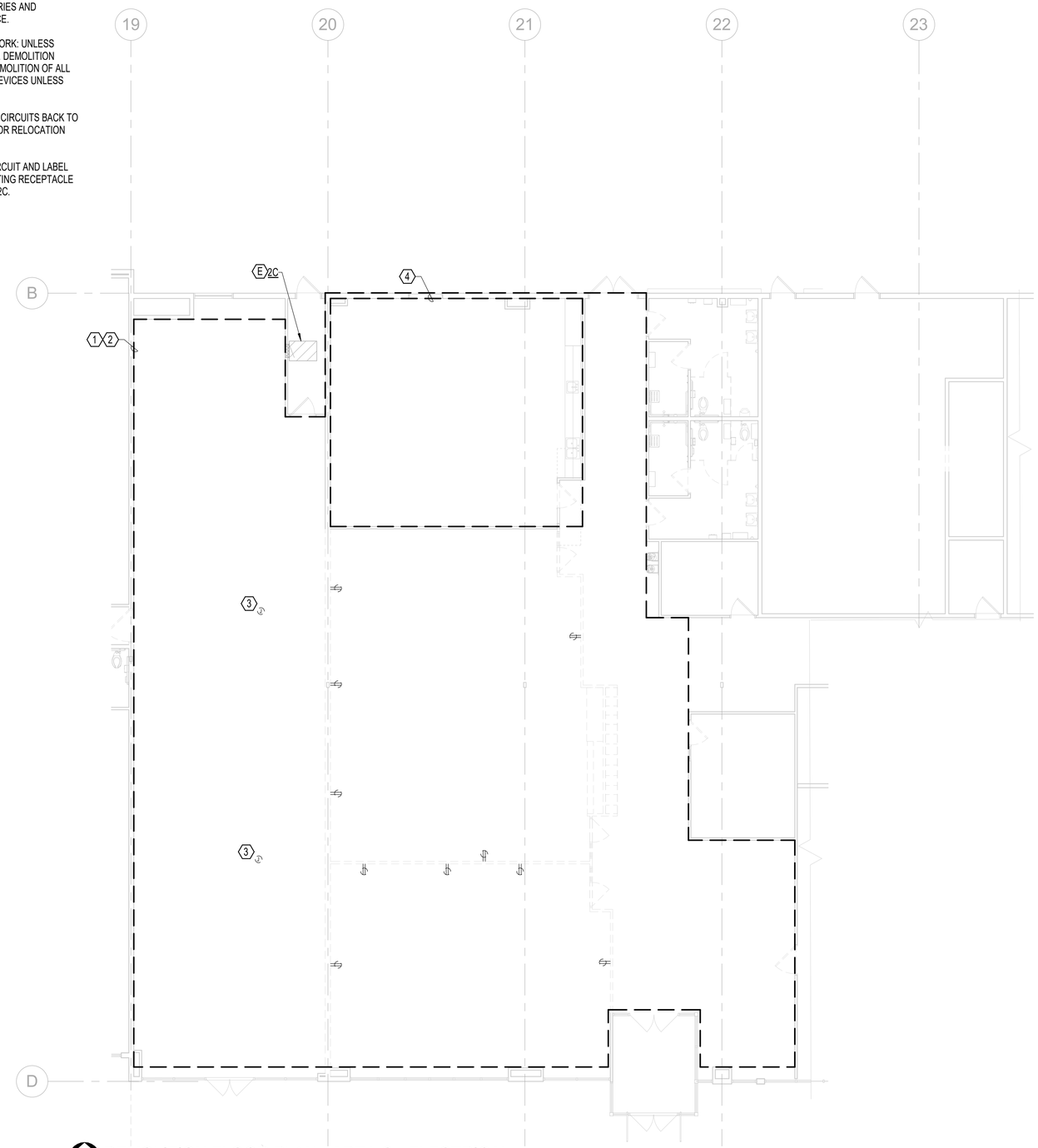
NOTES:

1. APPROXIMATE AREA OF LIGHTING DEMOLITION WORK: UNLESS SPECIFICALLY NOTED OTHERWISE DEMOLITION SCOPE IN THIS AREA INCLUDES DEMOLITION OF ALL LIGHTING AND LIGHTING CONTROL DEVICES. ALL ACCESSORIES AND COMPONENTS BACK TO ITS SOURCE.

2. APPROXIMATE AREA OF POWER WORK: UNLESS SPECIFICALLY NOTED OTHERWISE. DEMOLITION SCOPE IN THIS AREA INCLUDES DEMOLITION OF ALL ELECTRICAL AND LOW VOLTAGE DEVICES UNLESS NOTED OTHWERWISE.

3. DEMOLISH EXISTING POWER POLE CIRCUITS BACK TO ITS SOURCE SAVE POWER POLE FOR RELOCATION AND REUSE.

4. DEMOLISH EXISTING HOMERUN CIRCUIT AND LABEL BREAKER AS SPARE EXTEND EXISTING RECEPTACLE CIRCUITS IN THIS AREA TO PANEL 2C.



DEMOLITION FLOOR PLAN - AREA C - ELECTRICAL
1/8" = 1'-0"

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4/25/2025
EXPIRES: 12/31/2026

project:
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368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:
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DEMOLITION FLOOR PLAN - AREA C - ELECTRICAL

sheet: E-101C
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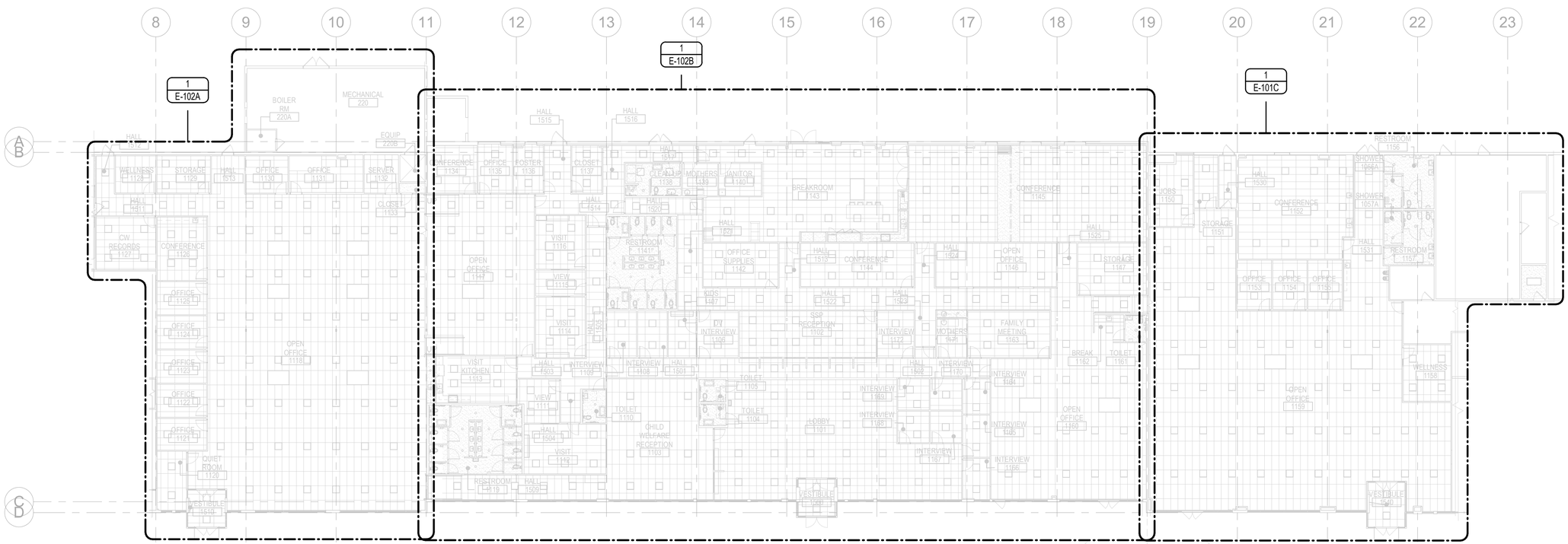
GENERAL NOTES:

A. SHEET SHOWN FOR REFERENCE ONLY.



OVERALL PLAN - LIGHTING - LIGHTING

1/16" = 1'-0"

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OVERALL PLAN - LIGHTING - LIGHTING

sheet: E-102

of:

GENERAL NOTES:

A. IT IS THE INTENT OF THESE DOCUMENTS TO PROVIDE FOR ALL NECESSARY ADJUSTMENTS OF THE ELECTRICAL AND LOW VOLTAGE SYSTEMS TO MEET CODE AND TO ACCOMODATE THE INSTALLATION OF NEW WORK.

B. LOCATION OF DEVICES AND EQUIPMENT SHOWN ARE BASED ON ROUGH APPROXIMATIONS. THE PLANS DO NOT SHOW ALL OF THE CONSTRUCTION CONDITIONS.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. PROVIDE NEW RACEWAY, CONDUCTORS, SUPPORTS, BRACING, ETC. AS REQUIRED TO MAINTAIN SERVICES. DO NOT DISTURB UTILITIES SERVING EQUIPMENT IN OTHER AREAS. CONTRACTOR TO ASSUME BRANCH CIRCUITS WILL NEED TO BE TRACED TO NOT DISTURB OTHER AREAS DURING CONSTRUCTION.

D. ALL MATERIAL INCLUDING EQUIPMENT, CONDUCTORS, CONTROLS, AND SIGNALING DEVICES SHALL BE INSTALLED AND LISTED FOR THEIR INTENDED USES.

E. EXIT SIGNS ARE ALL TYPE X1 UNLESS NOTED OTHERWISE, REFER TO LUMINAIRE SCHEDULE FOR ADDITIONAL INFORMATION.

F. PROVIDE NEW LIGHTING CONTROLS THROUGHOUT THE REMODELED SPACE. BASIS OF DESIGN IS LUTRON VIVE.

G. ALL LIGHTING SHOWN IS CIRCUITED TO PANEL 2A: 3 UNLESS OTHERWISE NOTED.

NOTES:

1. SIMULATED SKYLIGHT CIRCADIAN RYTHYM CONTROLS. PROVIDE PICO 4 SCENE SWITCH FOR SKYLIGHT, PROGRAMMED WITH:
   A. MORNING: 2700K, 20% LIGHT OUTPUT
   B. AFTERNOON: 5000K, 80% LIGHT OUTPUT
   C. EVENING: 2200K, 40% LIGHT OUTPUT
   D. OFF
2. PROVIDE TABLETOP PICO CONTROL STATION. .
3. PROVIDE EMERGI-LITE 1500W HIGH CAPACITY MINI INVERTER SERIES WITH NEXUS PRO DIAGNOSTICS, AND TWO CIRCUIT 20 AMP OUTPUT. ONE FOR EGRESS LIGHTING AND EXIT SIGNS AND ONE FOR LUTRON VIVE HUB. PROVIDE ETHERNET CONNECTION TO CHEMEKETA IT RACK.
4. LUTRON VIVE HUB. COORDINATE FINAL LOCATIONS WITH LUTRON SHOP DRAWINGS. PROVIDE ETHERNET CONNECTION FROM CHEMEKETA IT RACK AND COMPLETE POWER CONNECTION FROM INVERTER.

FLOOR PLAN - AREA A - LIGHTING
1/8" = 1'-0"

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MCMINNVILLE, OR 97128

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FLOOR PLAN - AREA A - LIGHTING

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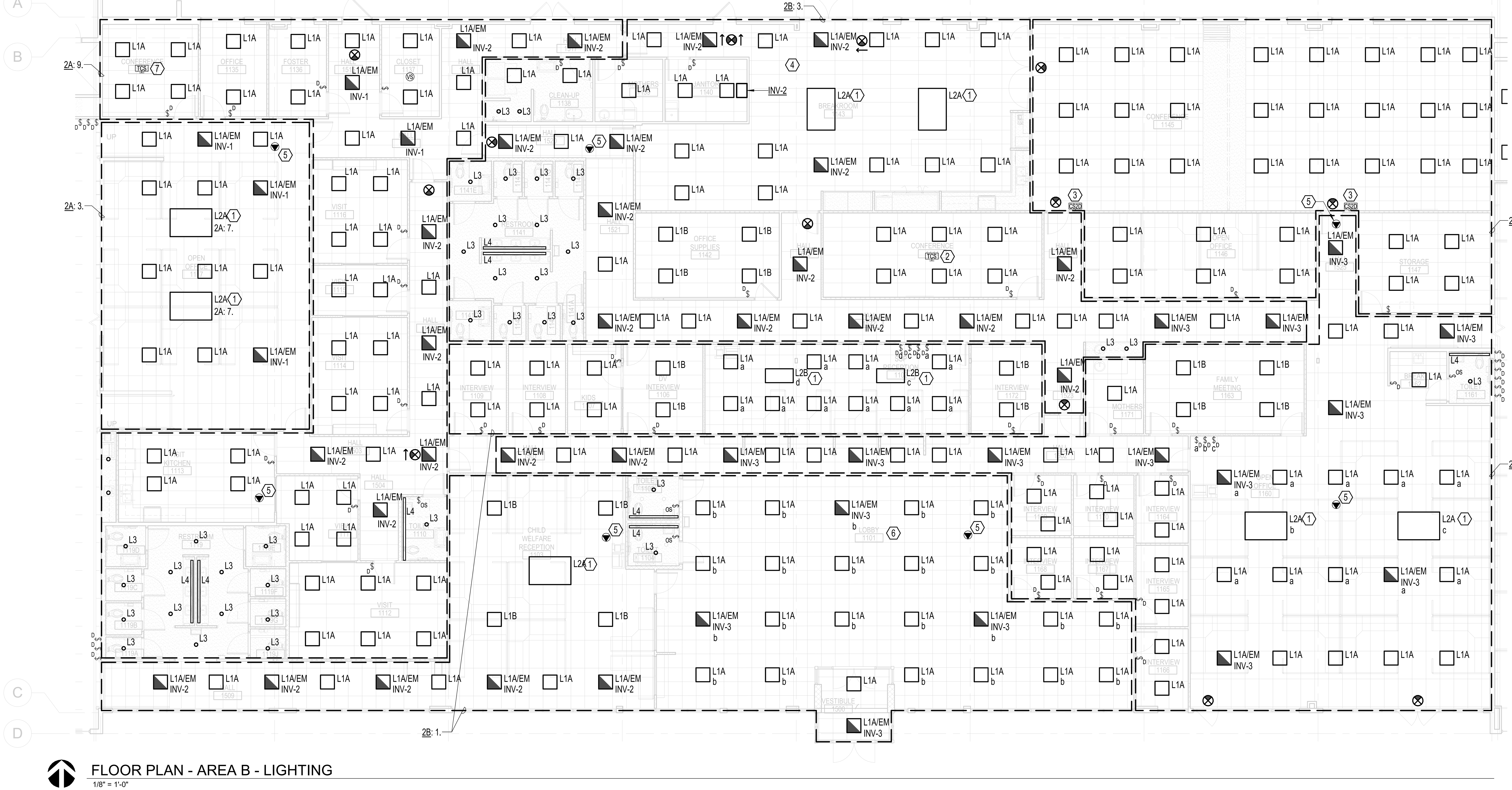
E. EXIT SIGNS ARE ALL TYPE X1 UNLESS NOTED OTHERWISE, REFER TO LUMINAIRE SCHEDULE FOR ADDITIONAL INFORMATION.

F. PROVIDE NEW LIGHTING CONTROLS THROUGHOUT THE REMODELED SPACE. BASIS OF DESIGN IS LUTRON VIVE.

⬡ NOTES:

1. SIMULATED SKYLIGHT CIRCADIAN RYTHYM CONTROLS. PROVIDE PICO 4 SCENE SWITCH FOR SKYLIGHT, PROGRAMMED WITH:
   A. MORNING: 2700K, 20% LIGHT OUTPUT
   B. AFTERNOON: 5000K, 80% LIGHT OUTPUT
   C. EVENING: 2200K, 40% LIGHT OUTPUT
   D. OFF
2. PROVIDE TABLETOP PICO CONTROL STATION.
3. PROVIDE PARTITION-RESPONSIVE LIGHTING CONTROL. EACH SIDE OF PARTITION TO OPERATE SEPARATELY WHEN PARTITION IS CLOSED. ENTIRE ROOM TO OPERATE TOGETHER WHEN PARTITION IS OPEN.
4. PROVIDE EMERGI-LITE 1500W HIGH CAPACITY MINI INVERTER SERIES WITH NEXUS PRO DIAGNOSTICS, AND TWO CIRCUIT 20 AMP OUTPUT. ONE FOR EGRESS LIGHTING AND EXIT SIGNS AND ONE FOR LUTRON VIVE HUB. PROVIDE ETHERNET CONNECTION TO CHEMEKETA IT RACK.
5. LUTRON VIVE HUB. COORDINATE FINAL LOCATIONS WITH LUTRON SHOP DRAWINGS. PROVIDE ETHERNET CONNECTION FROM CHEMEKETA IT RACK AND COMPLETE POWER CONNECTION FROM INVERTER.
6. PROVIDE SWITCH IN RECEPTION 1102.



FLOOR PLAN - AREA B - LIGHTING

1/8" = 1'-0"

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FLOOR PLAN - AREA B - LIGHTING

sheet: E-102B

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GENERAL NOTES:

A. IT IS THE INTENT OF THESE DOCUMENTS TO PROVIDE FOR ALL NECESSARY ADJUSTMENTS OF THE ELECTRICAL AND LOW VOLTAGE SYSTEMS TO MEET CODE AND TO ACCOMODATE THE INSTALLATION OF NEW WORK.

B. LOCATION OF DEVICES AND EQUIPMENT SHOWN ARE BASED ON ROUGH APPROXIMATIONS. THE PLANS DO NOT SHOW ALL OF THE CONSTRUCTION CONDITIONS.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. PROVIDE NEW RACEWAY, CONDUCTORS, SUPPORTS, BRACING, ETC. AS REQUIRED TO MAINTAIN SERVICES. DO NOT DISTURB UTILITIES SERVING EQUIPMENT IN OTHER AREAS. CONTRACTOR TO ASSUME BRANCH CIRCUITS WILL NEED TO BE TRACED TO NOT DISTURB OTHER AREAS DURING CONSTRUCTION.

D. ALL MATERIAL INCLUDING EQUIPMENT, CONDUCTORS, CONTROLS, AND SIGNALING DEVICES SHALL BE INSTALLED AND LISTED FOR THEIR INTENDED USES.

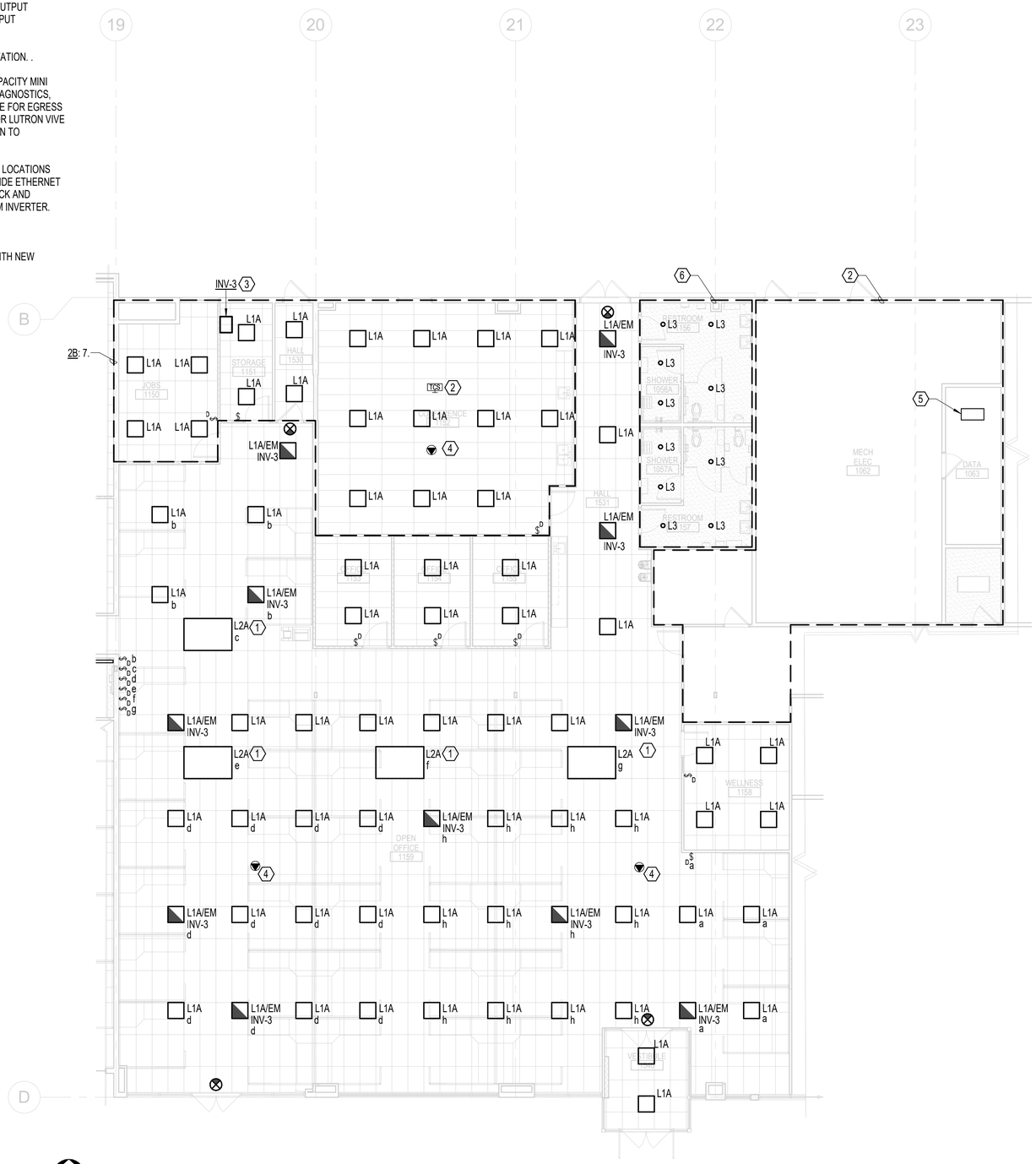
E. EXIT SIGNS ARE ALL TYPE X1 UNLESS NOTED OTHERWISE, REFER TO LUMINAIRE SCHEDULE FOR ADDITIONAL INFORMATION.

F. PROVIDE NEW LIGHTING CONTROLS THROUGHOUT THE REMODELED SPACE. BASIS OF DESIGN IS LUTRON VIVE.

G. ALL LIGHTING SHOWN IS CIRCUITED TO PANEL 2B: 9 UNLESS OTHERWISE NOTED.

NOTES:

1. SIMULATED SKYLIGHT CIRCADIAN RYTHYM CONTROLS. PROVIDE PICO 4 SCENE SWITCH FOR SKYLIGHT, PROGRAMMED WITH:
   A. MORNING: 2700K, 20% LIGHT OUTPUT
   B. AFTERNOON: 5000K, 80% LIGHT OUTPUT
   C. EVENING: 2200K, 40% LIGHT OUTPUT
   D. OFF
2. PROVIDE TABLETOP PICO CONTROL STATION. .
3. PROVIDE EMERGI-LITE 1500W HIGH CAPACITY MINI INVERTER SERIES WITH NEXUS PRO DIAGNOSTICS, AND TWO CIRCUIT 20 AMP OUTPUT. ONE FOR EGRESS LIGHTING AND EXIT SIGNS AND ONE FOR LUTRON VIVE HUB. PROVIDE ETHERNET CONNECTION TO CHEMEKETA IT RACK.
4. LUTRON VIVE HUB. COORDINATE FINAL LOCATIONS WITH LUTRON SHOP DRAWINGS. PROVIDE ETHERNET CONNECTION FROM CHEMEKETA IT RACK AND COMPLETE POWER CONNECTION FROM INVERTER.
5. EXISTING CHEMEKETA IT RACK.
6. REPLACE EXISTING LIGHT FIXTURES WITH NEW FIXTURE AS INDICATED.



FLOOR PLAN - AREA C - LIGHTING
1/8" = 1'-0"

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FLOOR PLAN - AREA C - LIGHTING

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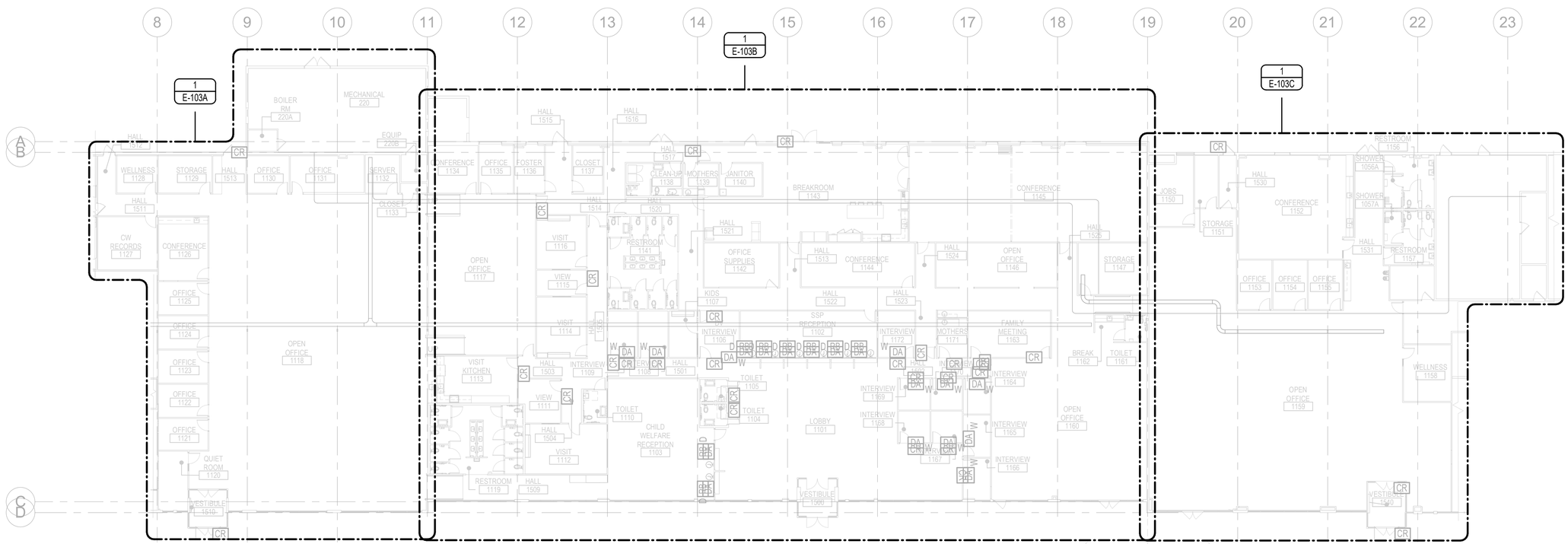

OVERALL PLAN - POWER

1/16" = 1'-0"

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OVERALL PLAN - POWER

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GENERAL NOTES:

A. IT IS THE INTENT OF THESE DOCUMENTS TO PROVIDE FOR ALL NECESSARY ADJUSTMENTS OF THE ELECTRICAL AND LOW VOLTAGE SYSTEMS TO MEET CODE AND TO ACCOMODATE THE INSTALLATION OF NEW WORK.

B. LOCATION OF DEVICES AND EQUIPMENT SHOWN ARE BASED ON ROUGH APPROXIMATIONS. THE PLANS DO NOT SHOW ALL OF THE CONSTRUCTION CONDITIONS.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. PROVIDE NEW RACEWAY, CONDUCTORS, SUPPORTS, BRACING, ETC. AS REQUIRED TO MAINTAIN SERVICES. DO NOT DISTURB UTILITIES SERVING EQUIPMENT IN OTHER AREAS. CONTRACTOR TO ASSUME BRANCH CIRCUITS WILL NEED TO BE TRACED TO NOT DISTURB OTHER AREAS DURING CONSTRUCTION.

D. ALL MATERIAL INCLUDING EQUIPMENT, CONDUCTORS, CONTROLS, AND SIGNALING DEVICES SHALL BE INSTALLED AND LISTED FOR THEIR INTENDED USES.

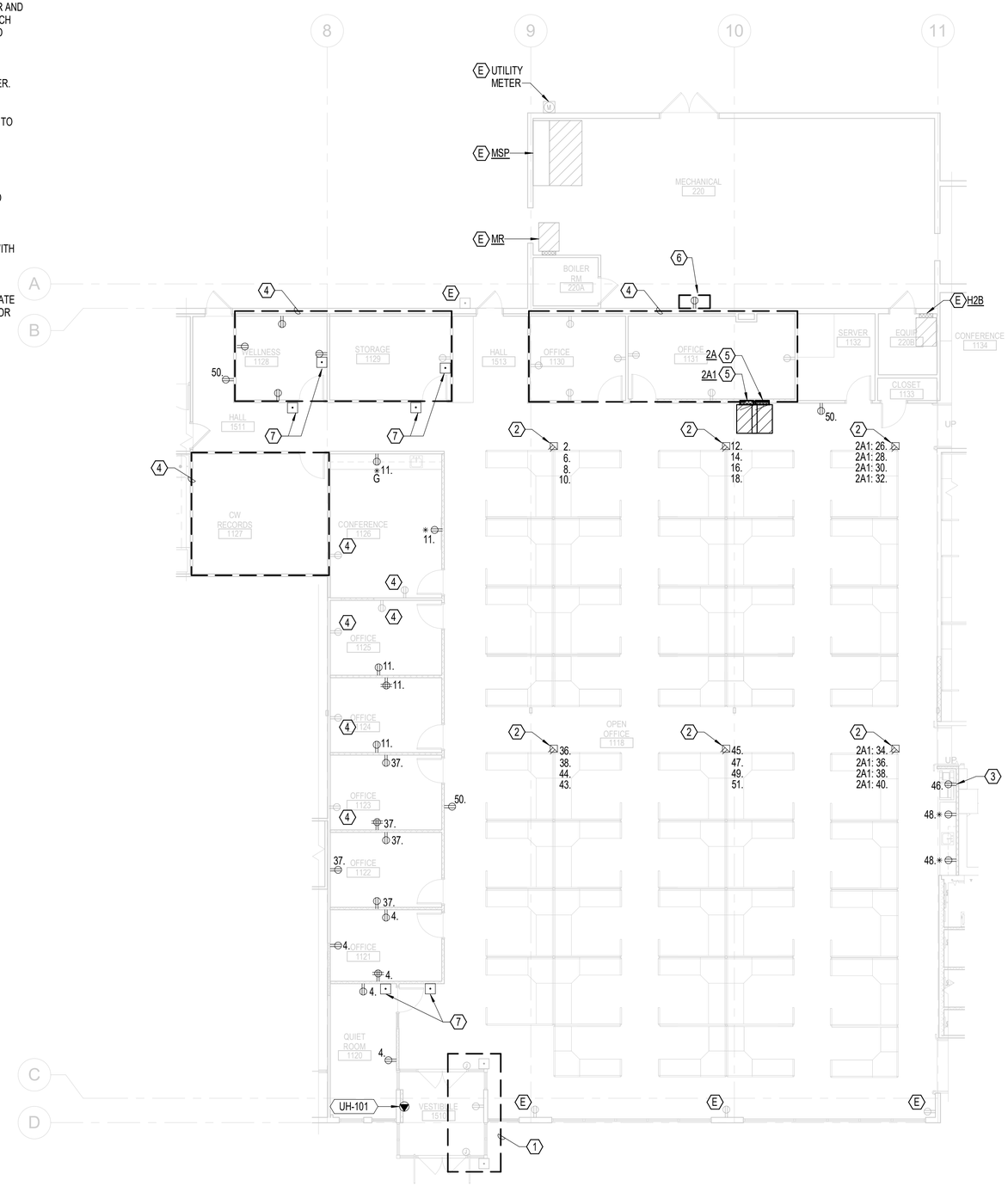
E. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL ELECTRICAL CONNECTIONS/REQUIREMENTS AND LOCATIONS.

F. PROVIDE TAMPER RESISTANT RECEPTACLES IN ALL PUBLIC AND SECLUSION AREAS.

G. ALL DEVICES SHOWN RE CIRCUITED TO PANEL 2A UNLESS OTHERWISE NOTED.

NOTES:

1. EXISTING DOOR OPENERS AND CONTROLS ARE EXISTING TO REMAIN.
2. RELOCATED POWER POLE, PROVIDE NEW POWER AND DATA CONNECTIONS. PROVIDE 4 CIRCUITS TO EACH POWER POLE . COORDINATE REQUIREMENTS AND FINAL CONNECTIONS WITH MANUFACTURER'S REQUIREMENTS.
3. PROVIDE DEDICATED CIRCUIT FOR LARGE PRINTER.
4. REPLACE EXISTING RECEPTACLES WITH NEW OUTLETS AND FACEPLATES. EXTEND CIRCUITING TO NEW PANEL LOCATION.
5. NEW FLUSH MOUNTED PANELBOARDS, EXTEND EXISTING CIRCUITS STILL IN SERVICE AFTER DEMOLITION TO NEW PANELBOARDS. PROVIDE ALLOWANCE TO EXTEND 24 BRANCH CIRCUITS TO NEW PANEL LOCATIONS.
6. RELOCATED CHEMEKETA IT RACK. COORDINATE EXACT LOCATION AND POWER REQUIREMENTS WITH CHEMEKETA.
7. PROVIDE COMPLETE POWER AND CONTROLS CONNECTION TO AUTO DOOR OPENER. COORDINATE EXACT LOCATION WITH ARCHITECTURAL AND DOOR INSTALLER.



FLOOR PLAN - AREA A - POWER
1/8" = 1'-0"

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FLOOR PLAN - AREA A - POWER

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GENERAL NOTES:

A. IT IS THE INTENT OF THESE DOCUMENTS TO PROVIDE FOR ALL NECESSARY ADJUSTMENTS OF THE ELECTRICAL AND LOW VOLTAGE SYSTEMS TO MEET CODE AND TO ACCOMODATE THE INSTALLATION OF NEW WORK.

B. LOCATION OF DEVICES AND EQUIPMENT SHOWN ARE BASED ON ROUGH APPROXIMATIONS. THE PLANS DO NOT SHOW ALL OF THE CONSTRUCTION CONDITIONS.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. PROVIDE NEW RACEWAY, CONDUCTORS, SUPPORTS, BRACING, ETC. AS REQUIRED TO MAINTAIN SERVICES. DO NOT DISTURB UTILITIES SERVING EQUIPMENT IN OTHER AREAS. CONTRACTOR TO ASSUME BRANCH CIRCUITS WILL NEED TO BE TRACED TO NOT DISTURB OTHER AREAS DURING CONSTRUCTION.

D. ALL MATERIAL INCLUDING EQUIPMENT, CONDUCTORS, CONTROLS, AND SIGNALING DEVICES SHALL BE INSTALLED AND LISTED FOR THEIR INTENDED USES.

E. PROVIDE DESIGN BUILD MODIFICATION TO EXISTING FIRE ALARM SYSTEM.BASIS OF DESIGN IS SIEMENS FIRE ALARM.

F. REFER TO TENANT'S REQUIREMENTS FOR LOW VOLTAGE DEVICES AND FULL DESIGN.

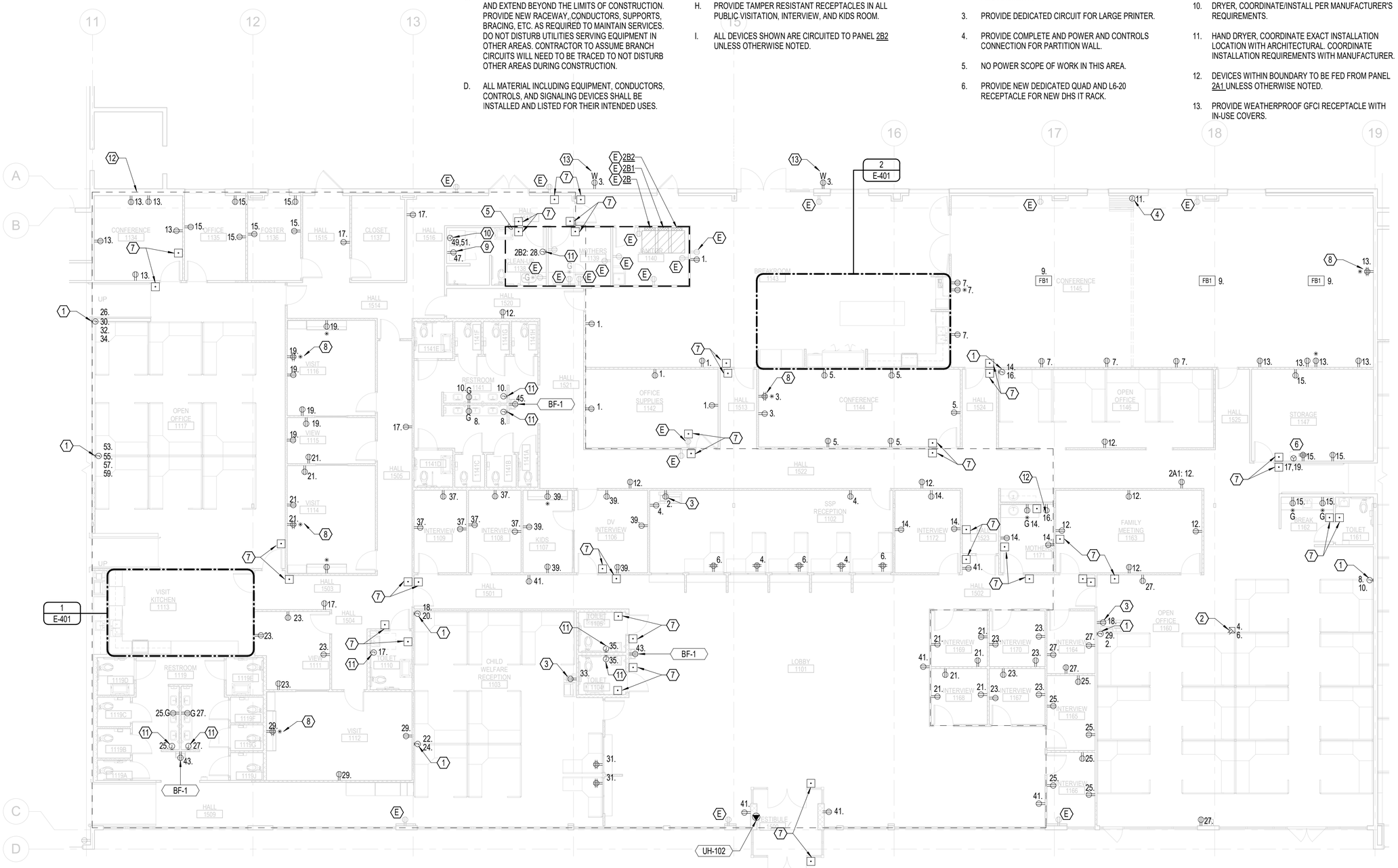
G. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL ELECTRICAL CONNECTIONS/REQUIREMENTS AND LOCATIONS.

H. PROVIDE TAMPER RESISTANT RECEPTACLES IN ALL PUBLIC VISITATION, INTERVIEW, AND KIDS ROOM.

I. ALL DEVICES SHOWN ARE CIRCUITED TO PANEL 2B2 UNLESS OTHERWISE NOTED.

NOTES:

1. PROVIDE WALL POWER AND DATA FURNITURE FEED. PROVIDE 4 CIRCUITS TO EACH FURNITURE FEED. COORDINATE REQUIREMENTS AND FINAL CONNECTIONS WITH MANUFACTURER'S REQUIREMENTS.
2. RELOCATED POWER POLE, PROVIDE NEW POWER AND DATA CONNECTIONS. PROVIDE 4 CIRCUITS TO EACH POWER POLE . COORDINATE REQUIREMENTS AND FINAL CONNECTIONS WITH MANUFACTURER'S REQUIREMENTS.
3. PROVIDE DEDICATED CIRCUIT FOR LARGE PRINTER.
4. PROVIDE COMPLETE AND POWER AND CONTROLS CONNECTION FOR PARTITION WALL.
5. NO POWER SCOPE OF WORK IN THIS AREA.
6. PROVIDE NEW DEDICATED QUAD AND L6-20 RECEPTACLE FOR NEW DHS IT RACK.
7. PROVIDE COMPLETE POWER AND CONTROLS CONNECTION TO AUTO DOOR OPENER. COORDINATE EXACT LOCATION WITH ARCHITECTURAL AND DOOR INSTALLER.
8. TV/SMARTBOARD - COORDINATE INSTALLATION WITH TV MOUNT AND ARCHITECTURAL ELEVATIONS.
9. WASHER, COORDINATE/INSTALL PER MANUFACTURER'S REQUIREMENTS.
10. DRYER, COORDINATE/INSTALL PER MANUFACTURER'S REQUIREMENTS.
11. HAND DRYER, COORDINATE EXACT INSTALLATION LOCATION WITH ARCHITECTURAL. COORDINATE INSTALLATION REQUIREMENTS WITH MANUFACTURER.
12. DEVICES WITHIN BOUNDARY TO BE FED FROM PANEL 2A1 UNLESS OTHERWISE NOTED.
13. PROVIDE WEATHERPROOF GFCI RECEPTACLE WITH IN-USE COVERS.



FLOOR PLAN - AREA B - POWER
1/8" = 1'-0"

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FLOOR PLAN - AREA B - POWER

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F. REFER TO TENANT'S REQUIREMENTS FOR LOW VOLTAGE DEVICES AND FULL DESIGN.

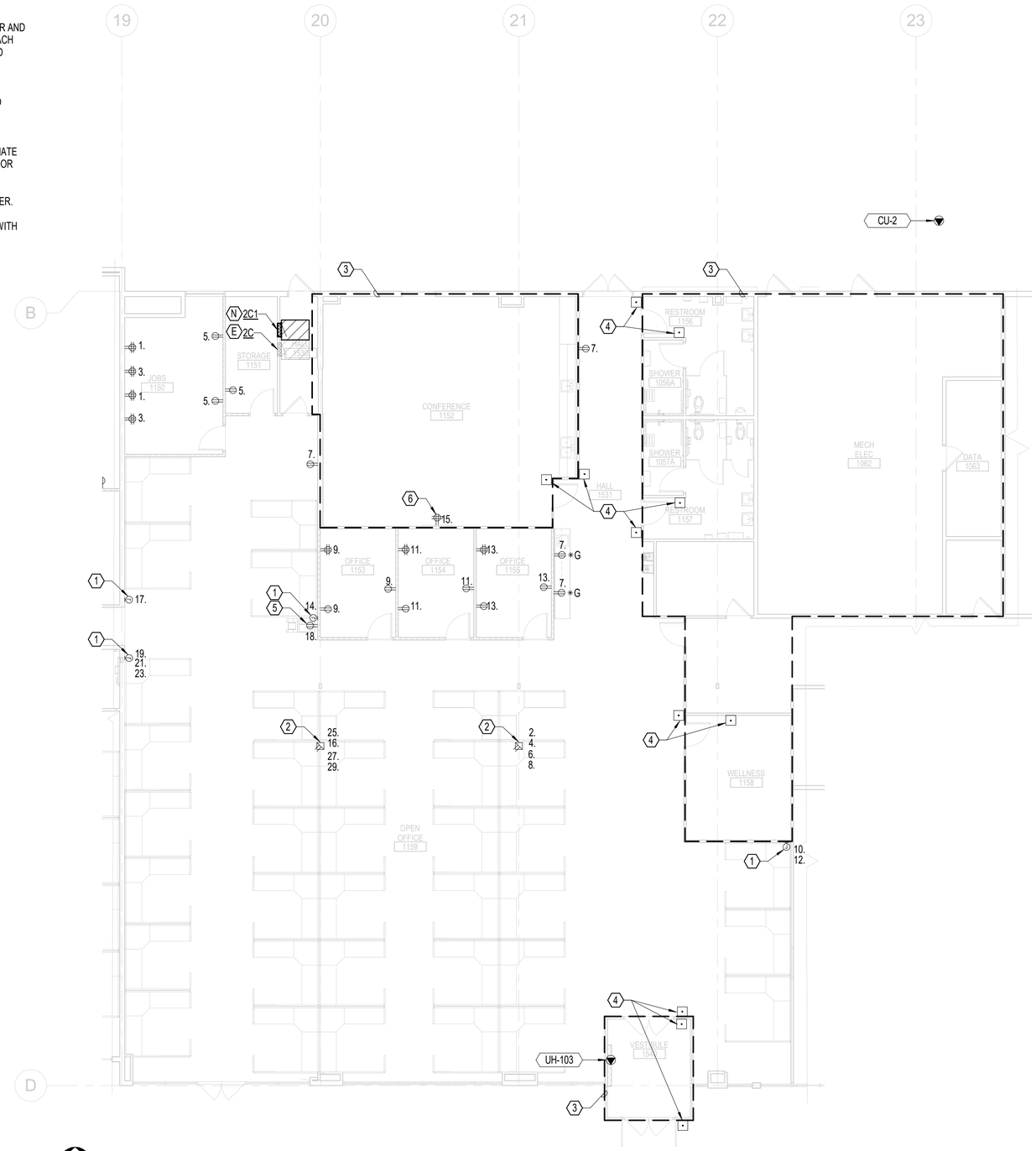
G. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL ELECTRICAL CONNECTIONS/REQUIREMENTS AND LOCATIONS.

H. PROVIDE TAMPER RESISTANT RECEPTACLES IN ALL PUBLIC AND SECLUSION AREAS.

I. ALL DEVICES SHOWN ARE CIRCUITED TO PANEL 2C1 UNLESS OTHERWISE NOTED

NOTES:

1. PROVIDE WALL POWER AND DATA FURNITURE FEED. PROVIDE 4 CIRCUITS TO EACH FURNITURE FEED. COORDINATE REQUIREMENTS AND FINAL CONNECTIONS WITH MANUFACTURER'S REQUIREMENTS.
2. RELOCATED POWER POLE, PROVIDE NEW POWER AND DATA CONNECTIONS. PROVIDE 4 CIRCUITS TO EACH POWER POLE. COORDINATE REQUIREMENTS AND FINAL CONNECTIONS WITH MANUFACTURER'S REQUIREMENTS.
3. EXTEND RECEPTACLE CIRCUITS IN THIS AREA TO PANEL 2C.
4. PROVIDE COMPLETE POWER AND CONTROLS CONNECTION TO AUTO DOOR OPENER. COORDINATE EXACT LOCATION WITH ARCHITECTURAL AND DOOR INSTALLER.
5. PROVIDE DEDICATED CIRCUIT FOR LARGE PRINTER.
6. TV/SMARTBOARD - COORDINATE INSTALLATION WITH TV MOUNT AND ARCHITECTURAL ELEVATIONS.



FLOOR PLAN - AREA C - POWER
1/8" = 1'-0"

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4/25/2025
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368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants: PAE pae-engineers.com

revisions:

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FLOOR PLAN - AREA C - POWER

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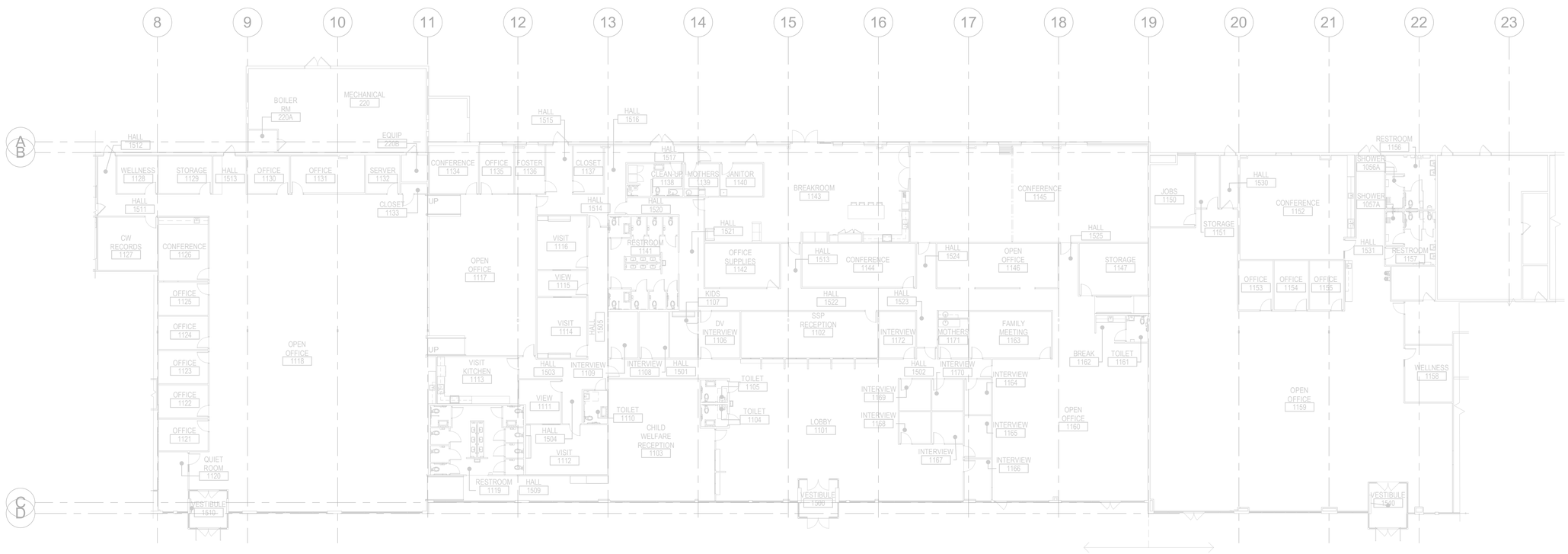

OVERALL PLAN - SIGNAL
1/16" = 1'-0"

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OVERALL PLAN - TECHNOLOGY

sheet: E-104
of:

GENERAL NOTES:

A. IT IS THE INTENT OF THESE DOCUMENTS TO PROVIDE FOR ALL NECESSARY ADJUSTMENTS OF THE LOW VOLTAGE SYSTEMS TO MEET CODE AND TO ACCOMODATE THE INSTALLATION OF NEW WORK.

B. LOCATION OF DEVICES AND EQUIPMENT SHOWN ARE BASED ON ROUGH APPROXIMATIONS. THE PLANS DO NOT SHOW ALL OF THE CONSTRUCTION CONDITIONS.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. PROVIDE NEW RACEWAY, CONDUCTORS, SUPPORTS, BRACING, ETC. AS REQUIRED TO MAINTAIN SERVICES. DO NOT DISTURB UTILITIES SERVING EQUIPMENT IN OTHER AREAS. CONTRACTOR TO ASSUME BRANCH CIRCUITS WILL NEED TO BE TRACED TO NOT DISTURB OTHER AREAS DURING CONSTRUCTION.

D. ALL MATERIAL INCLUDING EQUIPMENT, CONDUCTORS, CONTROLS, AND SIGNALING DEVICES SHALL BE INSTALLED AND LISTED FOR THEIR INTENDED USES.

E. REFER TO TENANT'S REQUIREMENTS FOR LOW VOLTAGE DEVICES AND FULL DESIGN.

F. CABLING REQUIREMENTS BASED ON TENANT'S STANDRDS IS CAT 6 CABLING.

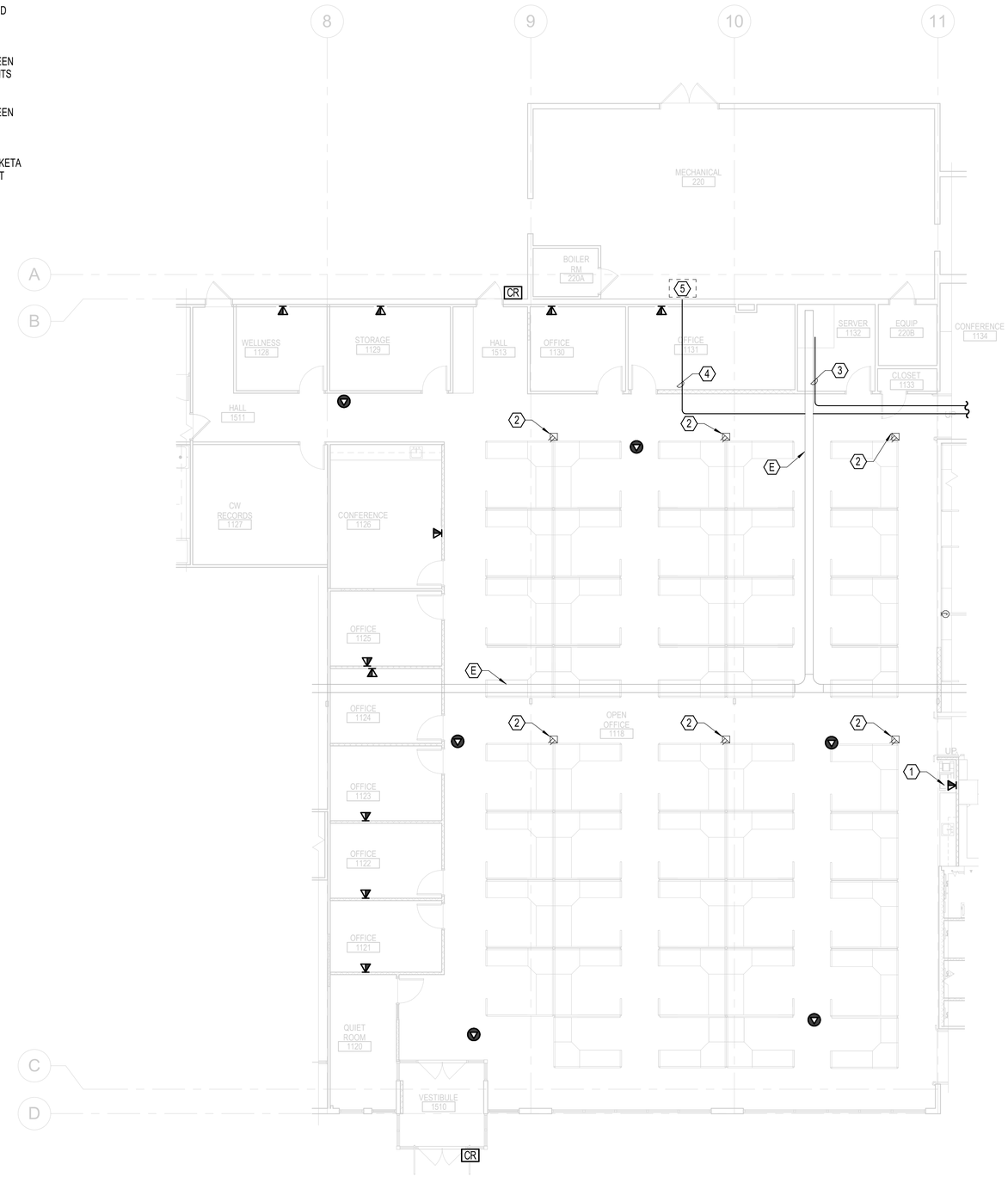
G. DESIGN DOCUMENTS SHOW APPROXIMATE PATHWAYS AND BACKBOX LOCATIONS. CONFIRM LOW VOLTAGE LOCATIONS WITH OWNER/TENANT.

H. FIRE ALARM IS A DESIGN BUILD SYSTEM, REFER TO SPECIFICAITONS FOR ADDITIONAL INFORMATION.

I. LOW VOLTAGE DEISGN DECISIONS ARE TO BE CONFIRMED WITH THE TENANT OR TENANTS REPRESENATIVE.

NOTES:

1. DATA FOR LARGE PRINTER/COPIER.
2. RELOCATED POWER POLE, PROVIDE NEW POWER AND DATA CONNECTIONS. 1 DATA DROP PER EACH WORKSTATION. COORDINATE REQUIREMENTS AND FINAL CONNECTIONS WITH MANUFACTURER'S REQUIREMENTS.
3. PROVIDE MULTIMODE FIBER CONNECTION BETWEEN TENANT IT RACKS. CONFIRM EXACT REQUIREMENTS WITH TENANT.
4. PROVIDE MULTIMODE FIBER CONNECTION BETWEEN CHEMEKETA IT RACKS. COORDINATE EXACT REQUIREMENTS WITH CHEMEKETA.
5. APPROXIMATE LOCATION OF RELOCATED CHEMEKETA IT RACK. COORDINATE WORK WITH CHEMEKETA IT DEPARTMENT.



FLOOR PLAN - AREA A - TECHNOLOGY
1/8" = 1'-0"

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FLOOR PLAN - AREA A - TECHNOLOGY

sheet: E-104A

of:

GENERAL NOTES:

A. IT IS THE INTENT OF THESE DOCUMENTS TO PROVIDE FOR ALL NECESSARY ADJUSTMENTS OF THE LOW VOLTAGE SYSTEMS TO MEET CODE AND TO ACCOMODATE THE INSTALLATION OF NEW WORK.

B. LOCATION OF DEVICES AND EQUIPMENT SHOWN ARE BASED ON ROUGH APPROXIMATIONS. THE PLANS DO NOT SHOW ALL OF THE CONSTRUCTION CONDITIONS.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. PROVIDE NEW RACEWAY, CONDUCTORS, SUPPORTS, BRACING, ETC. AS REQUIRED TO MAINTAIN SERVICES. DO NOT DISTURB UTILITIES SERVING EQUIPMENT IN OTHER AREAS. CONTRACTOR TO ASSUME BRANCH CIRCUITS WILL NEED TO BE TRACED TO NOT DISTURB OTHER AREAS DURING CONSTRUCTION.

D. ALL MATERIAL INCLUDING EQUIPMENT, CONDUCTORS, CONTROLS, AND SIGNALING DEVICES SHALL BE INSTALLED AND LISTED FOR THEIR INTENDED USES.

E. REFER TO TENANT'S REQUIREMENTS FOR LOW VOLTAGE DEVICES AND FULL DESIGN.

F. CABLING REQUIREMENTS BASED ON TENANT'S STANDRDS IS CAT 6 CABLING.

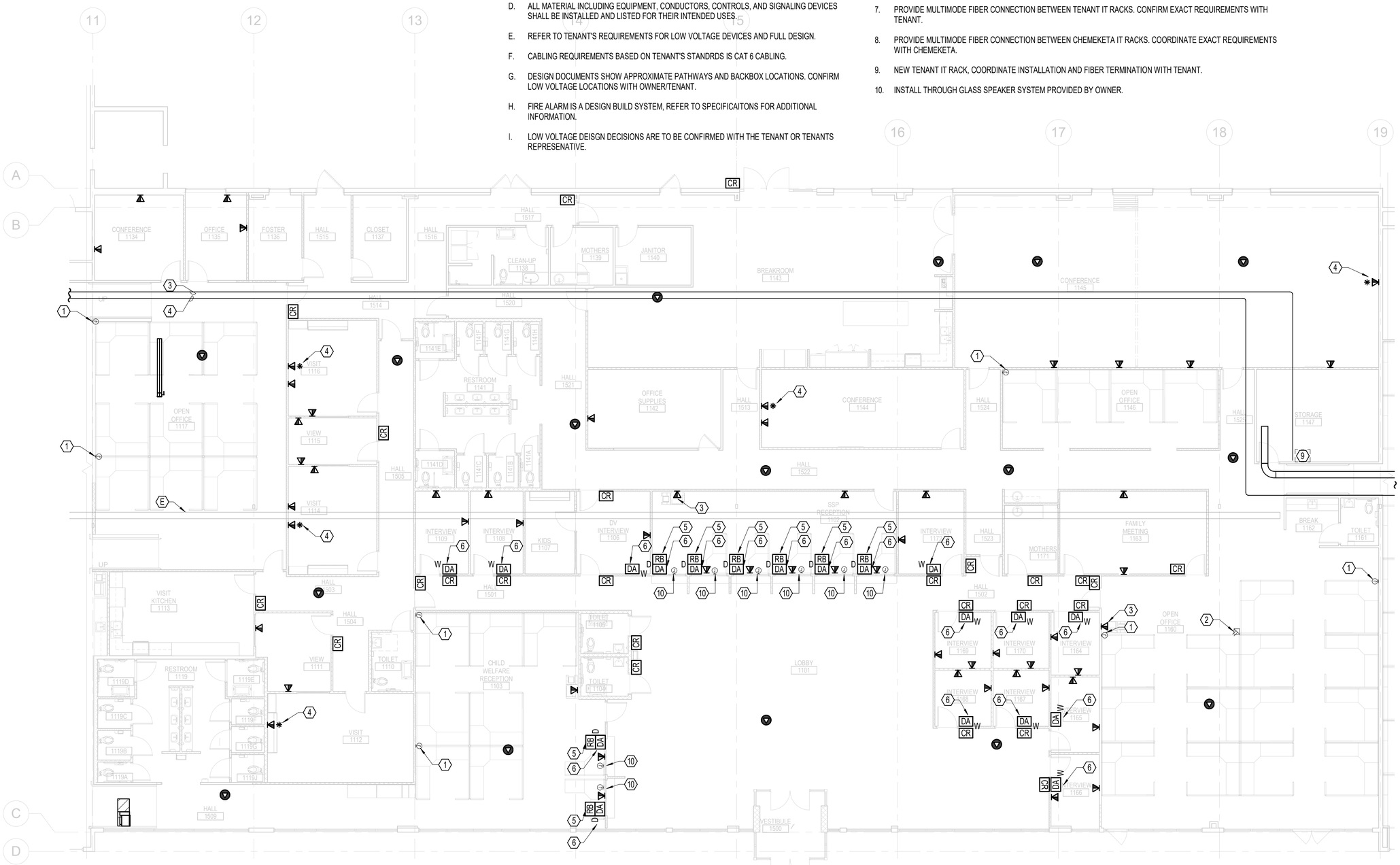
G. DESIGN DOCUMENTS SHOW APPROXIMATE PATHWAYS AND BACKBOX LOCATIONS. CONFIRM LOW VOLTAGE LOCATIONS WITH OWNER/TENANT.

H. FIRE ALARM IS A DESIGN BUILD SYSTEM, REFER TO SPECIFICAITONS FOR ADDITIONAL INFORMATION.

I. LOW VOLTAGE DEISGN DECISIONS ARE TO BE CONFIRMED WITH THE TENANT OR TENANTS REPRESENATIVE.

NOTES:

1. PROVIDE WALL POWER AND DATA FURNITURE FEED. PROVIDE 1 DATA DROP PER EACH WORKSTATION. COORDINATE REQUIREMENTS AND FINAL CONNECTIONS WITH MANUFACTURER'S REQUIREMENTS.
2. RELOCATED POWER POLE, PROVIDE NEW POWER AND DATA CONNECTIONS. 1 DATA DROP PER EACH WORKSTATION. COORDINATE REQUIREMENTS AND FINAL CONNECTIONS WITH MANUFACTURER'S REQUIREMENTS.
3. PROVIDE DEDICATED CIRCUIT FOR LARGE PRINTER.
4. TV/SMARTBOARD - COORDINATE INSTALLATION WITH TV MOUNT AND ARCHITECTURAL ELEVATIONS.
5. DOOR RELEASE BUTTON FOR LOBBY RESTROOM. PROVIDE COMPLETE POWER AND CONTROLS CONNECTION.
6. DURESS BUTTON, COORDINATE SYSTEM DESIGN WITH TENANT.
7. PROVIDE MULTIMODE FIBER CONNECTION BETWEEN TENANT IT RACKS. CONFIRM EXACT REQUIREMENTS WITH TENANT.
8. PROVIDE MULTIMODE FIBER CONNECTION BETWEEN CHEMEKETA IT RACKS. COORDINATE EXACT REQUIREMENTS WITH CHEMEKETA.
9. NEW TENANT IT RACK, COORDINATE INSTALLATION AND FIBER TERMINATION WITH TENANT.
10. INSTALL THROUGH GLASS SPEAKER SYSTEM PROVIDED BY OWNER.



FLOOR PLAN - AREA B - SIGNAL

1/8" = 1'-0"

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FLOOR PLAN - AREA B - TECHNOLOGY

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GENERAL NOTES:

A. IT IS THE INTENT OF THESE DOCUMENTS TO PROVIDE FOR ALL NECESSARY ADJUSTMENTS OF THE LOW VOLTAGE SYSTEMS TO MEET CODE AND TO ACCOMODATE THE INSTALLATION OF NEW WORK.

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D. ALL MATERIAL INCLUDING EQUIPMENT, CONDUCTORS, CONTROLS, AND SIGNALING DEVICES SHALL BE INSTALLED AND LISTED FOR THEIR INTENDED USES.

E. REFER TO TENANT'S REQUIREMENTS FOR LOW VOLTAGE DEVICES AND FULL DESIGN.

F. CABLING REQUIREMENTS BASED ON TENANT'S STANDRDS IS CAT 6 CABLING.

G. DESIGN DOCUMENTS SHOW APPROXIMATE PATHWAYS AND BACKBOX LOCATIONS. CONFIRM LOW VOLTAGE LOCATIONS WITH OWNER/TENANT.

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NOTES:

1. PROVIDE WALL POWER AND DATA FURNITURE FEED. PROVIDE 1 DATA DROPS PER EACH WORKSTATION. COORDINATE REQUIREMENTS AND FINAL CONNECTIONS WITH MANUFACTURER'S REQUIREMENTS.
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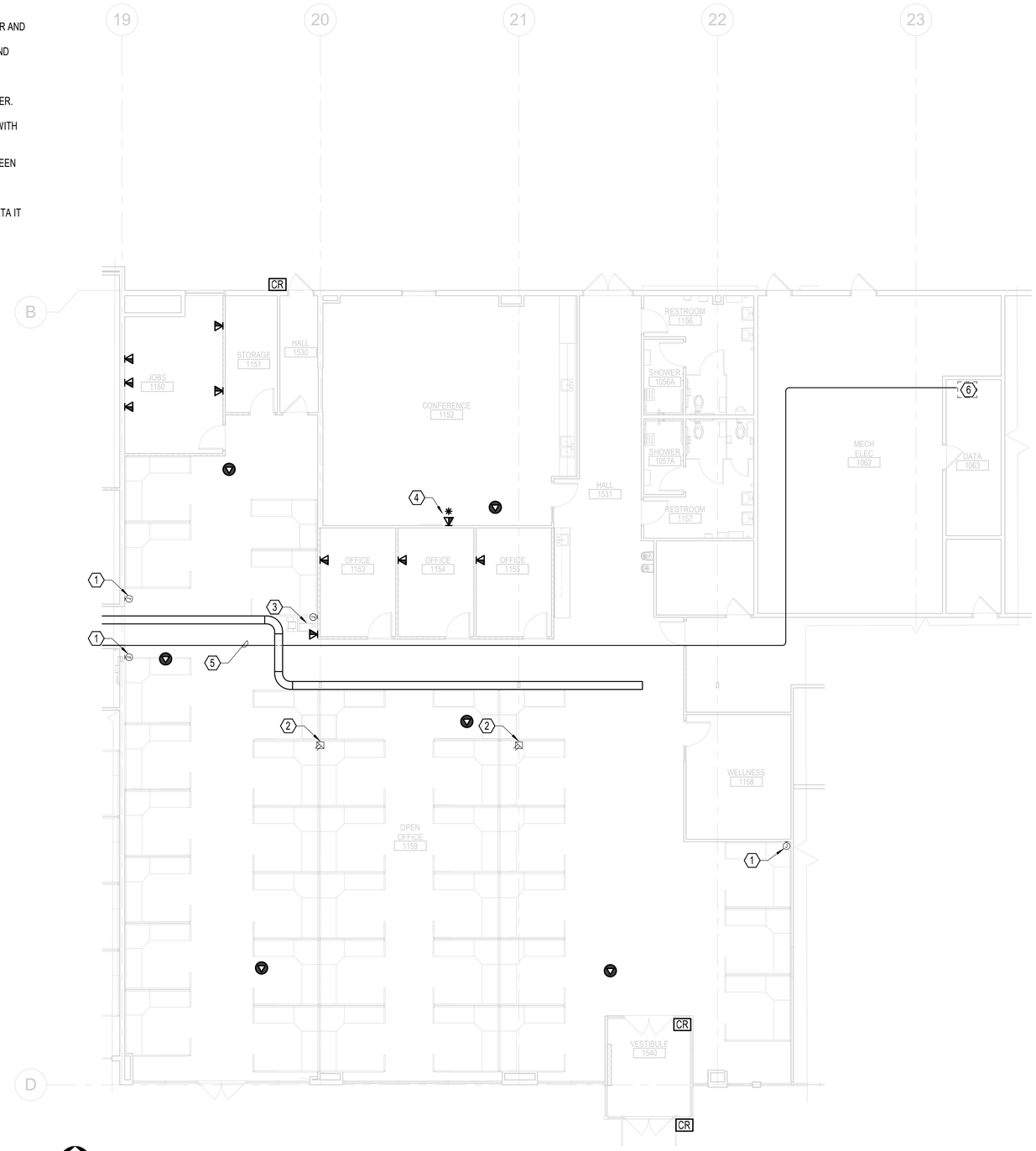
3. PROVIDE DEDICATED CIRCUIT FOR LARGE PRINTER.
4. TV/SMARTBOARD - COORDINATE INSTALLATION WITH TV MOUNT AND ARCHITECTURAL ELEVATIONS.
5. PROVIDE MULTIMODE FIBER CONNECTION BETWEEN CHEMEKETA IT RACKS. COORDINATE EXACT REQUIREMENTS WITH CHEMEKETA.
6. APPRXOIMATE LOCATION OF EXISTING CHEMEKETA IT RACK. COORDINATE WORK WITH CHEMEKETA IT DEPARTMENT.



FLOOR PLAN - AREA C - SIGNAL
1/8" = 1'-0"

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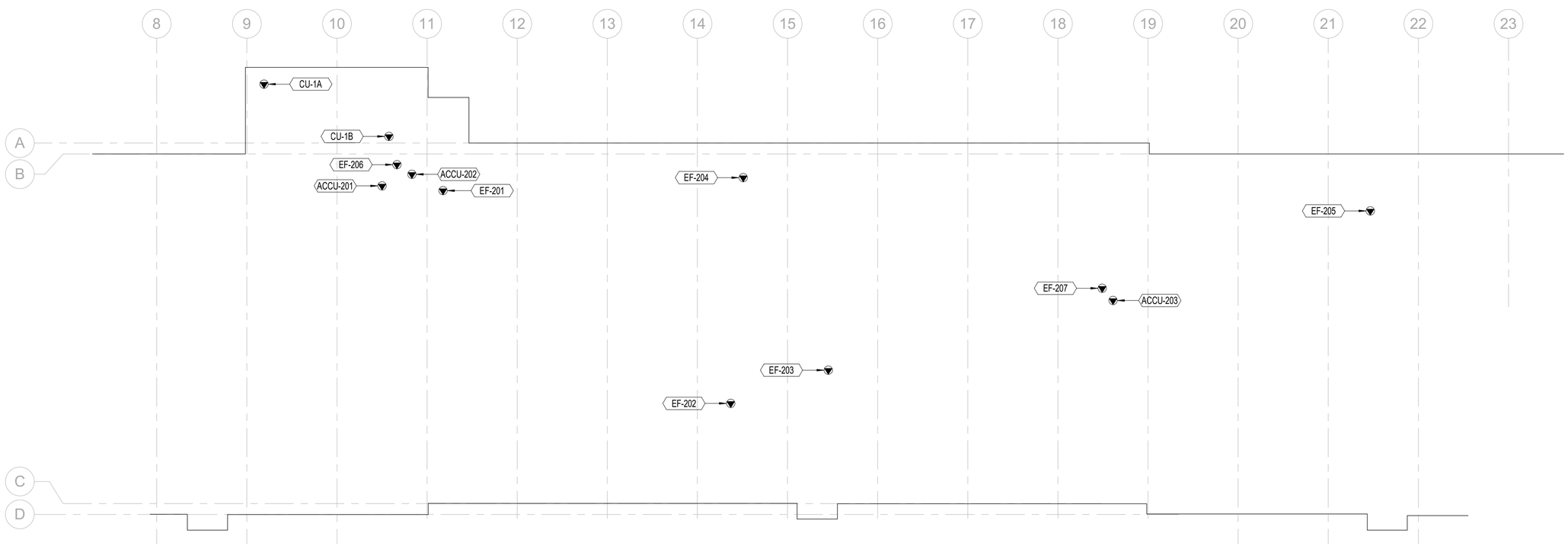
FLOOR PLAN - AREA C - TECHNOLOGY

sheet: E-104C
of:

GENERAL NOTES:

A. REFER TO EQUIPMENT CONNECTION SCHEDULE FOR ADDITIONAL INFORMATION.

B. REFER TO MECHANICAL/PLUMBING DRAWINGS FOR ADDITIONAL ELECTRICAL CONNECTIONS/REQUIREMENTS AND EXACT LOCATIONS.



OVERALL ROOF PLAN - ELECTRICAL
1/16" = 1'-0"

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ROOF PLAN - POWER

sheet: E-105
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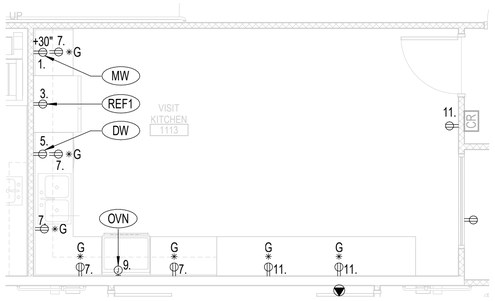
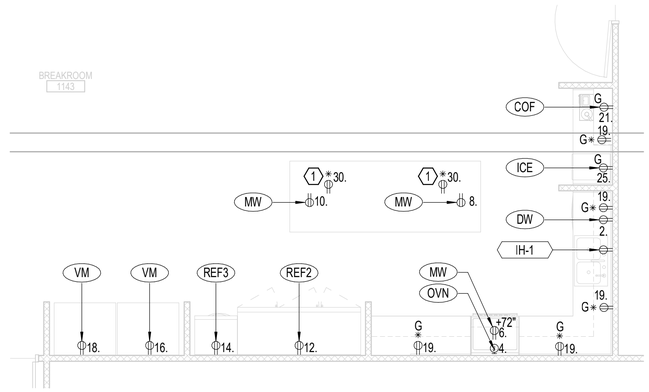


1 FLOOR PLAN - AREA B - POWER
1/4" = 1'-0"



2 FLOOR PLAN - AREA B - POWER
1/4" = 1'-0"

GENERAL NOTES:

A. IT IS THE INTENT OF THESE DOCUMENTS TO PROVIDE FOR ALL NECESSARY ADJUSTMENTS OF THE ELECTRICAL AND LOW VOLTAGE SYSTEMS TO MEET CODE AND TO ACCOMODATE THE INSTALLATION OF NEW WORK.

B. LOCATION OF DEVICES AND EQUIPMENT SHOWN ARE BASED ON ROUGH APPROXIMATIONS. THE PLANS DO NOT SHOW ALL OF THE CONSTRUCTION CONDITIONS.

C. PROTECT EXISTING UTILITIES THAT PASS THROUGH AND EXTEND BEYOND THE LIMITS OF CONSTRUCTION. PROVIDE NEW RACEWAY, CONDUCTORS, SUPPORTS, BRACING, ETC. AS REQUIRED TO MAINTAIN SERVICES. DO NOT DISTURB UTILITIES SERVING EQUIPMENT IN OTHER AREAS. CONTRACTOR TO ASSUME BRANCH CIRCUITS WILL NEED TO BE TRACED TO NOT DISTURB OTHER AREAS DURING CONSTRUCTION.

D. ALL MATERIAL INCLUDING EQUIPMENT, CONDUCTORS, CONTROLS, AND SIGNALING DEVICES SHALL BE INSTALLED AND LISTED FOR THEIR INTENDED USES.

E. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL ELECTRICAL CONNECTIONS/REQUIREMENTS AND LOCATIONS.

F. PROVIDE TAMPER RESISTANT RECEPTACLES IN ALL PUBLIC AND SECLUSION AREAS.

G. ALL DEVICES SHOWN ARE CIRCUITED TO PANEL 2B1 UNLESS OTHERWISE NOTED

NOTES:

1. PROVIDE LEW ELECTRIC PUFP-CT POP UP RECEPTACLES WITH USB CHARGING.

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ENLARGED PLANS - ELECTRICAL

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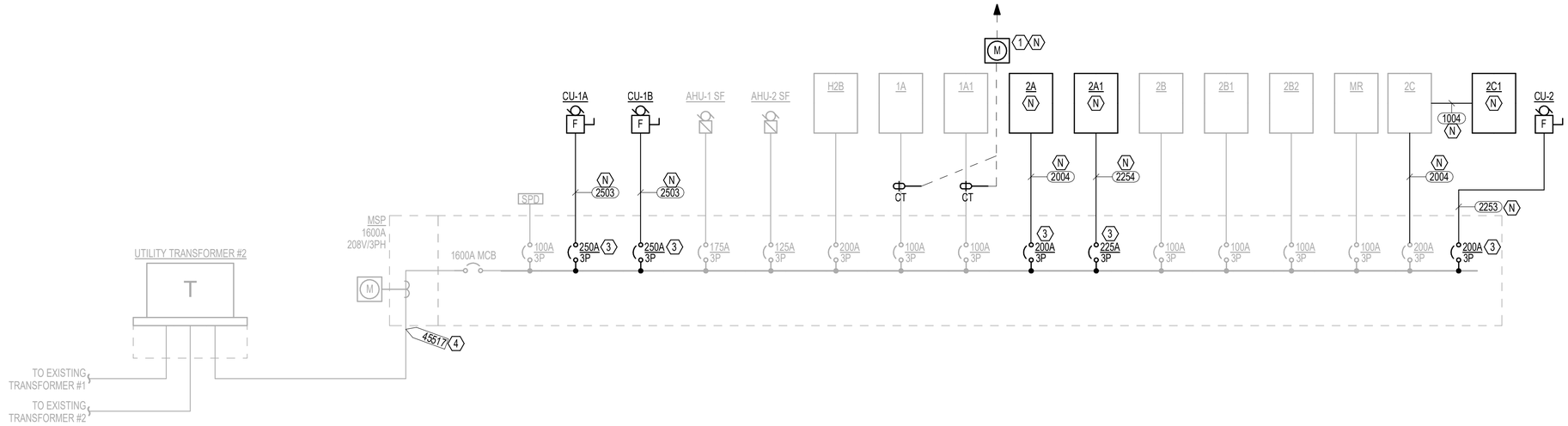


1 SINGLE LINE DIAGRAM
NONE

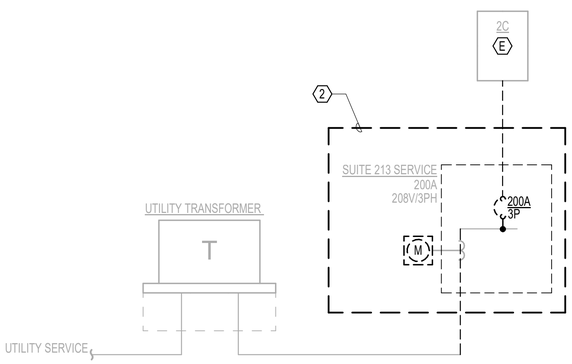
GENERAL NOTES:

A. ALL EQUIPMENT SHOWN IS EXISTING UNLESS OTHERWISE NOTED.

NOTES:

1. PROVIDE POWERSCOUT 12 HD SUB METER, CURRENT TRANSFORMERS AND COMPLETE WIRING CONNNECTION FOR PANEL 1A AND 1A1. PROVIDE ETHERNET CONNECTION TO CHEMEKETA IT RACK. COORDINATE INSTALLATION AND SHUTDOWN WITH BUILDING OWNER.
2. COORDINATE METER REMOVAL AND DEMOLITION OF UTILITY SERVICE LABELLED SUITE 213 WITH THE UTILITY. REMOVE EXTERIOR METER BASE AND SERVICE DISCONNECT. ANY EMPTY CONDUIT AFTER THE DEMOLITION OF THE ELECTRICAL SHALL BE CAPPED AND LABELLED SPARE AND NOTED ON CONTRACTOR AS-BUILTS AS SPARE FOR FUTURE USE.
3. REPLACE EXISTING CIRCUIT BREAKER WITH BREAKER INDICATED. MATCH EXISTING MANUFACTURER MAKE AND MODEL.
4. BASED ON EXISTING INFORMATION. ALL NEW PANELBOARD AIC RATINGS AND DISCONNECTS ARE TO BE CONFIRMED WITH A POWER STUDY PRIOR TO ORDERING.
5. EXTEND FEEDERS TO NEW PANELBOARD LOCATIONS.

LOAD SUMMARY		
MAIN SERVICE PANELBOARD MSP		
MSP PEAK DEMAND FROM UTILITY:	157.8	KVA
TENANT IMPROVENENT PANEL LOADS		
2A	28.91	KVA
2A1	78.85	KVA
2B	17.13	KVA
2B1	19.73	KVA
2B2	21.68	KVA
2C	25.65	KVA
TENANT IMPROVENENT NEW MECH LOAD		
CU-2	60.56	KVA
NOTE: CU-1A AND CU-1B ARE NOT INCLUDED IN THE CALCUATION SINCE THEY ARE EXISTING UNITS BEING REPLACED WITH MORE EFFICIENT UNITS.		
TENANT IMPROVEMENT ADDED DESIGN LOAD	252.51	KVA
NEW CALCULATED DEMAND LOAD FOR MSP	410.3	KVA
	1139	A @208V, 3P



2 SINGLE LINE DIAGRAM
NONE

	FEEDER SCHEDULE COPPER: 3 PHASE, 3 WIRE + GROUND					FEEDER SCHEDULE COPPER: 3 PHASE, 4 WIRE + GROUND				
NOMINAL AMPACITY	TAG	NUMBER OF SETS	CONDUIT SIZE (MIN)	PHASE CONDUCTORS (AWG or kcmil)	GROUND CONDUCTOR (AWG or kcmil)	TAG	NUMBER OF SETS	CONDUIT SIZE (MIN)	PHASE & NEUTRAL CONDUCTORS (AWG or kcmil)	GROUND CONDUCTOR (AWG or kcmil)
20	203	1	1/2"	(3) 12	12	204	1	1/2"	(4) 12	12
30	303	1	1/2"	(3) 10	10	304	1	3/4"	(4) 10	10
40	403	1	3/4"	(3) 8	10	404	1	3/4"	(4) 8	10
50	503	1	3/4"	(3) 6	10	504	1	1"	(4) 6	10
60	603	1	3/4"	(3) 6	10	604	1	1"	(4) 6	10
70	703	1	1"	(3) 4	8	704	1	1 1/4"	(4) 4	8
80	803	1	1 1/4"	(3) 3	8	804	1	1 1/4"	(4) 3	8
90	903	1	1 1/4"	(3) 3	8	904	1	1 1/4"	(4) 3	8
100	1003	1	1 1/4"	(3) 2	8	1004	1	1 1/4"	(4) 2	8
110	1103	1	1 1/2"	(3) 1	6	1104	1	1 1/2"	(4) 1	6
125	1253	1	1 1/2"	(3) 1	6	1254	1	1 1/2"	(4) 1	6
150	1503	1	1 1/2"	(3) 1/0	6	1504	1	2"	(4) 1/0	6
175	1753	1	2"	(3) 2/0	6	1754	1	2"	(4) 2/0	6
200	2003	1	2"	(3) 3/0	6	2004	1	2"	(4) 3/0	6
225	2253	1	2"	(3) 4/0	4	2254	1	2 1/2"	(4) 4/0	4
250	2503	1	2"	(3) 4/0	4	2504	1	2 1/2"	(4) 250	3
300	3003	1	2 1/2"	(3) 250	4	3004	1	3"	(4) 350	2
350	3503	1	2 1/2"	(3) 350	3	3504	1	3 1/2"	(4) 500	1
400	4003	2	2"	(3) 3/0	3	4004	2	2"	(4) 3/0	3
450	4503	2	2"	(3) 4/0	2	4504	2	2 1/2"	(4) 4/0	2
500	5003	2	2"	(3) 4/0	2	5004	2	3"	(4) 250	1
600	6003	2	2 1/2"	(3) 250	1	6004	2	3"	(4) 350	2/0
800	8003	2	3"	(3) 500	1/0	8004	3	3"	(4) 350	2/0
1000	10003	3	3"	(3) 500	2/0	10004	3	4"	(4) 500	2/0
1200	12003	4	3"	(3) 350	3/0	12004	4	4"	(4) 500	250
1600	16003	4	4"	(3) 750	4/0	16004	5	4"	(4) 500	4/0
2000	20003	5	4"	(3) 750	250	20004	6	4"	(4) 500	250
2500	25003	6	4"	(3) 750	350	25004	8	4"	(4) 500	350
3000	30003	7	4"	(3) 750	500	30004	9	4"	(4) 500	500
4000	40003	9	4"	(3) 750	500	40004	12	4"	(4) 500	500

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PERMIT SET

project:
CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

consultants:
PAE
pae-engineers.com

revisions:
Description Date

date: 04/25/25
project: 00524
drawn by: HLB
checked by: ELR

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Facet Architects PC

DIAGRAMS - ELECTRICAL

sheet: E-701
of:

(E) PANELBOARD: 2B

LOCATION: JANITOR 1140
SUPPLY FROM: MSP
MOUNTING: SURFACE
ENCLOSURE: NEMA-1

VOLTS: 208Y/120V 3PH 4W+G
PHASES: 3
WIRES: 4
SUB FEED LUGS: No

A.I.C. RATING: 0 A
BUS RATING: 125 A
MAINS TYPE: MLO
MCB RATING: N/A

CKT	CIRCUIT DESCRIPTION	LOAD CLASS.	TRIP (A)	POLES	A (VA)		B (VA)		C (VA)		POLES	TRIP (A)	LOAD CLASS.	CIRCUIT DESCRIPTION	CKT
1	LIGHTING	LTG	20	1	1,866	0					1	20	--	EXISTING LOAD	2
3	LIGHTING	LTG	20	1			1,698	0			1	20	--	EXISTING LOAD	4
5	LIGHTING	LTG	20	1					1,629	0	1	20	--	EXISTING LOAD	6
7	LIGHTING	LTG	20	1	1,754	0					1	20	--	EXISTING LOAD	8
9	LIGHTING	LTG	20	1			1,866	0			1	20	--	EXISTING LOAD	10
11	EXISTING LOAD	--	20	1					0	0	1	20	--	EXISTING LOAD	12
13	EXISTING LOAD	--	20	1	0	0					1	20	--	EXISTING LOAD	14
15	EXISTING LOAD	--	20	1			0	893			1	20	LTG	INV-2	16
17	EXISTING LOAD	--	20	1					0	0	1	20	--	EXISTING LOAD	18
19	EXISTING LOAD	--	20	1	0	0					1	20	--	EXISTING LOAD	20
21	EXISTING LOAD	--	20	1			0	0			1	20	--	EXISTING LOAD	22
23	EXISTING LOAD	--	20	1					0	0	1	20	--	EXISTING LOAD	24
25	EXISTING LOAD	--	20	1	0	0					3	20	--	(E) EF-1	26
27	UH-102 - VEST 1500	ELHT	30	2			2,000	0							28
29									2,000	0					30
				TOTAL LOAD (VA):	3,621		6,458		3,629						
				TOTAL LOAD (A):	30		54		30						

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	CALCULATED DEMAND	PANEL TOTALS	
LTG	9,707 VA	125.00%	12,134 VA		
ELHT	4,000 VA	125.00%	5,000 VA	CONNECTED:	13,707 VA
				CALCULATED DEMAND:	17,134 VA
				CONNECTED:	38 A
				CALCULATED DEMAND:	48 A

NOTES:

PANELBOARD: 2A

LOCATION: OPEN OFFICE 1118
SUPPLY FROM: MSP
MOUNTING: FLUSH
ENCLOSURE: NEMA-1

VOLTS: 208Y/120V 3PH 4W+G
PHASES: 3
WIRES: 4
SUB FEED LUGS: No

A.I.C. RATING: 0 A
BUS RATING: 225 A
MAINS TYPE: MLO
MCB RATING: N/A

CKT	CIRCUIT DESCRIPTION	LOAD CLASS.	TRIP (A)	POLES	A		B		C		POLES	TRIP (A)	LOAD CLASS.	CIRCUIT DESCRIPTION	CKT
1	INV-1	LTG	20	1	893	1,080					1	20	PREC	PP - OPEN OFFICE 1118	2
3	LIGHTING	LTG	20	1			1,782	1,080			1	20	PREC	REC - OFFICE 1121 / QUIET ROOM 1120	4
5	LIGHTING	LTG	20	1					1,209	1,080	1	20	PREC	PP - OPEN OFFICE 1118	6
7	LIGHTING	LTG	20	1	820	1,080					1	20	PREC	PP - OPEN OFFICE 1118	8
9	LIGHTING	LTG	20	1			1,597	1,080			1	20	PREC	PP - OPEN OFFICE 1118	10
11	REC - CONF 1126 / OFFICE 1124 1125	PREC	20	1					1,080	1,080	1	20	PREC	PP - OPEN OFFICE 1118	12
13	EXISTING LOAD	--	20	1	0	1,080					1	20	PREC	PP - OPEN OFFICE 1118	14
15	EXISTING LOAD	--	20	1			0	1,080			1	20	PREC	PP - OPEN OFFICE 1118	16
17	EXISTING LOAD	--	20	1					0	1,080	1	20	PREC	PP - OPEN OFFICE 1118	18
19	EXISTING LOAD	--	20	1	0	0					1	20	--	EXISTING LOAD	20
21	EXISTING LOAD	--	20	1			0	0			1	20	--	EXISTING LOAD	22
23	EXISTING LOAD	--	20	1					0	0	1	20	--	EXISTING LOAD	24
25	EXISTING LOAD	--	20	1	0	1,080					1	20	PREC	PP - OPEN OFFICE 1118	26
27	EXISTING LOAD	--	20	1			0	0			1	20	--	EXISTING LOAD	28
29	EXISTING LOAD	--	20	1					0	1,080	1	20	PREC	PP - OPEN OFFICE 1118	30
31	EXISTING LOAD	--	20	1	0	1,080					1	20	PREC	PP - OPEN OFFICE 1118	32
33	EXISTING LOAD	--	20	1			0	1,080			1	20	PREC	PP - OPEN OFFICE 1118	34
35	EXISTING LOAD	--	20	1					0	1,080	1	20	PREC	PP - OPEN OFFICE 1118	36
37	REC - OFFICE 1122 1121	PREC	20	1	1,080	1,080					1	20	PREC	PP - OPEN OFFICE 1118	38
39	EXISTING LOAD	--	50	2			0	0			1	20	--	EXISTING LOAD	40
41									0	0	1	20	--	EXISTING LOAD	42
43	PP - OPEN OFFICE 1118	PREC	20	1	1,080	1,080					1	20	PREC	PP - OPEN OFFICE 1118	44
45	PP - OPEN OFFICE 1118	PREC	20	1			1,080	1,000			1	20	PNON	REC - OPEN OFFICE 1118 PRINTER	46
47	PP - OPEN OFFICE 1118	PREC	20	1					1,080	360	1	20	PREC	REC - KITCHEN 1118	48
49	PP - OPEN OFFICE 1118	PREC	20	1	1,080	540					1	20	PREC	REC - OPEN OFFICE 118 CORRIDOR	50
51	PP - OPEN OFFICE 1118	PREC	20	1			1,080	0			1	20	--	SPARE	52
53	PP - OPEN OFFICE 1118	PREC	20	1					1,080	0	1	20	--	SPARE	54
55	PP - OPEN OFFICE 1118	PREC	20	1	1,080	0					1	20	--	SPARE	56
57	PP - OPEN OFFICE 1118	PREC	20	1			1,080	0			1	20	--	SPARE	58
59	PP - OPEN OFFICE 1118	PREC	20	1					1,080	0	1	20	--	SPARE	60
				TOTAL LOAD (VA):	14,133		11,939		11,289						
				TOTAL LOAD (A):	119		100		94						

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	CALCULATED DEMAND	PANEL TOTALS	
LTG	6,301 VA	125.00%	7,876 VA		
PNON	1,000 VA	100.00%	1,000 VA	CONNECTED:	37,361 VA
PREC	30,060 VA	66.63%	20,030 VA	CALCULATED DEMAND:	28,906 VA
				CONNECTED:	104 A
				CALCULATED DEMAND:	80 A

NOTES:

(E) PANELBOARD: 2B1

LOCATION: JANITOR 1140
SUPPLY FROM: MSP
MOUNTING: SURFACE
ENCLOSURE: NEMA-1

VOLTS: 208Y/120V 3PH 4W+G
PHASES: 3
WIRES: 4
SUB FEED LUGS: No

A.I.C. RATING: 0 A
BUS RATING: 125 A
MAINS TYPE: MLO
MCB RATING: N/A

CKT	CIRCUIT DESCRIPTION	LOAD CLASS.	TRIP (A)	POLES	A (VA)		B (VA)		C (VA)		POLES	TRIP (A)	LOAD CLASS.	CIRCUIT DESCRIPTION	CKT
1	REC - MW 1113	PNON	20	1	750	750					1	20	PNON	REC - DW 1143	2
3	REC - KITCHEN 1113	PNON	20	1			500	750			1	20	PNON	REC - KITCHEN 1143	4
5	REC - DW 1113	PNON	20	1					750	1,000	1	20	PNON	REC - OVN 1143	6
7	REC - KITCHEN 1113	PREC	20	1	900	750					1	20	PNON	REC - MW 1143	8
9	REC - OVN 1113	PNON	20	1			1,000	750			1	20	PNON	REC - MW 1143	10
11	REC - KITCHEN 1113	PREC	20	1					540	1,000	1	20	PNON	REC - KITCHEN 1143	12
13	EXISTING LOAD	--	40	3	0	500					1	20	PNON	REC - KITCHEN 1143	14
15							0	1,000			1	20	PNON	REC - VM 1143	16
17									0	1,000	1	20	PNON	REC - VM 1143	18
19	REC - KITCHEN 1143	PREC	20	1	900	750					1	20	PNON	IH-1 - BREAKROOM 1143	20
21	REC - COF 1143	PNON	20	1			500	471			2	20	HVAC	EF-202 - ROOF	22
23	EXISTING LOAD	--	20	1					0	471					24
25	REC - ICE 1143	PNON	20	1	750	1,294					2	20	HVAC	EF-203 - ROOF	26
27	WATER HEATER	--	20	2			0	1,294							28
29									0	360	1	20	PREC	REC - BREAKROOM 1143 COUNTERTOP	30
				TOTAL LOAD (VA):	7,344		6,265		5,121						
				TOTAL LOAD (A):	63		54		43						

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	CALCULATED DEMAND	PANEL TOTALS	
HVAC	3,530 VA	118.33%	4,177 VA		
PNON	12,500 VA	100.00%	12,500 VA	CONNECTED:	18,730 VA
PREC	2,700 VA	100.00%	2,700 VA	CALCULATED DEMAND:	19,377 VA
				CONNECTED:	52 A
				CALCULATED DEMAND:	54 A

NOTES:

PANELBOARD: 2A1

LOCATION: OPEN OFFICE 1118
SUPPLY FROM: MSP
MOUNTING: FLUSH
ENCLOSURE: NEMA-1

VOLTS: 208Y/120V 3PH 4W+G
PHASES: 3
WIRES: 4
SUB FEED LUGS: No

A.I.C. RATING: 0 A
BUS RATING: 225 A
MAINS TYPE: MLO
MCB RATING: N/A

CKT	CIRCUIT DESCRIPTION	LOAD CLASS.	TRIP (A)	POLES	A		B		C		POLES	TRIP (A)	LOAD CLASS.	CIRCUIT DESCRIPTION	CKT
1	EXISTING LOAD	--	20	1	0	180					1	20	PREC	REC - SSP RECEPTION 1102	2
3	EXISTING LOAD	--	20	1			0	1,080			1	20	PREC	REC - SSP RECEPTION 1102	4
5	EXISTING LOAD	--	20	1					0	1,080	1	20	PREC	REC - SSP RECEPTION 1102	6
7	EXISTING LOAD	--	20	1	0	580					1	20	PNON; PREC	REC - RESTROOM 1141	8
9	EXISTING LOAD	--	20	1			0	480			1	20	PNON; PREC	REC - RESTROOM 1141	10
11	EXISTING LOAD	--	20	1					0	720	1	20	PREC	REC - HALL 1522 1521	12
13	REC - CONF 1134	PREC	20	1	900	1,080					1	20	PREC	REC - INTERVIEW 1172 / MOTHERS 1171	14
15	REC - OFFICE 1135 / FOSTER 1136	PREC	20	1			1,080	300			1	20	PNON	REC - MOTHERS 1171	16
17	REC - HALL 1504 1514	PNON; PREC	20	1					1,020	1,080	1	20	PREC	PP - OPEN OFFICE 1118	18
19	REC - VISIT 1116 / VIEW 1115	PREC	20	1	1,260	1,080					1	20	PREC	PP - OPEN OFFICE 1118	20
21	REC - VIEW 1115 / VISIT 1114	PREC	20	1			1,080	1,080			1	20	PREC	PP - OPEN OFFICE 1118	22
23	REC - VIEW 1111	PREC	20	1					720	1,080	1	20	PREC	PP - OPEN OFFICE 1118	24
25	REC - RESTROOM 1119	PNON; PREC	20	1	480	1,080					1	20	PREC	PP - OPEN OFFICE 1118	26
27	REC - RESTROOM 1119	PNON; PREC	20	1			580	1,080			1	20	PREC	PP - OPEN OFFICE 1118	28
29	REC - VISIT 1112	PREC	20	1					720	1,080	1	20	PREC	PP - OPEN OFFICE 1118	30
31	REC - CHILD WELFARE RECEPTION 1103	PREC	20	1	720	1,080					1	20	PREC	PP - OPEN OFFICE 1118	32
33	REC - CHILD WELFARE RECEPTION 1103	PREC	20	1			180	1,080			1	20	PREC	PP - OPEN OFFICE 1118	34
35	REC - TOILET 1105 1104	PNON	20	1					600	1,080	1	20	PREC	PP - OPEN OFFICE 1118	36
37	REC - INTERVIEW 1109 1108	PREC	20	1	1,080	1,080					1	20	PREC	PP - OPEN OFFICE 1118	38
39	REC - KIDS 1107 / DV INTERVIEW 1106	PREC	20	1			1,080	1,080			1	20	PREC	PP - OPEN OFFICE 1118	40
41	REC - HALL 1501 1502 / LOBBY 1101	PREC	20	1					1,080	2,000	2	30	ELHT	UH-101 - VEST 1510	42
43	BF-1 - HALL 1509/LOBBY 1101	PNON	20	1	1,200	2,000									44
45	BF-1 - HALL 1521	PNON	20	1			600	728			2	20	HVAC	ACCU-201 - ROOF	46
47	WASHING MACHINE - CLEAN UP 1138	PNON	20	1					1,000	728					48
49	DRYER - CLEAN UP 1138	PNON	30	2	1,500	17,160					2	20	HVAC	ACCU-202 - ROOF	50
51							1,500	17,160							52
53	EF-201 - ROOF	HVAC	20	2					471	0	1	20	--	SPARE	54
55					471	0					1	20	--	SPARE	56
57	EF-206 - ROOF	HVAC	20	2			471	0			1	20	--	SPARE	58
59									471	0	1	20	--	SPARE	60
				TOTAL LOAD (VA):	32,931		30,639		14,929						
				TOTAL LOAD (A):	295		275		124						

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	CALCULATED DEMAND	PANEL TOTALS	
HVAC	37,659 VA	122.78%	46,239 VA		
PNON	8,400 VA	100.00%	8,400 VA	CONNECTED:	78,499 VA
ELHT	4,000 VA	125.00%	5,000 VA	CALCULATED DEMAND:	78,859 VA
PREC	28,440 VA	67.58%	19,220 VA	CONNECTED:	218 A
				CALCULATED DEMAND:	219 A

NOTES:

FACET ARCHITECTS
Formerly Carlson Veit Junge Architects
3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED PROFESSIONAL ENGINEER 94513PE OREGON JAN. 08, 2019 ERIC LORAIN REED
4/25/2025
EXPIRES: 12/31/2026

PERMIT SET

project: CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNVILLE, OR 97128

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revisions:

	Description	Date

date: 04/25/25
project: 00524
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checked by: ELR

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PANEL SCHEDULES - ELECTRICAL

sheet: E-801

of:

(E) PANELBOARD: 2B2

LOCATION: JANITOR 1140
SUPPLY FROM: MSP
MOUNTING: SURFACE
ENCLOSURE: NEMA-1

VOLTS: 208Y/120V 3PH 4W+G
PHASES: 3
WIRES: 4
SUB FEED LUGS: No

A.I.C. RATING: 0 A
BUS RATING: 125 A
MAINS TYPE: MLO
MCB RATING: N/A

CKT	CIRCUIT DESCRIPTION	LOAD CLASS.	TRIP (A)	POLES	A (VA)		B (VA)		C (VA)		POLES	TRIP (A)	LOAD CLASS.	CIRCUIT DESCRIPTION	CKT
1	REC - BREAKROOM 1143 / OFFICE...	PREC	20	1	1,080	1,080					1	20	PREC	REC - OPEN OFFICE 1160	2
3	REC - CONF 1144	PREC	20	1			900	1,080			1	20	PREC	REC - OPEN OFFICE 1160	4
5	REC - CONF 1144	PREC	20	1					900	1,080	1	20	PREC	REC - OPEN OFFICE 1160	6
7	REC - CONF 1145	PREC	20	1	1,080	1,080					1	20	PREC	REC - OPEN OFFICE 1160	8
9	FL BOX - CONF 1145	PNON	20	1			1,080	1,080			1	20	PREC	REC - OPEN OFFICE 1160	10
11	PARTITION WALL - CONF 1145	PNON	20	1					500	900	1	20	PREC	REC - FAMILY MEETING 1163	12
13	REC - CONF 1145	PREC	20	1	1,080	1,080					1	20	PREC	REC - OPEN OFFICE 1146	14
15	REC - STORAGE 1147 / BREAK 1162	PREC	20	1			1,080	1,080			1	20	PREC	REC - OPEN OFFICE 1146	16
17	IT RACK - STORAGE 1147	PNON	20	2					500	180	1	20	PREC	REC - OPEN OFFICE 1160	18
19					500	901					3	20	HVAC	EF-204 - ROOF	20
21	REC - INTERVIEW 1169 1168	PREC	20	1			1,080	901							22
23	REC - INTERVIEW 1170 1167	PREC	20	1					1,080	901					24
25	REC - INTERVIEW 1165 1166	PREC	20	1	1,080	893					1	20	LTG	INV-3	26
27	REC - INTERVIEW 1164 / OPEN OFFICE...	PREC	20	1			900	300			1	20	PNON	HAND DRYER - CLEAN UP 1138	28
29	REC - OPEN OFFICE 1160	PREC	20	1					1,080	0	1	20	--	SPARE	30
				TOTAL LOAD (VA):	9,854		9,481		7,121						
				TOTAL LOAD (A):	85		82		59						

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	CALCULATED DEMAND	PANEL TOTALS	
HVAC	2,702 VA	125.00%	3,377 VA		
LTG	893 VA	125.00%	1,116 VA	CONNECTED:	26,455 VA
PNON	2,880 VA	100.00%	2,880 VA	**CALCULATED DEMAND:**	**22,364 VA**
PREC	19,980 VA	75.03%	14,990 VA	CONNECTED:	73 A
				CALCULATED DEMAND:	**62 A**

NOTES:

PANELBOARD: 2C1

LOCATION: HALL 1530
SUPPLY FROM: 2C
MOUNTING: FLUSH
ENCLOSURE: NEMA-1

VOLTS: 208Y/120V 3PH 4W+G
PHASES: 3
WIRES: 4
SUB FEED LUGS: No

A.I.C. RATING: 0 A
BUS RATING: 100 A
MAINS TYPE: MLO
MCB RATING: N/A

CKT	CIRCUIT DESCRIPTION	LOAD CLASS.	TRIP (A)	POLES	A (VA)		B (VA)		C (VA)		POLES	TRIP (A)	LOAD CLASS.	CIRCUIT DESCRIPTION	CKT
1	REC - JOBS 1150	PREC	20	1	720	1,080					1	20	PREC	REC - OPEN OFFICE 1159	2
3	REC JOBS 1150	PREC	20	1			720	1,080			1	20	PREC	REC - OPEN OFFICE 1159	4
5	REC STORAGE 1151 / JOBS 1150	PREC	20	1					540	1,080	1	20	PREC	REC - OPEN OFFICE 1159	6
7	REC - HALL 1531	PREC	20	1	720	1,080					1	20	PREC	REC - OPEN OFFICE 1159	8
9	REC - OFFICE 1153	PREC	20	1			720	1,080			1	20	PREC	REC - OPEN OFFICE 1159	10
11	REC - OFFICE 1154	PREC	20	1					720	1,080	1	20	PREC	REC - OPEN OFFICE 1159	12
13	REC - OFFICE 1155	PREC	20	1	720	1,080					1	20	PREC	REC - FURNITURE 1159	14
15	REC - CONF 1152	PREC	20	1			360	1,080			1	20	PREC	REC - OPEN OFFICE 1159	16
17	REC - OPEN OFFICE 1159	PREC	20	1					1,080	180	1	20	PREC	REC - OPEN OFFICE 1159	18
19	REC - OPEN OFFICE 1159	PREC	20	1	1,080	0					1	20	--	SPARE	20
21	REC - OPEN OFFICE 1159	PREC	20	1			1,080	0			1	20	--	SPARE	22
23	REC - OPEN OFFICE 1159	PREC	20	1					1,080	0	1	20	--	SPARE	24
25	REC - OPEN OFFICE 1159	PREC	20	1	1,080	0					1	20	--	SPARE	26
27	REC - OPEN OFFICE 1159	PREC	20	1			1,080	0			1	20	--	SPARE	28
29	REC - OPEN OFFICE 1159	PREC	20	1					1,080	0	1	20	--	SPARE	30
31	SPARE	--	20	1	0	0					1	20	--	SPARE	32
33	SPARE	--	20	1			0	0			1	20	--	SPARE	34
35	SPARE	--	20	1					0	0	1	20	--	SPARE	36
37	SPARE	--	20	1	0	0					1	20	--	SPARE	38
39	SPARE	--	20	1			0	0			1	20	--	SPARE	40
41	SPARE	--	20	1					0	0	1	20	--	SPARE	42
				TOTAL LOAD (VA):	7,560		7,200		6,840						
				TOTAL LOAD (A):	63		60		57						

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	CALCULATED DEMAND	PANEL TOTALS	
PREC	21,600 VA	73.15%	15,800 VA		
				CONNECTED:	21,600 VA
				CALCULATED DEMAND:	**15,800 VA**
				CONNECTED:	60 A
				CALCULATED DEMAND:	**44 A**

NOTES:

(E) PANELBOARD: 2C

LOCATION: HALL 1530
SUPPLY FROM: MSP
MOUNTING: FLUSH
ENCLOSURE: NEMA-1

VOLTS: 208Y/120V 3PH 4W+G
PHASES: 3
WIRES: 4
SUB FEED LUGS: No

A.I.C. RATING: 0 A
BUS RATING: 225 A
MAINS TYPE: MLO
MCB RATING: N/A

CKT	CIRCUIT DESCRIPTION	LOAD CLASS.	TRIP (A)	POLES	A (VA)		B (VA)		C (VA)		POLES	TRIP (A)	LOAD CLASS.	CIRCUIT DESCRIPTION	CKT
1	EF-205 - ROOF	HVAC	20	2	471	0					1	20	--	EXIT LIGHTS	2
3							471	0			1	20	--	LIGHTS	4
5	SPARE	--	20	1					0	0	1	20	--	LIGHTS	6
7	WATER HEATER	--	20	1	0	0					1	20	--	LIGHTS	8
9	BATHROOM FAN	--	20	1			0	0			2	20	--	SPARE	10
11	EF-207 - ROOF	HVAC	20	2					471	0					12
13					471	0					1	20	--	SPARE	14
15	UH-103 - VEST 1540	ELHT	30	2			2,000	0			1	20	--	SPARE	16
17									2,000	0	1	20	--	SPARE	18
19	ACCU-203 - ROOF	HVAC	20	2	1,941	0					1	20	--	SPARE	20
21							1,941	0			1	20	--	SPARE	22
23	SPARE	--	20	1					0	0	1	20	--	SPARE	24
25	SPARE	--	20	1	0	7,560					3	100	Spare; PREC	2C1	26
27	SPARE	--	20	1			0	7,200							28
29	SPARE	--	20	1					0	6,840					30
				TOTAL LOAD (VA):	10,443		11,612		9,311						
				TOTAL LOAD (A):	88		98		78						

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	CALCULATED DEMAND	PANEL TOTALS	
HVAC	5,765 VA	116.84%	6,736 VA		
ELHT	4,000 VA	125.00%	5,000 VA	CONNECTED:	31,365 VA
PREC	21,600 VA	73.15%	15,800 VA	**CALCULATED DEMAND:**	**27,536 VA**
				CONNECTED:	87 A
				CALCULATED DEMAND:	**76 A**

NOTES:

FACET ARCHITECTS
Formerly Carlson Veit Junge Architects
3095 River Road N Salem, OR 97303 / 503.390.0281

REGISTERED PROFESSIONAL ENGINEER 94513PE OREGON JAN. 08, 2019 ERIC LORAIN REED
4/25/2025
EXPIRES: 12/31/2026

project:
CCC - YVC CAMPUS BUILDING 2 - DHS TI
368 NE NORTON LN
MCMINNINVILLE, OR 97128

consultants:
PAE pae-engineers.com

revisions:

#	Description	Date

date: 04/25/25
project: 00524
drawn by: HLB
checked by: ELR

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PANEL SCHEDULES - ELECTRICAL

sheet: E-802

of: