HMC 8EH Burn Upgrades

Project No. 206970
March 16, 2020

UNIVERSITY OF WASHINGTON
Facilities – Project Delivery Group

ARCHITECTURAL
Ankrom Moisan Architects

MECHANICAL
Sazan Group

ELECTRICAL
Stantec

ENVIRONMENTAL
PBS
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END OF SECTION
University of Washington
HMC 8EH Burn Upgrades, UW #206970
Date of Bid Opening: July 2, 2020

**Bid Submittal:** The University of Washington is taking precautions to limit exposure and impacts related to COVID-19. To comply with the Governor’s “Stay Home, Stay Healthy” mandate, the requirement to submit a sealed bid is waived. Bids will be received by the University of Washington, Project Delivery Group, by email at PDGbids@uw.edu.

The Bid Form will be received via email up to 3:00pm on July 2, 2020. Bids will then be publicly opened and read aloud via Zoom Version 5.0 (required) (https://washington.zoom.us/j/95798647153, Meeting ID: 957 9864 7153, One tap mobile: +12532158782,95798647153# US (Tacoma), +13462487799,94971613183# US (Houston). Bids received after the date and hour above stated will not receive consideration. Attendance in person is not allowed.

The mailing address of the office is Project Delivery Group, University of Washington, Box 352205, Seattle WA 98195-2205.

The Bid Form will be received up to 3:00 p.m. on July 2, 2020. Bids will then be publicly opened and read aloud. Bids received after the date and hour above stated will not receive consideration.

Only bidders who are on the Critical Patient Care Roster A at the time of bid receipt may bid on this project.
Bids will be received by the University of Washington at the above mentioned time and place.

**Project Description:** The project includes the following work: Interior alterations of approximately 1700sf of existing spaces in the Pediatric Burn Unit on Level 8 of the East Hospital building of the Harborview campus.

All construction operations must comply with the most current Covid 19 related rules and guidance from the Governor’s Office, including the most recent “Stay Home, Stay Healthy” addendum, dated April 24, 2020, and additional guidance issued April 29, 2020. All activities must also comply with all related and applicable requirements issued by the Washington State Department of Labor and Industries and Public Health Agencies having jurisdiction.

**Questions:** Questions about this project should be directed to:

A/E Name: Ankrom Moisan Architects
Contact Person: Britt Beushausen
Phone Number: 206-876-3036

**Pre-Bid Site Meeting:** The Project site is available for inspection by prospective bidders at a pre-bid site meeting and walk-through at 1:00 pm on June 26, 2020 at Harborview Medical Center, Pat Steel Bldg. Room PS 2005 located at 401 Broadway, Seattle WA 98104. This will be the only opportunity for bidders to visit the Project site.
Bid Documents: Bidders may obtain or access plans, specifications, and addenda for this project at https://facilities.uw.edu/projects/business-opportunities/solicitations. Contractors who would like to be included on the Planholder’s list shall either attend a pre-bid meeting or request to be added by emailing PDGbids@uw.edu.

Bid Guarantee: A surety company bid bond on a form acceptable to Owner, a cashier's check or a certified check payable to the order of University of Washington, or cash, shall accompany each bid in an amount not less than five percent (5%) of the Base Bid. No bidder may withdraw its bid after the hour set for the opening thereof, unless the award of the contract is delayed for a period exceeding 60 days.

MWBE: The Owner is committed to providing the maximum practicable opportunity for participation in contracting by Office of Minority and Women’s Business Enterprises (OMWBE) certified and non-OMWBE certified small business entities (sbe), disadvantaged business enterprises (db e), minority business enterprises (MBE), women’s business enterprises (WBE), and minority women’s business enterprises (MWBE) in public works projects. Participation may be either on a direct basis or as a subcontractor or supplier. The Owner has established aspirational goals for combined sbe/db e/MBE/WBE/MWBE participation of 3% for Group A Roster projects and 5% for Group B Roster projects, based on projected subcontracting opportunities; however, no minimum level of combined sbe/db e/MBE/WBE/MWBE participation shall be required as a condition for receiving an award.

Solicitation of Proposals from OMWBE Certified Firms: As required by RCW 28B.20.744(10), contractors shall solicit proposals from OMWBE certified firms. Within fourteen (14) days after the issuance of the Notice to Proceed, the Contractor shall submit to the Owner a report documenting that the Contractor solicited proposals from OMWBE certified firms. The report shall include the names and contact information for all firms, and the dates of solicitation.

Safety Plans: Prior to the issuance of the Notice to Proceed, the Contractor will be required to submit to the Owner a copy of its company safety program. See Modifications to the General Conditions, Part 5 for details.

The Owner reserves the right to reject any or all bids and to waive as an informality any irregularities in the bids received.
00 21 00  INSTRUCTIONS FOR BIDDERS

1. CONTRACTOR'S REGISTRATION

   All bidders must be registered by the Washington State Department of Labor and Industries in accordance with R.C.W. 18.27.020.

2. SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK

   A. Bidder acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the Work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the Work or its cost.

   B. The Project site is available for inspection for prospective bidders at a pre-bid site meeting and walk-through, as indicated in the Request for Bids, and existing conditions should be examined. This will be the only opportunity for bidders to visit the project site.

   C. Bidder acknowledges that it has satisfied itself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by Owner, as well as from the drawings and specifications made a part of these Contract Documents.

   D. Bidder acknowledges that adjoining areas will be conducting normal operations during the work. Bidder should anticipate pedestrian and traffic congestion, limited parking, and the requirement that the work be coordinated with ongoing operations.

   E. Bidder acknowledges that its bid is based upon a schedule and assumptions which incorporate these conditions.

   F. Owner assumes no responsibility for any conclusions or interpretations made by bidder based on the information made available by Owner. Should a bidder find discrepancies or omissions in the drawings or specifications, or should bidder be in doubt as to their meaning, bidder shall at once notify the Owner. If appropriate, Owner will send written instructions to all bidders by addenda. Questions received less than 10 days before the time of bid opening may not be answered. All addenda issued shall be incorporated into these Contract Documents.

3. PREPARATION OF BIDS

   Bidder shall comply with the following instructions in preparing its bid.

   A. The name, address, and Contractor's license number of bidder shall be typed or printed on the bid in the space provided.

      Bids must be (1) submitted on the forms furnished by Owner or on copies of those forms, and (2) manually signed in ink.

   B. Bidders shall submit bids in the format provided in the Bid Form. Only the amounts and information asked for in the Bid Form furnished will be considered as the bid. All blank spaces must be filled in.

   C. Bidder shall bid upon all alternates indicated in the Bid Form. When bidding on alternates for which there is no charge, bidder shall write the words "No Charge" in the space provided on the Bid Form. If a bidder fails to bid an alternate, or notes "no bid," it will be construed as meaning that there will be no change in the Contract Sum and that the alternate is included in the contract Sum. Alternate bids will not be considered unless requested in the Bid Form.
D. The cost of trench safety systems for trench excavation that exceeds a depth of four feet must be identified as a lump sum amount on the Bid Form as well as included in the Base Bid amount. The costs of trench safety systems shall not be considered as incidental to any other contract item, and any attempt to include the trench safety systems as an incidental cost is prohibited. Identification of this amount is an acknowledgment that the bidder has considered proper safety provisions in the estimate but does not relieve the bidder of responsibility for full compliance with all laws and statutes regardless of their actual cost. If this project will involve trench excavation in excess of a depth of four feet, bidder must include a lump sum dollar amount. “N/A” and ‘zero” are not responsive.

E. Bidders shall acknowledge all addenda by identifying the addendum number(s) in the space provided on the Bid Form. Notwithstanding any automatic notification methods utilized by Bidder, Bidder is responsible for checking Owner’s bid posting website for any addenda issued up to and until the bid opening date and time specified in Section 00 11 00.

F. Bidder shall include in the bid all allowances provided in the Bid Form. Owner will pay the difference if the actual cost exceeds the allowance.

4. TAXES

The bid shall include all taxes imposed by law except Washington State Sales Tax. Sales tax shall not be included in the bid price, except that the retail sales tax upon sales and rentals to prime contractors and subcontractors of tools, equipment, and material primarily for use by the Contractor rather than for resale as a component part of the finished structure, shall be included in the bid price. A proportionate amount of State sales tax will be added to each progress payment, collected from Owner, and paid to the State by Contractor.

5. BID GUARANTEE

Bidder shall furnish a bid guarantee in the form of a firm commitment, such as bid bond, postal money order, cash or cashier's check payable to Owner, in the amount of at least 5% of the base bid. Owner reserves the right to hold the bid guarantees of all bidders until the successful bidder has entered into the contract and furnished the required bonds and insurance certificates, or for a period of 60 days, whichever is the shorter time.

6. FILING FEES

Applicable state laws concerning prevailing wages, hours, workers' compensation and other conditions of employment are called to the attention of bidders for their compliance. Bidder shall include in the bid any filing fees required to comply with applicable labor laws.

7. SPECIFIED PRODUCTS

Bids must be based upon use of items named in the specifications, or approved equals or substitutions. In certain cases, specific items have been named because of operational or maintenance considerations; approval of equals or substitutions should not be assumed.

Requests for approval of equals or substitutions must be made in writing and received by the A/E at least 10 days prior to the date of bid opening. Said request must include complete descriptions, technical data, and performance records. Any approval of the proposed equal or substitution will be made by addendum issued to all bidders. See Section 01 25 00, Substitution Procedures, for instructions.

8. SUBMISSION AND WITHDRAWAL OF BIDS
A. Bids and bid modifications shall be submitted in sealed envelopes or packages (1) addressed to the office specified in the request for bids and (2) showing the project title, bid opening date and time, and the name and address of bidder.

B. Bids may be modified if in writing and received before bid opening time.

C. Receipt of bids and bid modifications by telegraph, facsimile, telephone, or orally will not be considered.

D. A bidder may withdraw its bid by submitting a written request before the bid opening time. Owner will return the bid unopened after Contract award.

9. LATE SUBMISSIONS

A. Any bid, bid modification or request to withdraw a bid which is received after bid opening time will not be considered.

B. The only acceptable evidence to establish the time of receipt at the office designated in the request for bid is the time/date stamped or printed by Owner on the bid wrapper or other documentary evidence of receipt maintained by Owner.

10. BID EVALUATION

Bids which are incomplete, or which are conditioned in any way, or which contain erasures, alterations, or items not called for in the Bid Form, or which are not in conformity with the law or with these Instructions, shall be rejected as nonresponsive if the irregularity is material and may be rejected as nonresponsive if the irregularity is not material.

Owner reserves the right to reject any or all bids and to waive any informalities or nonmaterial irregularities in the bids received.

If the bid includes a supplemental schedule of unit prices for labor and materials, or other items for the purpose of establishing a cost basis for unforeseen contract changes, Owner reserves the right to reject, without impairing the balance of the bid, any or all such predetermined unit prices.

The determination of the low responsive bid shall be made by Owner based upon any combination of the base bid and alternates which, in Owner's sole discretion, is in Owner's best interest considering price, schedule and other factors. The numbering of the alternates in the Bid Form bears no relationship to the order in which the alternates may be selected by Owner.

11. LOW RESPONSIBLE BIDDER

A. It is the intent of Owner to award a contract to the low responsible bidder. Before award, the bidder must meet the following bidder responsibility criteria to be considered a responsible bidder. The bidder may be required by the Owner to submit documentation demonstrating compliance with the criteria. The bidder must:

1. Have a current certificate of registration in compliance with chapter 18.27 RCW, which must have been in effect at the time of bid submittal;

2. Have a current Washington Unified Business Identifier (UBI) number;

3. If applicable:
   a. Have Industrial Insurance (workers’ compensation) coverage for the bidder’s employees working in Washington, as required in Title 51 RCW;
b. Have a Washington Employment Security Department number, as required in Title 50 RCW;

c. Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;

4. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3); and

5. Within the three-year period immediately preceding the date of the bid solicitation, not have been determined by a final and binding citation and notice of assessment issued by the Washington Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provision of Chapter 49.46, 49.48, or 49.52 RCW.

B. In addition to the bidder responsibility criteria above, the bidder must also meet the following relevant supplemental bidder responsibility criteria applicable to the project:

1. **Performance Evaluations:** The Bidder shall not have received one or more overall evaluations of “Deficient” or “Inadequate” as part of the Owner’s Contractor Performance Evaluation Program.

2. **Debarment by Owner:** The Bidder shall not be currently debarred by the Owner from contracting with the Owner for having received overall evaluations of their performance of “Deficient” or “Inadequate” on three or more projects of the Owner physically completed during the preceding five (5) year period.

C. As evidence that the bidder meets the bidder responsibility criteria in paragraph B above, the apparent low bidder must submit documentation as may be required below to the Owner within 48 hours of the bid submittal deadline. The Owner reserves the right to request such documentation from other bidders also.

1. **Performance Evaluations:** The Owner shall use its own records of the Bidder’s Performance Evaluation Reports on previous projects to evaluate the Bidder’s compliance with this criterion. The bidder is not required to submit any documentation for this item, unless the bidder has information different from the Owner’s records.

2. **Debarment by Owner:** The Owner shall use its own records of debarment to evaluate the Bidder’s compliance with this criterion. The bidder is not required to submit any documentation for this item, unless the bidder has information different from the Owner’s records.

D. If the Owner determines the bidder does not meet the bidder responsibility criteria in paragraph B above and is therefore not a responsible bidder, the Owner shall notify the bidder in writing with the reasons for its determination. If the bidder disagrees with this determination, it may appeal the determination within 24 hours of receipt of the Owner’s determination by presenting additional information to the Owner. The Owner will consider the additional information before issuing its final determination. If the final determination affirms that the bidder is not responsible, the Owner will not execute a contract with any other bidder until two business days after the bidder determined to be not responsible has received the final determination.
12. CONTRACT AWARD AND EXECUTION

The formal acceptance by the Owner of the lowest responsive bid of a responsible bidder will be in the form of a notice of award of public works contract issued by the Owner to the bidder. Within 7 days of the notice of award date, bidder shall submit an executed Contract (see Appendix A); certificate of insurance and endorsements as required in the Contract Documents; and Payment and Performance Bonds using AIA Document A312, most current edition, or other form acceptable to Owner, in Contract Award Amount plus Washington State Sales Tax. If the successful bidder, after award of the Contract, fails to execute all Contract Documents or provide insurance documentation and bonds as required within the time specified, Owner may revoke award of the Contract and the bid guarantee may be retained by Owner.

13. FEDERAL EXCLUSION REQUIREMENTS

By submitting a bid for this project, Contractor hereby represents and warrants that it is not and at no time has been, excluded, suspended, or barred from participation in, or otherwise sanctioned by any federally funded health care program, including Medicare and Medicaid. Contractor hereby agrees to immediately notify the Owner of any threatened, proposed, or actual exclusion, suspension, or debarment from any federally funded health care program, including Medicare and Medicaid.

Individuals or entities that are excluded by the Office of the Inspector General from working on federally-funded programs will not be permitted to work on this project. If a contractor, including any subcontractors or suppliers, is found to be barred by the OIG, that contractor shall immediately be excluded from the jobsite and the Owner will not be responsible for any damage or delay resulting from such exclusion. Contractor should check the exclusion program of the OIG to verify that neither it nor its subcontractors or suppliers appear on the database. The database may be accessed through the OIG website at:  www.oig.hhs.gov. Upon receipt of a notice of award of contract from the Owner, Contractor shall submit a list of subcontractors and suppliers for review by Owner.

14. UNIVERSITY OF WASHINGTON’S CORPORATE COMPLIANCE PLAN

University of Washington’s Medical Center’s Corporate Compliance Plan is designed to ensure that the Hospital complies with federal, state, and local laws and regulations. It focuses on the promotion of good corporate citizenship, including a commitment to uphold the highest standard of ethical and legal business practices, and the prevention of misconduct. Contractor agrees to conduct all business transactions that occur pursuant to this contract in accordance with all applicable laws, regulations, and Hospital compliance policies, and ensure that Contractors, its officers, employees and agents do the same. Any major compliance violations would be considered a material breach of this contract.
BID FORM

TO:  Board of Regents
     University of Washington
     Seattle, Washington 98195

The undersigned Bidder submits the following bid:

BASE BID:

Pursuant to and in compliance with the Contract Documents, including the Request for Bids and Instructions for Bidders, the Bidder hereby certifies that it has, carefully examined the Contract Documents entitled:

HMC 8EH BURN UPGRADES

Prepared by ANKROM MOISAN ARCHITECTS

and the conditions affecting the Work, and being familiar with the site; and having made the necessary examinations, proposes to furnish all labor, materials, equipment, and services necessary to complete the Work in strict accordance with the Contract Documents for the above-named project for the following sum, which is hereby designated as the Base Bid:

| Base Bid | $ |

ALLOWANCES:

The following allowances are in addition to the Based Bid amount and shall be added to the Based Bid to obtain the Total Base Bid amount. See Section 01 21 00 Allowances for additional information.

<table>
<thead>
<tr>
<th>Allowance No</th>
<th>Description of Allowance</th>
<th>Allowance Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Infection control and prevention measures as shown on the drawings and specified in Section 01 35 33, &quot;Infection Control&quot;</td>
<td>$90,000.00</td>
</tr>
<tr>
<td>2</td>
<td>Support measures for existing non-code compliant utilities in the area of work</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>3</td>
<td>Floor preparation and floor leveling in the area of work</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>4</td>
<td>Installation of wall hung items furnished by the Owner in the area of work</td>
<td>$1,000.00</td>
</tr>
</tbody>
</table>

| Total Bid (Base Bid + Allowances) | $ |

Initials of Bidder's Representative
SALES TAX:
None of the sums stated in the foregoing include Washington State Sales Tax, except as designated in Article 4 of the Instructions for Bidders.

TIME OF COMPLETION AND LIQUIDATED DAMAGES:
The undersigned Bidder agrees, if awarded the Contract, to complete the Work of the Contract within the number of calendar days specified in Supplemental Conditions, Section 00 73 00, and also agrees to the amounts specified for Liquidated Damages. It is further agreed that the time for completion of the Work described herein is a reasonable time considering the average climatic range and usual industrial conditions prevailing in the locality.

TRENCH EXCAVATION SAFETY PROVISIONS:
If the Contract Documents contain any work which requires trenching exceeding a depth of four feet, all costs for adequate trench safety systems shall be identified as a separate bid item in compliance with Chapter 39.04 RCW and WAC 296-155-650. The purpose of this provision is to ensure that the Bidder agrees to comply with all the relevant trench safety requirements of Chapter 49.17 RCW. This bid amount shall be considered as part of the Base Bid set forth above. Bidder must include a lump sum dollar amount in blank below (even if the value is $0.00) to be responsive.

  Trench Excavation Safety Provisions Only: $ N/A

CONTRACT AND BONDS:
If the Owner awards a contract based on this bid within sixty (60) days of the bid submittal deadline, the Bidder agrees to execute a contract for the above work, for compensation computed from the above stated sums, on the University of Washington Public Works Contract form, and to furnish Payment and Performance Bonds and acceptable evidence of insurance as required by the Contract Documents.

BID GUARANTEE:
Pursuant to paragraph 4 of the Instruction to Bidders, Section 00 21 00, Bidder hereby certifies that it has furnished a bid guarantee for no less than 5% of the base bid, and that such guarantee accompanies this Bid Form.

The successful bidder shall submit an executed Contract, Payment and Performance Bonds, and acceptable evidence of insurance within seven (7) days after receipt of award notice and Public Works Contract form from the Owner. If the successful bidder, upon award of a contract by the Owner, fails to execute the Public Works Contract or submit the Payment and Performance Bonds and acceptable evidence of insurance as required within the time specified, Owner may revoke the award. Should the successful bidder fail to enter into a contract with Owner, the bid guarantee may be retained by Owner as liquidated damages, not as a penalty.

If a contract is not awarded within sixty (60) days after the bid submittal deadline, or if the bidder delivers a signed Public Works Contract, Payment and Performance Bonds, and acceptable evidence of insurance, then the certified or cashier’s check or cash submitted as the bid guarantee shall be returned to the bidder, or the Bid Bond shall become void.
<table>
<thead>
<tr>
<th>Bidder’s Business Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Business:</td>
</tr>
<tr>
<td>☐ Sole Proprietorship</td>
</tr>
<tr>
<td>☐ Partnership</td>
</tr>
<tr>
<td>☐ Corporation (State of Incorporation: ___)</td>
</tr>
<tr>
<td>☐ Other</td>
</tr>
<tr>
<td>Business Address:</td>
</tr>
<tr>
<td>City:</td>
</tr>
<tr>
<td>State:</td>
</tr>
<tr>
<td>Zip Code:</td>
</tr>
<tr>
<td>Business Telephone Number:</td>
</tr>
<tr>
<td>Business Fax Number:</td>
</tr>
<tr>
<td>Business E-mail Address:</td>
</tr>
<tr>
<td>State of Washington numbers for the following:</td>
</tr>
<tr>
<td>Contractor Registration No.:</td>
</tr>
<tr>
<td>UBI No.:</td>
</tr>
<tr>
<td>Employment Security Dept. No.:</td>
</tr>
<tr>
<td>Receipt is hereby acknowledged of Addenda No(s):</td>
</tr>
</tbody>
</table>

Bidder is in compliance with the responsible bidder criteria requirement of RCW 39.04.350(1)(g).

**OFFICIAL AUTHORIZED TO SIGN FOR BIDDER:**

"I certify (or declare) under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct":

<table>
<thead>
<tr>
<th>Signature:</th>
<th>Date:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Print Name and Title</th>
<th>Location or Place Executed: (City, State)</th>
</tr>
</thead>
</table>

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July 1, 2010
PART 1 – GENERAL PROVISIONS

1.01 DEFINITIONS

A. “Application for Payment” means a written request submitted by Contractor to A/E for payment of Work completed in accordance with the Contract Documents and approved Schedule of Values, supported by such substantiating data as Owner or A/E may require.

B. “Architect,” “Engineer,” or “A/E” means a person or entity lawfully entitled to practice architecture or engineering, representing Owner within the limits of its delegated authority.

C. “Change Order” means a written instrument signed by Owner and Contractor stating their agreement upon all of the following: (1) a change in the Work; (2) the amount of the adjustment in the Contract Sum, if any, and (3) the extent of the adjustment in the Contract Time, if any.

D. “Claim” means Contractor’s exclusive remedy for resolving disputes with Owner regarding the terms of a Change Order or a request for equitable adjustment, as more fully set forth in Part 8.

E. “Contract Award Amount” is the sum of the Base Bid and any accepted Alternates.

F. “Contract Documents” means the Advertisement for Bids, Instructions for Bidders, completed Bid Form, General Conditions, Modifications to the General Conditions, Supplemental Conditions, Public Works Contract, other Special Forms, Drawings and Specifications, and all addenda and modifications thereof.

G. “Contract Sum” is the total amount payable by Owner to Contractor, for performance of the Work in accordance with the Contract Documents, including all taxes imposed by law and properly chargeable to the Work, except Washington State sales tax.

H. “Contract Time” is the number of calendar days allotted in the Contract Documents for achieving Substantial Completion of the Work.

I. “Contractor” means the person or entity who has agreed with Owner to perform the Work in accordance with the Contract Documents.

J. “Day(s): Unless otherwise specified, day(s) shall mean calendar day(s).”

K. “Drawings” are the graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, and may include plans, elevations, sections, details, schedules, and diagrams.

L. “Final Acceptance” means the written acceptance issued to Contractor by Owner after Contractor has completed the requirements of the Contract Documents, as more fully set forth in Section 6.09 B.

M. “Final Completion” means that the Work is fully and finally complete in accordance with the Contract Documents, as more fully set forth in Section 6.09 A.

N. “Force Majeure” means those acts entitling Contractor to request an equitable adjustment in the Contract Time, as more fully set forth in paragraph 3.05A.

O. “Notice” means a written notice which has been delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended or, if delivered or sent by registered or certified mail, to the last business address known to the party giving notice.
P. "Notice to Proceed" means a notice from Owner to Contractor that defines the date on which the Contract Time begins to run.

Q. "Owner" means the state agency, institution, or its authorized representative with the authority to enter into, administer, and/or terminate the Work in accordance with the Contract Documents and make related determinations and findings.

R. "Person" means a corporation, partnership, business association of any kind, trust, company, or individual.

S. "Prior Occupancy" means Owner’s use of all or parts of the Project before Substantial Completion, as more fully set forth in Section 6.08 A.

T. "Progress Schedule" means a schedule of the Work, in a form satisfactory to Owner, as further set forth in Section 3.02.

U. "Project" means the total construction of which the Work performed in accordance with the Contract Documents may be the whole or a part and which may include construction by Owner or by separate contractors.

V. "Project Record" means the separate set of Drawings and Specifications as further set forth in paragraph 4.02A.

W. "Schedule of Values" means a written breakdown allocating the total Contract Sum to each principal category of Work, in such detail as requested by Owner.

X. "Specifications" are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.

Y. "Subcontract" means a contract entered into by Subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind for or in connection with the Work.

Z. "Subcontractor" means any person, other than Contractor, who agrees to furnish or furnishes any supplies, materials, equipment, or services of any kind in connection with the Work.

AA. "Substantial Completion" means that stage in the progress of the Work when the construction is sufficiently complete, as more fully set forth in Section 6.07.

AB. "Work" means the construction and services required by the Contract Documents, and includes, but is not limited to, labor, materials, supplies, equipment, services, permits, and the manufacture and fabrication of components, performed, furnished, or provided in accordance with the Contract Documents.

1.02 **ORDER OF PRECEDENCE**

Any conflict or inconsistency in the Contract Documents shall be resolved by giving the documents precedence in the following order:

1. Signed Public Works Contract, including any Change Orders.

2. Supplemental Conditions.

3. Modifications to the General Conditions.

4. General Conditions.

July 1, 2010
5. Specifications. Provisions in Division 1 shall take precedence over provisions of any other Division.

6. Drawings. In case of conflict within the Drawings, large scale drawings shall take precedence over small scale drawings.

7. Signed and Completed Bid Form.

8. Instructions to Bidders.

9. Advertisement for Bids.

1.03 EXECUTION AND INTENT

Contractor Representations: Contractor makes the following representations to Owner:

1. Contract Sum reasonable: The Contract Sum is reasonable compensation for the Work and the Contract Time is adequate for the performance of the Work, as represented by the Contract Documents;

2. Contractor familiar with project: Contractor has carefully reviewed the Contract Documents, visited and examined the Project site, become familiar with the local conditions in which the Work is to be performed, and satisfied itself as to the nature, location, character, quality and quantity of the Work, the labor, materials, equipment, goods, supplies, work, services and other items to be furnished and all other requirements of the Contract Documents, as well as the surface and subsurface conditions and other matters that may be encountered at the Project site or affect performance of the Work or the cost or difficulty thereof;

3. Contractor financially capable: Contractor is financially solvent, able to pay its debts as they mature, and possesses sufficient working capital to complete the Work and perform Contractor's obligations required by the Contract Documents; and

4. Contractor can complete Work: Contractor is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform the obligations required by the Contract Documents and has sufficient experience and competence to do so.

PART 2 – INSURANCE AND BONDS

2.01 CONTRACTOR'S LIABILITY INSURANCE

General insurance requirements: Prior to commencement of the Work, Contractor shall obtain all the insurance required by the Contract Documents and provide evidence satisfactory to Owner that such insurance has been procured. Review of the Contractor's insurance by Owner shall not relieve or decrease the liability of Contractor. Companies writing the insurance to be obtained by this part shall be licensed to do business under Chapter 48 RCW or comply with the Surplus Lines Law of the State of Washington. Contractor shall include in its bid the cost of all insurance and bond costs required to complete the base bid work and accepted alternates. Insurance carriers providing insurance in accordance with the Contract Documents shall be acceptable to Owner, and its A.M. Best rating shall be indicated on the insurance certificates.

A. Term of insurance coverage: Contractor shall maintain the following insurance coverage during the Work and for one year after Final Acceptance. Contractor shall also maintain the following insurance coverage during the performance of any corrective Work required by Section 5.16.
1. **General Liability Insurance:** Commercial General Liability (CGL) on an Occurrence Form. Coverage shall include, but not be limited to:
   a. Completed operations/products liability;
   b. Explosion, collapse, and underground; and
   c. Employer’s liability coverage.
2. **Automobile Liability Insurance:** Automobile liability
   B. **Industrial Insurance compliance:** Contractor shall comply with the Washington State Industrial Insurance Act and, if applicable, the Federal Longshoremen’s and Harbor Workers’ Act and the Jones Act.
   C. **Insurance to protect for the following:** All insurance coverages shall protect against claims for damages for personal and bodily injury or death, as well as claims for property damage, which may arise from operations in connection with the Work whether such operations are by Contractor or any Subcontractor.
   D. **Owner as Additional Insured:** All insurance coverages shall be endorsed to include Owner as an additional named insured for Work performed in accordance with the Contract Documents, and all insurance certificates shall evidence the Owner as an additional insured.

### 2.02 COVERAGE LIMITS

**Insurance amounts:** The coverage limits shall be as follows:

A. Limits of Liability shall not be less than $1,000,000 Combined Single Limit for Bodily Injury and Property Damage (other than Automobile Liability) Each Occurrence; Personal Injury and Advertising Liability Each Occurrence.
B. $2,000,000 Combined Single Limit Annual General Aggregate.
C. $2,000,000 Annual Aggregate for Products and Completed Operations Liability.
D. $1,000,000 Combined Single Limit for Automobile Bodily Injury and Property Damage Liability, Each Accident or Loss.

### 2.03 INSURANCE COVERAGE CERTIFICATES

A. **Certificate required:** Prior to commencement of the Work, Contractor shall furnish to Owner a completed certificate of insurance coverage.
B. **List Project info:** All insurance certificates shall name Owner’s Project number and Project title.
C. **Cancellation provisions:** All insurance certificates shall specifically require 45 Days prior notice to Owner of cancellation or any material change, except 30 Days for surplus line insurance.

### 2.04 PAYMENT AND PERFORMANCE BONDS

**Conditions for bonds:** Payment and performance bonds for 100% of the Contract Award Amount, plus state sales tax, shall be furnished for the Work, using the Payment Bond and Performance Bond form published by and available from the American Institute of Architects (AIA) – form A312. Prior to execution of a Change Order that, cumulatively with previous Change Orders, increases the Contract Award Amount by 15% or more, the Contractor shall provide either new payment and performance bonds for the
revised Contract Sum, or riders to the existing payment and performance bonds increasing the amount of the bonds. The Contractor shall likewise provide additional bonds or riders when subsequent Change Orders increase the Contract Sum by 15% or more. No payment or performance bond is required if the Contract Sum is $35,000 or less and Contractor agrees that Owner may, in lieu of the bond, retain 50% of the Contract Sum for the period allowed by RCW 39.08.010.

2.05 ALTERNATIVE SURETY

When alternative surety required: Contractor shall promptly furnish payment and performance bonds from an alternative surety as required to protect Owner and persons supplying labor or materials required by the Contract Documents if:

A. Owner has a reasonable objection to the surety; or

B. Any surety fails to furnish reports on its financial condition if required by Owner.

2.06 BUILDER’S RISK

A. Contractor to buy Property Insurance: Contractor shall purchase and maintain property insurance in the amount of the Contract Sum including all Change Orders for the Work on a replacement cost basis until Substantial Completion. For projects not involving New Building Construction, “Installation Floater” is an acceptable substitute for the Builder’s Risk Insurance. The insurance shall cover the interest of Owner, Contractor, and any Subcontractors, as their interests may appear.

B. Losses covered: Contractor property insurance shall be placed on an “all risk” basis and insure against the perils of fire and extended coverage and physical loss or damage including theft, vandalism, malicious mischief, collapse, false work, temporary buildings, debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for A/E’s services and expenses required as a result of an insured loss.

C. Waiver of subrogation rights: Owner and Contractor waive all subrogation rights against each other, any Subcontractors, A/E, A/E’s subconsultants, separate contractors described in Section 5.20, if any, and any of their subcontractors, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this section or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by Owner as fiduciary. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

PART 3 – TIME AND SCHEDULE

3.01 PROGRESS AND COMPLETION

Contractor to meet schedule: Contractor shall diligently prosecute the Work, with adequate forces, achieve Substantial Completion within the Contract Time, and achieve Final Completion within a reasonable period thereafter.

3.02 CONSTRUCTION SCHEDULE

A. Preliminary Progress Schedule: Unless otherwise provided in Division 1, Contractor shall, within 14 Days after issuance of the Notice to Proceed, submit a preliminary Progress Schedule. The Progress Schedule shall show the sequence in which Contractor proposes to perform the Work,
and the dates on which Contractor plans to start and finish major portions of the Work, including dates for shop drawings and other submittals, and for acquiring materials and equipment.

B. **Form of Progress Schedule:** Unless otherwise provided in Division 1, the Progress Schedule shall be in the form of a bar chart, or a critical path method analysis, as specified by Owner. The preliminary Progress Schedule may be general, showing the major portions of the Work, with a more detailed Progress Schedule submitted as directed by Owner.

C. **Owner comments on Progress Schedule:** Owner shall return comments on the preliminary Progress Schedule to Contractor within 14 Days of receipt. Review by Owner of Contractor’s schedule does not constitute an approval or acceptance of Contractor’s construction means, methods, or sequencing, or its ability to complete the Work within the Contract Time. Contractor shall revise and resubmit its schedule, as necessary. Owner may withhold a portion of progress payments until a Progress Schedule has been submitted which meets the requirements of this section.

D. **Monthly updates and compliance with Progress Schedule:** Contractor shall utilize and comply with the Progress Schedule. On a monthly basis, or as otherwise directed by Owner, Contractor shall submit an updated Progress Schedule at its own expense to Owner indicating actual progress. If, in the opinion of Owner, Contractor is not in conformance with the Progress Schedule for reasons other than acts of Force Majeure as identified in Section 3.05, Contractor shall take such steps as are necessary to bring the actual completion dates of its work activities into conformance with the Progress Schedule, and if directed by Owner, Contractor shall submit a corrective action plan or revise the Progress Schedule to reconcile with the actual progress of the Work.

E. **Contractor to notify Owner of delays:** Contractor shall promptly notify Owner in writing of any actual or anticipated event which is delaying or could delay achievement of any milestone or performance of any critical path activity of the Work. Contractor shall indicate the expected duration of the delay, the anticipated effect of the delay on the Progress Schedule, and the action being or to be taken to correct the problem. Provision of such notice does not relieve Contractor of its obligation to complete the Work within the Contract Time.

### 3.03 OWNER’S RIGHT TO SUSPEND THE WORK FOR CONVENIENCE

A. **Owner may suspend Work:** Owner may, at its sole discretion, order Contractor, in writing, to suspend all or any part of the Work for up to 90 Days, or for such longer period as mutually agreed.

B. **Compliance with suspension; Owner’s options:** Upon receipt of a written notice suspending the Work, Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incidence of cost of performance directly attributable to such suspension. Within a period up to 90 Days after the notice is delivered to Contractor, or within any extension of that period to which the parties shall have agreed, Owner shall either:

1. Cancel the written notice suspending the Work; or
2. Terminate the Work covered by the notice as provided in the termination provisions of Part 9.

C. **Resumption of Work:** If a written notice suspending the Work is cancelled or the period of the notice or any extension thereof expires, Contractor shall resume Work.

D. **Equitable Adjustment for suspensions:** Contractor shall be entitled to an equitable adjustment in the Contract Time, or Contract Sum, or both, for increases in the time or cost of performance.
directly attributable to such suspension, provided Contractor complies with all requirements set forth in Part 7.

3.04 OWNER’S RIGHT TO STOP THE WORK FOR CAUSE

A. Owner may stop Work for Contractor’s failure to perform: If Contractor fails or refuses to perform its obligations in accordance with the Contract Documents, Owner may order Contractor, in writing, to stop the Work, or any portion thereof, until satisfactory corrective action has been taken.

B. No Equitable Adjustment for Contractor’s failure to perform: Contractor shall not be entitled to an equitable adjustment in the Contract Time or Contract Sum for any increased cost or time of performance attributable to Contractor’s failure or refusal to perform or from any reasonable remedial action taken by Owner based upon such failure.

3.05 DELAY

A. Force Majeure actions not a default; Force Majeure defined: Any delay in or failure of performance by Owner or Contractor, other than the payment of money, shall not constitute a default hereunder if and to the extent the cause for such delay or failure of performance was unforeseeable and beyond the control of the party (“Force Majeure”). Acts of Force Majeure include, but are not limited to:

1. Acts of God or the public enemy;
2. Acts or omissions of any government entity;
3. Fire or other casualty for which Contractor is not responsible;
4. Quarantine or epidemic;
5. Strike or defensive lockout;
6. Unusually severe weather conditions which could not have been reasonably anticipated; and
7. Unusual delay in receipt of supplies or products which were ordered and expedited and for which no substitute reasonably acceptable to Owner was available.

B. Contract Time adjustment for Force Majeure: Contractor shall be entitled to an equitable adjustment in the Contract Time for changes in the time of performance directly attributable to an act of Force Majeure, provided it makes a request for equitable adjustment according to Section 7.03. Contractor shall not be entitled to an adjustment in the Contract Sum resulting from an act of Force Majeure.

C. Contract Time or Contract Sum adjustment if Owner at fault: Contractor shall be entitled to an equitable adjustment in Contract Time, and may be entitled to an equitable adjustment in Contract Sum, if the cost or time of Contractor’s performance is changed due to the fault or negligence of Owner, provided the Contractor makes a request according to Sections 7.02 and 7.03.

D. No Contract Time or Contract Sum adjustment if Contractor at fault: Contractor shall not be entitled to an adjustment in Contract Time or in the Contract Sum for any delay or failure of performance to the extent such delay or failure was caused by Contractor or anyone for whose acts Contractor is responsible.
E. **Contract Time adjustment only for concurrent fault:** To the extent any delay or failure of performance was concurrently caused by the Owner and Contractor, Contractor shall be entitled to an adjustment in the Contract Time for that portion of the delay or failure of performance that was concurrently caused, provided it makes a request for equitable adjustment according to Section 7.03, but shall not be entitled to an adjustment in Contract Sum.

F. **Contractor to mitigate delay impacts:** Contractor shall make all reasonable efforts to prevent and mitigate the effects of any delay, whether occasioned by an act of Force Majeure or otherwise.

### 3.06 NOTICE TO OWNER OF LABOR DISPUTES

A. **Contractor to notify Owner of labor disputes:** If Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay timely performance in accordance with the Contract Documents, Contractor shall immediately give notice, including all relevant information, to Owner.

B. **Pass through notification provisions to Subcontractors:** Contractor agrees to insert a provision in its Subcontracts and to require insertion in all sub-subcontracts, that in the event timely performance of any such contract is delayed or threatened by delay by any actual or potential labor dispute, the Subcontractor or Sub-subcontractor shall immediately notify the next higher tier Subcontractor or Contractor, as the case may be, of all relevant information concerning the dispute.

### 3.07 DAMAGES FOR FAILURE TO ACHIEVE TIMELY COMPLETION

A. **Liquidated Damages**

1. **Reason for Liquidated Damages:** Timely performance and completion of the Work is essential to Owner and time limits stated in the Contract Documents are of the essence. Owner will incur serious and substantial damages if Substantial Completion of the Work does not occur within the Contract Time. However, it would be difficult if not impossible to determine the exact amount of such damages. Consequently, provisions for liquidated damages are included in the Contract Documents.

2. **Calculation of Liquidated Damages amount:** The liquidated damage amounts set forth in the Contract Documents will be assessed not as a penalty, but as liquidated damages for breach of the Contract Documents. This amount is fixed and agreed upon by and between the Contractor and Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain. This amount shall be construed as the actual amount of damages sustained by the Owner, and may be retained by the Owner and deducted from periodic payments to the Contractor.

3. **Contractor responsible even if Liquidated Damages assessed:** Assessment of liquidated damages shall not release Contractor from any further obligations or liabilities pursuant to the Contract Documents.

B. **Actual Damages**

**Calculation of Actual Damages:** Actual damages will be assessed for failure to achieve Final Completion within the time provided. Actual damages will be calculated on the basis of direct architectural, administrative, and other related costs attributable to the Project from the date when Final Completion should have been achieved, based on the date Substantial Completion is actually achieved, to the date Final Completion is actually achieved. Owner may offset these costs against any payment due Contractor.
PART 4 – SPECIFICATIONS, DRAWINGS, AND OTHER DOCUMENTS

4.01 DISCREPANCIES AND CONTRACT DOCUMENT REVIEW

A. Specifications and Drawings are basis of the Work: The intent of the Specifications and Drawings is to describe a complete Project to be constructed in accordance with the Contract Documents. Contractor shall furnish all labor, materials, equipment, tools, transportation, permits, and supplies, and perform the Work required in accordance with the Drawings, Specifications, and other provisions of the Contract Documents.

B. Parts of the Contract Documents are complementary: The Contract Documents are complementary. What is required by one part of the Contract Documents shall be binding as if required by all. Anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be of like effect as if shown or mentioned in both.

C. Contractor to report discrepancies in Contract Documents: Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by Owner. If, during the performance of the Work, Contractor finds a conflict, error, inconsistency, or omission in the Contract Documents, it shall promptly and before proceeding with the Work affected thereby, report such conflict, error, inconsistency, or omission to A/E in writing.

D. Contractor knowledge of discrepancy in documents – responsibility: Contractor shall do no Work without applicable Drawings, Specifications, or written modifications, or Shop Drawings where required, unless instructed to do so in writing by Owner. If Contractor performs any construction activity, and it knows or reasonably should have known that any of the Contract Documents contain a conflict, error, inconsistency, or omission, Contractor shall be responsible for the performance and shall bear the cost for its correction.

E. Contractor to perform Work implied by Contract Documents: Contractor shall provide any work or materials the provision of which is clearly implied and is within the scope of the Contract Documents even if the Contract Documents do not mention them specifically.

F. Interpretation questions referred to A/E: Questions regarding interpretation of the requirements of the Contract Documents shall be referred to the A/E.

4.02 PROJECT RECORD

A. Contractor to maintain Project Record Drawings and Specifications: Contractor shall legibly mark in ink on a separate set of the Drawings and Specifications all actual construction, including depths of foundations, horizontal and vertical locations of internal and underground utilities and appurtenances referenced to permanent visible and accessible surface improvements, field changes of dimensions and details, actual suppliers, manufacturers and trade names, models of installed equipment, and Change Order Proposals (COP). This separate set of Drawings and Specifications shall be the “Project Record.”

B. Update Project Record weekly and keep on site: The Project Record shall be maintained on the project site throughout the construction and shall be clearly labeled “PROJECT RECORD.” The Project Record shall be updated at least weekly noting all changes and shall be available to Owner at all times.

C. Final Project Record to A/E before Final Acceptance: Contractor shall submit the completed and finalized Project Record to A/E prior to Final Acceptance.
4.03 **SHOP DRAWINGS**

**A. Definition of Shop Drawings:** “Shop Drawings” means documents and other information required to be submitted to A/E by Contractor pursuant to the Contract Documents, showing in detail: the proposed fabrication and assembly of structural elements; and the installation (i.e. form, fit, and attachment details) of materials and equipment. Shop Drawings include, but are not limited to, drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, samples, and similar materials furnished by Contractor to explain in detail specific portions of the Work required by the Contract Documents. For materials and equipment to be incorporated into the Work, Contractor submittal shall include the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the item. When directed, Contractor shall submit all samples at its own expense. Owner may duplicate, use, and disclose Shop Drawings provided in accordance with the Contract Documents.

**B. Approval of Shop Drawings by Contractor and A/E:** Contractor shall coordinate all Shop Drawings, and review them for accuracy, completeness, and compliance with the Contract Documents and shall indicate its approval thereon as evidence of such coordination and review. Where required by law, Shop Drawings shall be stamped by an appropriate professional licensed by the state of Washington. Shop Drawings submitted to A/E without evidence of Contractor’s approval shall be returned for resubmission. Contractor shall review, approve, and submit Shop Drawings with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of Owner or separate contractors. Contractor’s submittal schedule shall allow a reasonable time for A/E review. A/E will review, approve, or take other appropriate action on the Shop Drawings. Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings until the respective submittal has been reviewed and the A/E has approved or taken other appropriate action. Owner and A/E shall respond to Shop Drawing submittals with reasonable promptness. Any Work by Contractor shall be in accordance with reviewed Shop Drawings. Submittals made by Contractor which are not required by the Contract Documents may be returned without action.

**C. Contractor not relieved of responsibility when Shop Drawings approved:** Approval, or other appropriate action with regard to Shop Drawings, by Owner or A/E shall not relieve Contractor of responsibility for any errors or omissions in such Shop Drawings, nor from responsibility for compliance with the requirements of the Contract Documents. Unless specified in the Contract Documents, review by Owner or A/E shall not constitute an approval of the safety precautions employed by Contractor during construction, or constitute an approval of Contractor’s means or methods of construction. If Contractor fails to obtain approval before installation and the item or work is subsequently rejected, Contractor shall be responsible for all costs of correction.

**D. Variations between Shop Drawings and Contract Documents:** If Shop Drawings show variations from the requirements of the Contract Documents, Contractor shall describe such variations in writing, separate from the Shop Drawings, at the time it submits the Shop Drawings containing such variations. If A/E approves any such variation, an appropriate Change Order will be issued. If the variation is minor and does not involve an adjustment in the Contract Sum or Contract Time, a Change Order need not be issued; however, the modification shall be recorded upon the Project Record.

**E. Contractor to submit 5 copies of Shop Drawings:** Unless otherwise provided in Division 1, Contractor shall submit to A/E for approval 5 copies of all Shop Drawings. Unless otherwise indicated, 3 sets of all Shop Drawings shall be retained by A/E and 2 sets shall be returned to Contractor.
4.04 **ORGANIZATION OF SPECIFICATIONS**

Specification organization by trade: Specifications are prepared in sections which conform generally with trade practices. These sections are for Owner and Contractor convenience and shall not control Contractor in dividing the Work among the Subcontractors or in establishing the extent of the Work to be performed by any trade.

4.05 **OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS, AND OTHER DOCUMENTS**

A. A/E, not Contractor, owns Copyright of Drawings and Specifications: The Drawings, Specifications, and other documents prepared by A/E are instruments of A/E’s service through which the Work to be executed by Contractor is described. Neither Contractor nor any Subcontractor shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by A/E, and A/E shall be deemed the author of them and will, along with any rights of Owner, retain all common law, statutory, and other reserved rights, in addition to the copyright. All copies of these documents, except Contractor’s set, shall be returned or suitably accounted for to A/E, on request, upon completion of the Work.

B. Drawings and Specifications to be used only for this Project: The Drawings, Specifications, and other documents prepared by the A/E, and copies thereof furnished to Contractor, are for use solely with respect to this Project. They are not to be used by Contractor or any Subcontractor on other projects or for additions to this Project outside the scope of the Work without the specific written consent of Owner and A/E. Contractor and Subcontractors are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications, and other documents prepared by A/E appropriate to and for use in the execution of their Work.

C. Shop Drawing license granted to Owner: Contractor and all Subcontractors grant a non-exclusive license to Owner, without additional cost or royalty, to use for its own purposes (including reproduction) all Shop Drawings, together with the information and diagrams contained therein, prepared by Contractor or any Subcontractor. In providing Shop Drawings, Contractor and all Subcontractors warrant that they have authority to grant to Owner a license to use the Shop Drawings, and that such license is not in violation of any copyright or other intellectual property right. Contractor agrees to defend and indemnify Owner pursuant to the indemnity provisions in Section 5.03 and 5.22 from any violations of copyright or other intellectual property rights arising out of Owner’s use of the Shop Drawings hereunder, or to secure for Owner, at Contractor’s own cost, licenses in conformity with this section.

D. Shop Drawings to be used only for this Project: The Shop Drawings and other submittals prepared by Contractor, Subcontractors of any tier, or its or their equipment or material suppliers, and copies thereof furnished to Contractor, are for use solely with respect to this Project. They are not to be used by Contractor or any Subcontractor of any tier, or material or equipment supplier, on other projects or for additions to this Project outside the scope of the Work without the specific written consent of Owner. The Contractor, Subcontractors of any tier, and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Shop Drawings and other submittals appropriate to and for use in the execution of their Work under the Contract Documents.

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**PART 5 – PERFORMANCE**

5.01 **CONTRACTOR CONTROL AND SUPERVISION**

A. Contractor responsible for Means and Methods of construction: Contractor shall supervise and direct the Work, using its best skill and attention, and shall perform the Work in a skillful manner. 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, unless the
Contract Documents give other specific instructions concerning these matters. Contractor shall disclose its means and methods of construction when requested by Owner.

B. **Competent Superintendent required:** Performance of the Work shall be directly supervised by a competent superintendent who has authority to act for Contractor. The superintendent must be satisfactory to the Owner and shall not be changed without the prior written consent of Owner. Owner may require Contractor to remove the superintendent from the Work or Project site, if Owner reasonably deems the superintendent incompetent, careless, or otherwise objectionable, provided Owner has first notified Contractor in writing and allowed a reasonable period for transition.

C. **Contractor responsible for acts and omissions of self and agents:** Contractor shall be responsible to Owner for acts and omissions of Contractor, Subcontractors, and their employees and agents.

D. **Contractor to employ competent and disciplined workforce:** Contractor shall enforce strict discipline and good order among all of the Contractor’s employees and other persons performing the Work. Contractor shall not permit employment of persons not skilled in tasks assigned to them. Contractor’s employees shall at all times conduct business in a manner which assures fair, equal, and nondiscriminatory treatment of all persons. Owner may, by written notice, request Contractor to remove from the Work or Project site any employee Owner reasonably deems incompetent, careless, or otherwise objectionable.

E. **Contractor to keep project documents on site:** Contractor shall keep on the Project site a copy of the Drawings, Specifications, addenda, reviewed Shop Drawings, and permits and permit drawings.

F. **Contractor to comply with ethical standards:** Contractor shall ensure that its owner(s) and employees, and those of its Subcontractors, comply with the Ethics in Public Service Act RCW 42.52, which, among other things, prohibits state employees from having an economic interest in any public works contract that was made by, or supervised by, that employee. Contractor shall remove, at its sole cost and expense, any of its, or its Subcontractors’ employees, if they are in violation of this act.

### 5.02 PERMITS, FEES, AND NOTICES

A. **Contractor to obtain and pay for permits:** Unless otherwise provided in the Contract Documents, Contractor shall pay for and obtain all permits, licenses, and inspections necessary for proper execution and completion of the Work. Prior to Final Acceptance, the approved, signed permits shall be delivered to Owner.

B. **Allowances for permit fees:** If allowances for permits or utility fees are called for in the Contract Documents and set forth in Contractor’s bid, and the actual costs of those permits or fees differ from the allowances in the Contract Documents, the difference shall be adjusted by Change Order.

C. **Contractor to comply with all applicable laws:** Contractor shall comply with and give notices required by all federal, state, and local laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to performance of the Work.

### 5.03 PATENTS AND ROYALTIES

Payment, indemnification, and notice: Contractor is responsible for, and shall pay, all royalties and license fees. Contractor shall defend, indemnify, and hold Owner harmless from any costs, expenses, and liabilities arising out of the infringement by Contractor of any patent, copyright, or other intellectual property right used in the Work; however, provided that Contractor gives prompt notice, Contractor shall not be responsible for such defense or indemnity when a particular design, process, or product of a
particular manufacturer or manufacturers is required by the Contract Documents. If Contractor has reason to believe that use of the required design, process, or product constitutes an infringement of a patent or copyright, it shall promptly notify Owner of such potential infringement.

5.04 **PREVAILING WAGES**

A. **Contractor to pay Prevailing Wages:** Contractor shall pay the prevailing rate of wages to all workers, laborers, or mechanics employed in the performance of any part of the Work in accordance with RCW 39.12 and the rules and regulations of the Department of Labor and Industries. The schedule of prevailing wage rates for the locality or localities of the Work, is determined by the Industrial Statistician of the Department of Labor and Industries. It is the Contractor’s responsibility to verify the applicable prevailing wage rate.

B. **Statement of Intent to Pay Prevailing Wages:** Before payment is made by the Owner to the Contractor for any work performed by the Contractor and subcontractors whose work is included in the application for payment, the Contractor shall submit, or shall have previously submitted to the Owner for the Project, a Statement of Intent to Pay Prevailing Wages, approved by the Department of Labor and Industries, certifying the rate of hourly wage paid and to be paid each classification of laborers, workers, or mechanics employed upon the Work by Contractor and Subcontractors. Such rates of hourly wage shall not be less than the prevailing wage rate.

C. **Affidavit of Wages Paid:** Prior to release of retainage, the Contractor shall submit to the Owner an Affidavit of Wages Paid, approved by the Department of Labor and Industries, for the Contractor and every subcontractor, of any tier, that performed work on the Project.

D. **Disputes:** Disputes regarding prevailing wage rates shall be referred for arbitration to the Director of the Department of Labor and Industries. The arbitration decision shall be final and conclusive and binding on all parties involved in the dispute as provided for by RCW 39.12.060.

E. **Statement with pay application; Post Statements of Intent at job site:** Each Application for Payment submitted by Contractor shall state that prevailing wages have been paid in accordance with the prefilled statement(s) of intent, as approved. Copies of the approved intent statement(s) shall be posted on the job site with the address and telephone number of the Industrial Statistician of the Department of Labor and Industries where a complaint or inquiry concerning prevailing wages may be made.

F. **Contractor to pay for Statements of Intent and Affidavits:** In compliance with chapter 296-127 WAC, Contractor shall pay to the Department of Labor and Industries the currently established fee(s) for each statement of intent and/or affidavit of wages paid submitted to the Department of Labor and Industries for certification.

G. **Certified Payrolls:** Consistent with WAC 296-127-320, the Contractor and any subcontractor shall submit a certified copy of payroll records if requested.

5.05 **HOURS OF LABOR**

A. **Overtime:** Contractor shall comply with all applicable provisions of RCW 49.28 and they are incorporated herein by reference. Pursuant to that statute, no laborer, worker, or mechanic employed by Contractor, any Subcontractor, or any other person performing or contracting to do the whole or any part of the Work, shall be permitted or required to work more than eight hours in any one calendar day, provided, that in cases of extraordinary emergency, such as danger to life or property, the hours of work may be extended, but in such cases the rate of pay for time employed in excess of eight hours of each calendar day shall be not less than one and one-half times the rate allowed for this same amount of time during eight hours of service.
B. 4-10 Agreements: Notwithstanding the preceding paragraph, RCW 49.28 permits a contractor or subcontractor in any public works contract subject to those provisions, to enter into an agreement with its employees in which the employees work up to ten hours in a calendar day. No such agreement may provide that the employees work ten-hour days for more than four calendar days a week. Any such agreement is subject to approval by the employees. The overtime provisions of RCW 49.28 shall not apply to the hours, up to forty hours per week, worked pursuant to any such agreement.

5.06 NONDISCRIMINATION

A. Discrimination prohibited by applicable laws: Discrimination in all phases of employment is prohibited by, among other laws and regulations, Title VII of the Civil Rights Act of 1964, the Vietnam Era Veterans Readjustment Act of 1974, Sections 503 and 504 of the Vocational Rehabilitation Act of 1973, the Equal Employment Act of 1972, the Age Discrimination Act of 1967, the Americans with Disabilities Act of 1990, the Civil Rights Act of 1991, Presidential Executive Order 11246, Executive Order 11375, the Washington State Law Against Discrimination, RCW 49.60, and Gubernatorial Executive Order 85-09. These laws and regulations establish minimum requirements for affirmative action and fair employment practices which Contractor must meet.

B. During performance of the Work:

1. Protected Classes: Contractor shall not discriminate against any employee or applicant for employment because of race, creed, color, national origin, sex, age, marital status, or the presence of any physical, sensory, or mental disability, Vietnam era veteran status, or disabled veteran status, nor commit any other unfair practices as defined in RCW 49.60.

2. Advertisements to state nondiscrimination: Contractor shall, in all solicitations or advertisements for employees placed by or for it, state that all qualified applicants will be considered for employment, without regard to race, creed, color, national origin, sex, age, marital status, or the presence of any physical, sensory, or mental disability.

3. Contractor to notify unions and others of nondiscrimination: Contractor shall send to each labor union, employment agency, or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice advising the labor union, employment agency, or workers’ representative of Contractor’s obligations according to the Contract Documents and RCW 49.60.

4. Owner and State access to Contractor records: Contractor shall permit access to its books, records, and accounts, and to its premises by Owner, and by the Washington State Human Rights Commission, for the purpose of investigation to ascertain compliance with this section of the Contract Documents.

5. Pass through provisions to Subcontractors: Contractor shall include the provisions of this section in every Subcontract.

5.07 SAFETY PRECAUTIONS

A. Contractor responsible for safety: Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Work.

B. Contractor safety responsibilities: In carrying out its responsibilities according to the Contract Documents, Contractor shall protect the lives and health of employees performing the Work and other persons who may be affected by the Work; prevent damage to materials, supplies, and equipment whether on site or stored off-site; and prevent damage to other property at the site or adjacent thereto. Contractor shall comply with all applicable laws, ordinances, rules, regulations,
and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss; shall erect and maintain all necessary safeguards for such safety and protection; and shall notify owners of adjacent property and utilities when prosecution of the Work may affect them.

C. Contractor to maintain safety records: Contractor shall maintain an accurate record of exposure data on all incidents relating to the Work resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment. Contractor shall immediately report any such incident to Owner. Owner shall, at all times, have a right of access to all records of exposure.

D. Contractor to provide HazMat training: Contractor shall provide all persons working on the Project site with information and training on hazardous chemicals in their work at the time of their initial assignment, and whenever a new hazard is introduced into their work area.

1. Information. At a minimum, Contractor shall inform persons working on the Project site of:
   a. WAC: The requirements of chapter 296-62 WAC, General Occupational Health Standards;
   b. Presence of hazardous chemicals: Any operations in their work area where hazardous chemicals are present; and
   c. Hazard communications program: The location and availability of written hazard communication programs, including the required list(s) of hazardous chemicals and material safety data sheets required by chapter 296-62 WAC.

2. Training. At a minimum, Contractor shall provide training for persons working on the Project site which includes:
   a. Detecting hazardous chemicals: Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
   b. Hazards of chemicals: The physical and health hazards of the chemicals in the work area;
   c. Protection from hazards: The measures such persons can take to protect themselves from these hazards, including specific procedures Contractor, or its Subcontractors, or others have implemented to protect those on the Project site from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and
   d. Hazard communications program: The details of the hazard communications program developed by Contractor, or its Subcontractors, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

E. Hazardous, toxic or harmful substances: Contractor’s responsibility for hazardous, toxic, or harmful substances shall include the following duties:

1. Illegal use of dangerous substances: Contractor shall not keep, use, dispose, transport, generate, or sell on or about the Project site, any substances now or hereafter designated as, or which are subject to regulation as, hazardous, toxic, dangerous, or
harmful by any federal, state or local law, regulation, statute or ordinance (hereinafter collectively referred to as “hazardous substances”), in violation of any such law, regulation, statute, or ordinance, but in no case shall any such hazardous substance be stored more than 90 Days on the Project site.

2. Contractor notifications of spills, failures, inspections, and fines: Contractor shall promptly notify Owner of all spills or releases of any hazardous substances which are otherwise required to be reported to any regulatory agency and pay the cost of cleanup. Contractor shall promptly notify Owner of all failures to comply with any federal, state, or local law, regulation, or ordinance; all inspections of the Project site by any regulatory entity concerning the same; all regulatory orders or fines; and all responses or interim cleanup actions taken by or proposed to be taken by any government entity or private party on the Project site.

F. Public safety and traffic: All Work shall be performed with due regard for the safety of the public. Contractor shall perform the Work so as to cause a minimum of interruption of vehicular traffic or inconvenience to pedestrians. All arrangements to care for such traffic shall be Contractor’s responsibilities. All expenses involved in the maintenance of traffic by way of detours shall be borne by Contractor.

G. Contractor to act in an emergency: In an emergency affecting the safety of life or the Work or of adjoining property, Contractor is permitted to act, at its discretion, to prevent such threatened loss or injury, and Contractor shall so act if so authorized or instructed.

H. No duty of safety by Owner or A/E: Nothing provided in this section shall be construed as imposing any duty upon Owner or A/E with regard to, or as constituting any express or implied assumption of control or responsibility over, Project site safety, or over any other safety conditions relating to employees or agents of Contractor or any of its Subcontractors, or the public.

5.08 OPERATIONS, MATERIAL HANDLING, AND STORAGE AREAS

A. Limited storage areas: Contractor shall confine all operations, including storage of materials, to Owner-approved areas.

B. Temporary buildings and utilities at Contractor expense: Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be provided by Contractor only with the consent of Owner and without expense to Owner. The temporary buildings and utilities shall be removed by Contractor at its expense upon completion of the Work.

C. Roads and vehicle loads: Contractor shall use only established roadways or temporary roadways authorized by Owner. When materials are transported in prosecuting the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by federal, state, or local law or regulation.

D. Ownership and reporting by Contractor of demolished materials: Ownership and control of all materials or facility components to be demolished or removed from the Project site by Contractor shall immediately vest in Contractor upon severance of the component from the facility or severance of the material from the Project site. Contractor shall be responsible for compliance with all laws governing the storage and ultimate disposal. Contractor shall provide Owner with a copy of all manifests and receipts evidencing proper disposal when required by Owner or applicable law.

E. Contractor responsible for care of materials and equipment on-site: Contractor shall be responsible for the proper care and protection of its materials and equipment delivered to the Project site. Materials and equipment may be stored on the premises subject to approval of
Owner. When Contractor uses any portion of the Project site as a shop, Contractor shall be responsible for any repairs, patching, or cleaning arising from such use.

F. Contractor responsible for loss of materials and equipment: Contractor shall protect and be responsible for any damage or loss to the Work, or to the materials or equipment until the date of Substantial Completion, and shall repair or replace without cost to Owner any damage or loss that may occur, except damages or loss caused by the acts or omissions of Owner. Contractor shall also protect and be responsible for any damage or loss to the Work, or to the materials or equipment, after the date of Substantial Completion, and shall repair or replace without cost to Owner any such damage or loss that might occur, to the extent such damages or loss are caused by the acts or omissions of Contractor, or any Subcontractor.

5.09 PRIOR NOTICE OF EXCAVATION

A. Excavation defined; Use of locator services: “Excavation” means an operation in which earth, rock, or other material on or below the ground is moved or otherwise displaced by any means, except the tilling of soil less than 12 inches in depth for agricultural purposes, or road ditch maintenance that does not change the original road grade or ditch flow line. Before commencing any excavation, Contractor shall provide notice of the scheduled commencement of excavation to all owners of underground facilities or utilities, through locator services.

5.10 UNFORESEEN PHYSICAL CONDITIONS

A. Notice requirement for concealed or unknown conditions: If Contractor encounters conditions at the site which are subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents, or unknown physical conditions of an unusual nature which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then Contractor shall give written notice to Owner promptly and in no event later than 7 Days after the first observance of the conditions. Conditions shall not be disturbed prior to such notice.

B. Adjustment in Contract Time and Contract Sum: If such conditions differ materially and cause a change in Contractor’s cost of, or time required for, performance of any part of the Work, the Contractor may be entitled to an equitable adjustment in the Contract Time or Contract Sum, or both, provided it makes a request therefore as provided in Part 7.

5.11 PROTECTION OF EXISTING STRUCTURES, EQUIPMENT, VEGETATION, UTILITIES AND IMPROVEMENTS

A. Contractor to protect and repair property: Contractor shall protect from damage all existing structures, equipment, improvements, utilities, and vegetation: at or near the Project site; and on adjacent property of a third party, the locations of which are made known to or should be known by Contractor. Contractor shall repair any damage, including that to the property of a third party, resulting from failure to comply with the requirements of the Contract Documents or failure to exercise reasonable care in performing the Work. If Contractor fails or refuses to repair the damage promptly, Owner may have the necessary work performed and charge the cost to Contractor.

B. Tree and vegetation protection: Contractor shall only remove trees when specifically authorized to do so, and shall protect vegetation that will remain in place.

5.12 LAYOUT OF WORK

A. Advanced planning of the Work: Contractor shall plan and lay out the Work in advance of operations so as to coordinate all work without delay or revision.

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B. **Layout responsibilities:** Contractor shall lay out the Work from Owner-established baselines and bench marks indicated on the Drawings, and shall be responsible for all field measurements in connection with the layout. Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the Work. Contractor shall be responsible for executing the Work to the lines and grades that may be established. Contractor shall be responsible for maintaining or restoring all stakes and other marks established.

5.13 **MATERIAL AND EQUIPMENT**

A. **Contractor to provide new and equivalent equipment and materials:** All equipment, material, and articles incorporated into the Work shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in the Contract Documents. References in the Specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard quality and shall not be construed as limiting competition. Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of A/E, is equal to that named in the specifications, unless otherwise specifically provided in the Contract Documents.

B. **Contractor responsible for fitting parts together:** Contractor shall do all cutting, fitting, or patching that may be required to make its several parts fit together properly, or receive or be received by work of others set forth in, or reasonably implied by, the Contract Documents. Contractor shall not endanger any work by cutting, excavating, or otherwise altering the Work and shall not cut or alter the work of any other contractor unless approved in advance by Owner.

C. **Owner may reject defective Work:** Should any of the Work be found defective, or in any way not in accordance with the Contract Documents, this work, in whatever stage of completion, may be rejected by Owner.

5.14 **AVAILABILITY AND USE OF UTILITY SERVICES**

A. **Owner to provide and charge for utilities:** Owner shall make all reasonable utilities available to Contractor from existing outlets and supplies, as specified in the Contract Documents. Unless otherwise provided in the Contract Documents, the utility service consumed shall be charged to or paid for by Contractor at prevailing rates charged to Owner or, where the utility is produced by Owner, at reasonable rates determined by Owner. Contractor will carefully conserve any utilities furnished.

B. **Contractor to install temporary connections and meters:** Contractor shall, at its expense and in a skillful manner satisfactory to Owner, install and maintain all necessary temporary connections and distribution lines, together with appropriate protective devices, and all meters required to measure the amount of each utility used for the purpose of determining charges. Prior to the date of Final Acceptance, Contractor shall remove all temporary connections, distribution lines, meters, and associated equipment and materials.

5.15 **TESTS AND INSPECTION**

A. **Contractor to provide for all testing and inspection of Work:** Contractor shall maintain an adequate testing and inspection program and perform such tests and inspections as are necessary or required to ensure that the Work conforms to the requirements of the Contract Documents. Contractor shall be responsible for inspection and quality surveillance of all its Work and all Work performed by any Subcontractor. Unless otherwise provided, Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. Contractor shall give Owner timely notice of when and
where tests and inspections are to be made. Contractor shall maintain complete inspection records and make them available to Owner.

B. Owner may conduct tests and inspections: Owner may, at any reasonable time, conduct such inspections and tests as it deems necessary to ensure that the Work is in accordance with the Contract Documents. Owner shall promptly notify Contractor if an inspection or test reveals that the Work is not in accordance with the Contract Documents. Unless the subject items are expressly accepted by Owner, such Owner inspection and tests are for the sole benefit of Owner and do not:

1. Constitute or imply acceptance;
2. Relieve Contractor of responsibility for providing adequate quality control measures;
3. Relieve Contractor of responsibility for risk of loss or damage to the Work, materials, or equipment;
4. Relieve Contractor of its responsibility to comply with the requirements of the Contract Documents; or
5. Impair Owner’s right to reject defective or nonconforming items, or to avail itself of any other remedy to which it may be entitled.

C. Inspections or inspectors do not modify Contract Documents: Neither observations by an inspector retained by Owner, the presence or absence of such inspector on the site, nor inspections, tests, or approvals by others, shall relieve Contractor from any requirement of the Contract Documents, nor is any such inspector authorized to change any term or condition of the Contract Documents.

D. Contractor responsibilities on inspections: Contractor shall promptly furnish, without additional charge, all facilities, labor, material and equipment reasonably needed for performing such safe and convenient inspections and tests as may be required by Owner. Owner may charge Contractor any additional cost of inspection or testing when Work is not ready at the time specified by Contractor for inspection or testing, or when prior rejection makes reinspection or retest necessary. Owner shall perform its inspections and tests in a manner that will cause no undue delay in the Work.

5.16 CORRECTION OF NONCONFORMING WORK

A. Work covered by Contractor without inspection: If a portion of the Work is covered contrary to the requirements in the Contract Documents, it must, if required in writing by Owner, be uncovered for Owner’s observation and be replaced at the Contractor’s expense and without change in the Contract Time.

B. Payment provisions for uncovering covered Work: If, at any time prior to Final Completion, Owner desires to examine the Work, or any portion of it, which has been covered, Owner may request to see such Work and it shall be uncovered by Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an adjustment in the Contract Sum for the costs of uncovering and replacement, and, if completion of the Work is thereby delayed, an adjustment in the Contract Time, provided it makes such a request as provided in Part 7. If such Work is not in accordance with the Contract Documents, the Contractor shall pay the costs of examination and reconstruction.

C. Contractor to correct and pay for non-conforming Work: Contractor shall promptly correct Work found by Owner not to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed, or
completed. Contractor shall bear all costs of correcting such nonconforming Work, including additional testing and inspections.

D. **Contractor’s compliance with warranty provisions:** If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or within one year after the date for commencement of any system warranties established under Section 6.08, or within the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, Contractor shall correct it promptly after receipt of written notice from Owner to do so. Owner shall give such notice promptly after discovery of the condition. This period of one year shall be extended, with respect to portions of Work first performed after Substantial Completion, by the period of time between Substantial Completion and the actual performance of the Work. Contractor’s duty to correct with respect to Work repaired or replaced shall run for one year from the date of repair or replacement. Obligations under this paragraph shall survive Final Acceptance.

E. **Contractor to remove non-conforming Work:** Contractor shall remove from the Project site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by Contractor nor accepted by Owner.

F. **Owner may charge Contractor for non-conforming Work:** If Contractor fails to correct nonconforming Work within a reasonable time after written notice to do so, Owner may replace, correct, or remove the nonconforming Work and charge the cost thereof to the Contractor.

G. **Contractor to pay for damaged Work during correction:** Contractor shall bear the cost of correcting destroyed or damaged Work, whether completed or partially completed, caused by Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

H. **No Period of limitation on other requirements:** Nothing contained in this section shall be construed to establish a period of limitation with respect to other obligations which Contractor might have according to the Contract Documents. Establishment of the time period of one year as described in Section 5.16D relates only to the specific obligation of Contractor to correct the Work, and has no relationship to the time within which the Contractor’s obligation to comply with the Contract Documents may be sought to be enforced, including the time within which such proceedings may be commenced.

I. **Owner may accept non-conforming Work and charge Contractor:** If Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, Owner may do so instead of requiring its removal and correction, in which case the Contract Sum may be reduced as appropriate and equitable.

### 5.17 CLEAN UP

**Contractor to keep site clean and leave it clean:** Contractor shall at all times keep the Project site, including hauling routes, infrastructures, utilities, and storage areas, free from accumulations of waste materials. Before completing the Work, Contractor shall remove from the premises its rubbish, tools, scaffolding, equipment, and materials. Upon completing the Work, Contractor shall leave the Project site in a clean, neat, and orderly condition satisfactory to Owner. If Contractor fails to clean up as provided herein, and after reasonable notice from Owner, Owner may do so and the cost thereof shall be charged to Contractor.

### 5.18 ACCESS TO WORK

**Owner and A/E access to Work site:** Contractor shall provide Owner and A/E access to the Work in progress wherever located.
5.19 OTHER CONTRACTS

Owner may award other contracts; Contractor to cooperate: Owner may undertake or award other contracts for additional work at or near the Project site. Contractor shall reasonably cooperate with the other contractors and with Owner’s employees and shall carefully adapt scheduling and perform the Work in accordance with these Contract Documents to reasonably accommodate the other work.

5.20 SUBCONTRACTORS AND SUPPLIERS

A. Subcontractor Responsibility: The Contractor shall include the language of this paragraph in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. Upon request of the Owner, the Contractor shall promptly provide documentation to the Owner demonstrating that the subcontractor meets the subcontractor responsibility criteria below. The requirements of this paragraph apply to all subcontractors regardless of tier. At the time of subcontract execution, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:

1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;

2. Have a current Washington Unified Business Identifier (UBI) number;

3. If applicable, have:
   a. Industrial Insurance (workers’ compensation) coverage for the subcontractor’s employees working in Washington, as required in Title 51 RCW;
   b. A Washington Employment Security Department number, as required in Title 50 RCW;
   c. A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
   d. An electrical contractor license, if required by Chapter 19.28 RCW;
   e. An elevator contractor license, if required by Chapter 70.87 RCW.

4. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065 (3).

5. On a project subject to the apprenticeship utilization requirements in RCW 39.04.320, not have been found out of compliance by the Washington state apprenticeship and training council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under chapter 49.04 RCW for the one-year period immediately preceding the date of the Owner’s first advertisement of the project.

B. Provide names of Subcontractors and use qualified firms: Before submitting the first Application for Payment, Contractor shall furnish in writing to Owner the names, addresses, and telephone numbers of all Subcontractors, as well as suppliers providing materials in excess of $2,500. Contractor shall utilize Subcontractors and suppliers which are experienced and qualified, and meet the requirements of the Contract Documents, if any. Contractor shall not utilize any Subcontractor or supplier to whom the Owner has a reasonable objection, and shall obtain Owner’s written consent before making any substitutions or additions.
C. **Subcontracts in writing and pass through provision:** All Subcontracts must be in writing. By appropriate written agreement, Contractor shall require each Subcontractor, so far as applicable to the Work to be performed by the Subcontractor, to be bound to Contractor by terms of the Contract Documents, and to assume toward Contractor all the obligations and responsibilities which Contractor assumes toward Owner in accordance with the Contract Documents. Each Subcontract shall preserve and protect the rights of Owner in accordance with the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. However, nothing in this paragraph shall be construed to alter the contractual relations between Contractor and its Subcontractors with respect to insurance or bonds.

D. **Coordination of Subcontractors; Contractor responsible for Work:** Contractor shall schedule, supervise, and coordinate the operations of all Subcontractors. No Subcontracting of any of the Work shall relieve Contractor from its responsibility for the performance of the Work in accordance with the Contract Documents or any other obligations of the Contract Documents.

E. **Automatic assignment of subcontracts:** Each subcontract agreement for a portion of the Work is hereby assigned by Contractor to Owner provided that:

1. **Effective only after termination and Owner approval:** The assignment is effective only after termination by Owner for cause pursuant to Section 9.01 and only for those Subcontracts which Owner accepts by notifying the Subcontractor in writing; and

2. **Owner assumes Contractor’s responsibilities:** After the assignment is effective, Owner will assume all future duties and obligations toward the Subcontractor which Contractor assumed in the Subcontract.

3. **Impact of bond:** The assignment is subject to the prior rights of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.

### 5.21 WARRANTY OF CONSTRUCTION

A. **Contractor warranty of Work:** In addition to any special warranties provided elsewhere in the Contract Documents, Contractor warrants that all Work conforms to the requirements of the Contract Documents and is free of any defect in equipment, material, or design furnished, or workmanship performed by Contractor.

B. **Contractor responsibilities:** With respect to all warranties, express or implied, for Work performed or materials furnished according to the Contract Documents, Contractor shall:

1. **Obtain warranties:** Obtain all warranties that would be given in normal commercial practice;

2. **Warranties for benefit of Owner:** Require all warranties to be executed, in writing, for the benefit of Owner;

3. **Enforcement of warranties:** Enforce all warranties for the benefit of Owner, if directed by Owner; and

4. **Contractor responsibility for subcontractor warranties:** Be responsible to enforce any subcontractor’s, manufacturer’s, or supplier’s warranties should they extend beyond the period specified in the Contract Documents.

C. **Warranties beyond Final Acceptance:** The obligations under this section shall survive Final Acceptance.
5.22 **INDEMNIFICATION**

A. **Contractor to indemnify Owner:** Contractor shall defend, indemnify, and hold Owner and A/E harmless from and against all claims, demands, losses, damages, or costs, including but not limited to damages arising out of bodily injury or death to persons and damage to property, caused by or resulting from:

1. **Sole negligence of Contractor:** The sole negligence of Contractor or any of its Subcontractors;

2. **Concurrent negligence:** The concurrent negligence of Contractor, or any Subcontractor, but only to the extent of the negligence of Contractor or such Subcontractor; and

3. **Patent infringement:** The use of any design, process, or equipment which constitutes an infringement of any United States patent presently issued, or violates any other proprietary interest, including copyright, trademark, and trade secret.

B. **Employee action and RCW Title 51:** In any action against Owner and any other entity indemnified in accordance with this section, by any employee of Contractor, its Subcontractors, Sub-subcontractors, agents, or anyone directly or indirectly employed by any of them, the indemnification obligation of this section shall not be limited by a limit on the amount or type of damages, compensation, or benefits payable by or for Contractor or any Subcontractor under RCW Title 51, the Industrial Insurance Act, or any other employee benefit acts. In addition, Contractor waives immunity as to Owner and A/E only, in accordance with RCW Title 51.

**PART 6 – PAYMENTS AND COMPLETION**

6.01 **CONTRACT SUM**

Owner shall pay Contract Sum: Owner shall pay Contractor the Contract Sum plus state sales tax for performance of the Work, in accordance with the Contract Documents.

6.02 **SCHEDULE OF VALUES**

Contractor to submit Schedule of Values: Before submitting its first Application for Payment, Contractor shall submit to Owner for approval a breakdown allocating the total Contract Sum to each principal category of work, in such detail as requested by Owner ("Schedule of Values"). The approved Schedule of Values shall include appropriate amounts for demobilization, record drawings, O&M manuals, and any other requirements for Project closeout, and shall be used by Owner as the basis for progress payments. Payment for Work shall be made only for and in accordance with those items included in the Schedule of Values.

6.03 **APPLICATION FOR PAYMENT**

A. **Monthly Application for Payment with substantiation:** At monthly intervals, unless determined otherwise by Owner, Contractor shall submit to Owner an itemized Application for Payment for Work completed in accordance with the Contract Documents and the approved Schedule of Values. Each application shall be supported by such substantiating data as Owner may require.

B. **Contractor certifies Subcontractors paid:** By submitting an Application for Payment, Contractor is certifying that all Subcontractors have been paid, less earned retainage in accordance with RCW 60.28.011, as their interests appeared in the last preceding certificate of payment. By submitting an Application for Payment, Contractor is recertifying that the representations set forth in Section 1.03, are true and correct, to the best of Contractor’s knowledge, as of the date of the Application for Payment.

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C. Reconciliation of Work with Progress Schedule: At the time it submits an Application for Payment, Contractor shall analyze and reconcile, to the satisfaction of Owner, the actual progress of the Work with the Progress Schedule.

D. Payment for material delivered to site or stored off-site: If authorized by Owner, the Application for Payment may include request for payment for material delivered to the Project site and suitably stored, or for completed preparatory work. Payment may similarly be requested for material stored off the Project site, provided Contractor complies with or furnishes satisfactory evidence of the following:

1. Suitable facility or location: The material will be placed in a facility or location that is structurally sound, dry, lighted and suitable for the materials to be stored;

2. Facility or location within 10 miles of Project: The facility or location is located within a 10-mile radius of the Project. Other locations may be utilized, if approved in writing, by Owner;

3. Facility or location exclusive to Project's materials: Only materials for the Project are stored within the facility or location (or a secure portion of a facility or location set aside for the Project);

4. Insurance provided on materials in facility or location: Contractor furnishes Owner a certificate of insurance extending Contractor’s insurance coverage for damage, fire, and theft to cover the full value of all materials stored, or in transit;

5. Facility or location locked and secure: The facility or location (or secure portion thereof) is continuously under lock and key, and only Contractor’s authorized personnel shall have access;

6. Owner right of access to facility or location: Owner shall at all times have the right of access in company of Contractor;

7. Contractor assumes total responsibility for stored materials: Contractor and its surety assume total responsibility for the stored materials; and

8. Contractor provides documentation and Notice when materials moved to site: Contractor furnishes to Owner certified lists of materials stored, bills of lading, invoices, and other information as may be required, and shall also furnish Notice to Owner when materials are moved from storage to the Project site.

6.04 Progress Payments

A. Owner to pay within 30 Days: Owner shall make progress payments, in such amounts as Owner determines are properly due, within 30 Days after receipt of a properly executed Application for Payment. Owner shall notify Contractor in accordance with chapter 39.76 RCW if the Application for Payment does not comply with the requirements of the Contract Documents.

B. Withholding retainage; Options for retainage: Owner shall retain 5% of the amount of each progress payment until 45 Days after Final Acceptance and receipt of all documents required by law or the Contract Documents, including, at Owner’s request, consent of surety to release of the retainage. In accordance with chapter 60.28 RCW, Contractor may request that monies reserved be retained in a fund by Owner, deposited by Owner in a bank or savings and loan, or placed in escrow with a bank or trust company to be converted into bonds and securities to be held in escrow with interest to be paid to Contractor. Owner may permit Contractor to provide an appropriate bond in lieu of the retained funds.
C. Title passes to Owner upon payment: Title to all Work and materials covered by a progress payment shall pass to Owner at the time of such payment free and clear of all liens, claims, security interests, and encumbrances. Passage of title shall not, however, relieve Contractor from any of its duties and responsibilities for the Work or materials, or waive any rights of Owner to insist on full compliance by Contractor with the Contract Documents.

D. Interest on unpaid balances: Payments due and unpaid in accordance with the Contract Documents shall bear interest as specified in chapter 39.76 RCW.

6.05 PAYMENTS WITHHELD

A. Owner’s right to withhold payment: Owner may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any payment to such extent as may be necessary to protect Owner from loss or damage for reasons including but not limited to:

1. Non-compliant Work: Work not in accordance with the Contract Documents;

2. Remaining Work to cost more than unpaid balance: Reasonable evidence that the Work required by the Contract Documents cannot be completed for the unpaid balance of the Contract Sum;

3. Owner correction or completion Work: Work by Owner to correct defective Work or complete the Work in accordance with Section 5.16;

4. Contractor’s failure to perform: Contractor’s failure to perform in accordance with the Contract Documents; or

5. Contractor’s negligent acts or omissions: Cost or liability that may occur to Owner as the result of Contractor’s fault or negligent acts or omissions.

B. Owner to notify Contractor of withholding for unsatisfactory performance: In any case where part or all of a payment is going to be withheld for unsatisfactory performance, Owner shall notify Contractor in accordance with chapter 39.76 RCW.

6.06 RETAINAGE AND BOND CLAIM RIGHTS

Chapters 39.08 RCW and 60.28 RCW incorporated by reference: Chapters 39.08 RCW and 60.28 RCW, concerning the rights and responsibilities of Contractor and Owner with regard to the performance and payment bonds and retainage, are made a part of the Contract Documents by reference as though fully set forth herein.

6.07 SUBSTANTIAL COMPLETION

Substantial Completion defined: Substantial Completion is the stage in the progress of the Work (or portion thereof designated and approved by Owner) when the construction is sufficiently complete, in accordance with the Contract Documents, so Owner has full and unrestricted use and benefit of the facilities (or portion thereof designated and approved by Owner) for the use for which it is intended. All Work other than incidental corrective or punch list work shall be completed. Substantial Completion shall not have been achieved if all systems and parts are not functional, if utilities are not connected and operating normally, if all required occupancy permits have not been issued, or if the Work is not accessible by normal vehicular and pedestrian traffic routes. The date Substantial Completion is achieved shall be established in writing by Owner. Contractor may request an early date of Substantial Completion which must be approved by Change Order. Owner’s occupancy of the Work or designated portion thereof does not necessarily indicate that Substantial Completion has been achieved.
6.08  PRIOR OCCUPANCY

A. **Prior Occupancy defined; Restrictions:** Owner may, upon written notice thereof to Contractor, take possession of or use any completed or partially completed portion of the Work ("Prior Occupancy") at any time prior to Substantial Completion. Unless otherwise agreed in writing, Prior Occupancy shall not: be deemed an acceptance of any portion of the Work; accelerate the time for any payment to Contractor; prejudice any rights of Owner provided by any insurance, bond, guaranty, or the Contract Documents; relieve Contractor of the risk of loss or any of the obligations established by the Contract Documents; establish a date for termination or partial termination of the assessment of liquidated damages; or constitute a waiver of claims.

B. **Damage; Duty to repair and warranties:** Notwithstanding anything in the preceding paragraph, Owner shall be responsible for loss of or damage to the Work resulting from Prior Occupancy. Contractor’s one year duty to repair any system warranties shall begin on building systems activated and used by Owner as agreed in writing by Owner and Contractor.

6.09  FINAL COMPLETION, ACCEPTANCE, AND PAYMENT

A. **Final Completion defined:** Final Completion shall be achieved when the Work is fully and finally complete in accordance with the Contract Documents. The date Final Completion is achieved shall be established by Owner in writing, but in no case shall constitute Final Acceptance which is a subsequent, separate, and distinct action.

B. **Final Acceptance defined:** Final Acceptance shall be achieved when the Contractor has completed the requirements of the Contract Documents. The date Final Acceptance is achieved shall be established by Owner in writing. Prior to Final Acceptance, Contractor shall, in addition to all other requirements in the Contract Documents, submit to Owner a written notice of any outstanding disputes or claims between Contractor and any of its Subcontractors, including the amounts and other details thereof. Neither Final Acceptance, nor final payment, shall release Contractor or its sureties from any obligations of these Contract Documents or the payment and performance bonds, or constitute a waiver of any claims by Owner arising from Contractor’s failure to perform the Work in accordance with the Contract Documents.

C. **Final payment waives Claim rights:** Acceptance of final payment by Contractor, or any Subcontractor, shall constitute a waiver and release to Owner of all claims by Contractor, or any such Subcontractor, for an increase in the Contract Sum or the Contract Time, and for every act or omission of Owner relating to or arising out of the Work, except for those Claims made in accordance with the procedures, including the time limits, set forth in Part 8.

PART 7 – CHANGES

7.01  CHANGE IN THE WORK

A. **Changes in Work, Contract Sum, and Contract Time by Change Order:** Owner may, at any time and without notice to Contractor’s surety, order additions, deletions, revisions, or other changes in the Work. These changes in the Work shall be incorporated into the Contract Documents through the execution of Change Orders. If any change in the Work ordered by Owner causes an increase or decrease in the Contract Sum or the Contract Time, an equitable adjustment shall be made as provided in Section 7.02 or 7.03, respectively, and such adjustment(s) shall be incorporated into a Change Order.

B. **Owner may request COP from Contractor:** If Owner desires to order a change in the Work, it may request a written Change Order Proposal (COP) from Contractor. Contractor shall submit a Change Order Proposal within 14 Days of the request from Owner, or within such other period as mutually agreed. Contractor’s Change Order Proposal shall be full compensation for
implementing the proposed change in the Work, including any adjustment in the Contract Sum or Contract Time, and including compensation for all delays in connection with such change in the Work and for any expense or inconvenience, disruption of schedule, or loss of efficiency or productivity occasioned by the change in the Work.

C. **COP negotiations:** Upon receipt of the Change Order Proposal, or a request for equitable adjustment in the Contract Sum or Contract Time, or both, as provided in Sections 7.02 and 7.03, Owner may accept or reject the proposal, request further documentation, or negotiate acceptable terms with Contractor. Pending agreement on the terms of the Change Order, Owner may direct Contractor to proceed immediately with the Change Order Work. Contractor shall not proceed with any change in the Work until it has obtained Owner’s approval. All Work done pursuant to any Owner-directed change in the Work shall be executed in accordance with the Contract Documents.

D. **Change Order as full payment and final settlement:** If Owner and Contractor reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, such agreement shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of all claims for time and for direct, indirect, and consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity, related to any Work either covered or affected by the Change Order, or related to the events giving rise to the request for equitable adjustment.

E. **Failure to agree upon terms of Change Order; Final offer and Claims:** If Owner and Contractor are unable to reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, Contractor may at any time in writing, request a final offer from Owner. Owner shall provide Contractor with its written response within 30 Days of Contractor’s request. Owner may also provide Contractor with a final offer at any time. If Contractor rejects Owner’s final offer, or the parties are otherwise unable to reach agreement, Contractor’s only remedy shall be to file a Claim as provided in Part 8.

F. **Field Authorizations:** The Owner may direct the Contractor to proceed with a change in the work through a written Field Authorization (also referred to as a Field Order) when the time required to price and execute a Change Order would impact the Project.

The Field Authorization shall describe and include the following:

1. The scope of work
2. An agreed upon maximum not-to-exceed amount
3. Any estimated change to the Contract Time
4. The method of final cost determination in accordance with the requirements of Part 7 of the General Conditions
5. The supporting cost data to be submitted in accordance with the requirements of Part 7 of the General Conditions

Upon satisfactory submittal by the Contractor and approval by the Owner of supporting cost data, a Change Order will be executed. The Owner will not make payment to the Contractor for Field Authorization work until that work has been incorporated into an executed Change Order.
7.02 CHANGE IN THE CONTRACT SUM

A. General Application

1. Contract Sum changes only by Change Order: The Contract Sum shall only be changed by a Change Order. Contractor shall include any request for a change in the Contract Sum in its Change Order Proposal.

2. Owner fault or negligence as basis for change in Contract Sum: If the cost of Contractor's performance is changed due to the fault or negligence of Owner, or anyone for whose acts Owner is responsible, Contractor shall be entitled to make a request for an equitable adjustment in the Contract Sum in accordance with the following procedure. No change in the Contract Sum shall be allowed to the extent: Contractor's changed cost of performance is due to the fault or negligence of Contractor, or anyone for whose acts Contractor is responsible; the change is concurrently caused by Contractor and Owner; or the change is caused by an act of Force Majeure as defined in Section 3.05.

   (a) Notice and record keeping for equitable adjustment: A request for an equitable adjustment in the Contract Sum shall be based on written notice delivered to Owner within 7 Days of the occurrence of the event giving rise to the request. For purposes of this part, “occurrence” means when Contractor knew, or in its diligent prosecution of the Work should have known, of the event giving rise to the request. If Contractor believes it is entitled to an adjustment in the Contract Sum, Contractor shall immediately notify Owner and begin to keep and maintain complete, accurate, and specific daily records. Contractor shall give Owner access to any such records and, if requested shall promptly furnish copies of such records to Owner.

   (b) Content of notice for equitable adjustment; Failure to comply: Contractor shall not be entitled to any adjustment in the Contract Sum for any occurrence of events or costs that occurred more than 7 Days before Contractor's written notice to Owner. The written notice shall set forth, at a minimum, a description of: the event giving rise to the request for an equitable adjustment in the Contract Sum; the nature of the impacts to Contractor and its Subcontractors of any tier, if any; and to the extent possible the amount of the adjustment in Contract Sum requested. Failure to properly give such written notice shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.

   (c) Contractor to provide supplemental information: Within 30 Days of the occurrence of the event giving rise to the request, unless Owner agrees in writing to allow an additional period of time to ascertain more accurate data, Contractor shall supplement the written notice provided in accordance with subparagraph a. above with additional supporting data. Such additional data shall include, at a minimum: the amount of compensation requested, itemized in accordance with the procedure set forth herein; specific facts, circumstances, and analysis that confirms not only that Contractor suffered the damages claimed, but that the damages claimed were actually a result of the act, event, or condition complained of and that the Contract Documents provide entitlement to an equitable adjustment to Contractor for such act, event, or condition; and documentation sufficiently detailed to permit an informed analysis of the request by Owner. When the request for compensation relates to a delay, or other change in Contract Time, Contractor shall demonstrate the impact on the critical path, in accordance with Section 7.03C. Failure to provide such additional information and documentation within the time allowed or within the format required shall, to the extent Owner’s interests are prejudiced, constitute a waiver of Contractor’s right to an equitable adjustment.
(d) Contractor to proceed with Work as directed: Pending final resolution of any request made in accordance with this paragraph, unless otherwise agreed in writing, Contractor shall proceed diligently with performance of the Work.

(e) Contractor to combine requests for same event together: Any requests by Contractor for an equitable adjustment in the Contract Sum and in the Contract Time that arise out of the same event(s) shall be submitted together.

3. **Methods for calculating Change Order amount:** The value of any Work covered by a Change Order, or of any request for an equitable adjustment in the Contract Sum, shall be determined by one of the following methods:

   a. **Fixed Price:** On the basis of a fixed price as determined in paragraph 7.02B.

   b. **Unit Prices:** By application of unit prices to the quantities of the items involved as determined in paragraph 7.02C.

   c. **Time and Materials:** On the basis of time and material as determined in paragraph 7.02D.

4. **Fixed price method is default; Owner may direct otherwise:** When Owner has requested Contractor to submit a Change Order Proposal, Owner may direct Contractor as to which method in subparagraph 3 above to use when submitting its proposal. Otherwise, Contractor shall determine the value of the Work, or of a request for an equitable adjustment, on the basis of the fixed price method.

**B. Change Order Pricing – Fixed Price**

**Procedures:** When the fixed price method is used to determine the value of any Work covered by a Change Order, or of a request for an equitable adjustment in the Contract Sum, the following procedures shall apply:

1. **Breakdown and itemization of details on COP:** Contractor’s Change Order Proposal, or request for adjustment in the Contract Sum, shall be accompanied by a complete itemization of the costs, including labor, material, subcontractor costs, and overhead and profit. The costs shall be itemized in the manner set forth below, and shall be submitted on breakdown sheets in a form approved by Owner.

2. **Use of industry standards in calculating costs:** All costs shall be calculated based upon appropriate industry standard methods of calculating labor, material quantities, and equipment costs.

3. **Costs contingent on Owner’s actions:** If any of Contractor’s pricing assumptions are contingent upon anticipated actions of Owner, Contractor shall clearly state them in the proposal or request for an equitable adjustment.

4. **Markups on additive and deductive Work:** The cost of any additive or deductive changes in the Work shall be calculated as set forth below, except that overhead and profit shall not be included on deductive changes in the Work. Where a change in the Work involves additive and deductive work by the same Contractor or Subcontractor, small tools, overhead, profit, bond and insurance markups will apply to the net difference.

5. **Breakdown not required if change less than $1,000:** If the total cost of the change in the Work or request for equitable adjustment does not exceed $1,000, Contractor shall not be required to submit a breakdown if the description of the change in the Work or request for equitable adjustment is sufficiently definitive for Owner to determine fair value.
6. **Breakdown required if change between $1,000 and $2,500:** If the total cost of the change in the Work or request for equitable adjustment is between $1,000 and $2,500, Contractor may submit a breakdown in the following level of detail if the description of the change in the Work or if the request for equitable adjustment is sufficiently definitive to permit the Owner to determine fair value:

   a. lump sum labor;
   b. lump sum material;
   c. lump sum equipment usage;
   d. overhead and profit as set forth below; and
   e. insurance and bond costs as set forth below.

7. **Components of increased cost:** Any request for adjustment of Contract Sum based upon the fixed price method shall include only the following items:

   a. **Craft labor costs:** These are the labor costs determined by multiplying the estimated or actual additional number of craft hours needed to perform the change in the Work by the hourly labor costs. Craft hours should cover direct labor, as well as indirect labor due to trade inefficiencies. The hourly costs shall be based on the following:

      (1) **Basic wages and benefits:** Hourly rates and benefits as stated on the Department of Labor and Industries approved “statement of intent to pay prevailing wages” or a higher amount if approved by the Owner. Direct supervision shall be a reasonable percentage not to exceed 15% of the cost of direct labor. No supervision markup shall be allowed for a working supervisor’s hours.

      (2) **Worker’s insurance:** Direct contributions to the state of Washington for industrial insurance; medical aid; and supplemental pension, by the class and rates established by the Department of Labor and Industries.

      (3) **Federal insurance:** Direct contributions required by the Federal Insurance Compensation Act; Federal Unemployment Tax Act; and the State Unemployment Compensation Act.

      (4) **Travel allowance:** Travel allowance and/or subsistence, if applicable, not exceeding those allowances established by regional labor union agreements, which are itemized and identified separately.

      (5) **Safety:** Cost incurred due to the Washington Industrial Safety and Health Act, which shall be a reasonable percentage not to exceed 2% of the sum of the amounts calculated in (1), (2), and (3) above.

   b. **Material costs:** This is an itemization of the quantity and cost of materials needed to perform the change in the Work. Material costs shall be developed first from actual known costs, second from supplier quotations or if these are not available, from standard industry pricing guides. Material costs shall consider all available discounts. Freight costs, express charges, or special delivery charges, shall be itemized.
c. **Equipment costs:** This is an itemization of the type of equipment and the estimated or actual length of time the construction equipment appropriate for the Work is or will be used on the change in the Work. Costs will be allowed for construction equipment only if used solely for the changed Work, or for additional rental costs actually incurred by the Contractor. Equipment charges shall be computed on the basis of actual invoice costs or if owned, from the current edition of one of the following sources:

2. The National Electrical Contractors Association for equipment used on electrical work.
3. The Mechanical Contractors Association of America for equipment used on mechanical work.

The EquipmentWatch Rental Rate Blue Book shall be used as a basis for establishing rental rates of equipment not listed in the above sources. The maximum rate for standby equipment shall not exceed that shown in the AGC WSDOT Equipment Rental Agreement, current edition on the Contract execution date.

d. **Allowance for small tools, expendables & consumable supplies:** Small tools consist of tools which cost $250 or less and are normally furnished by the performing contractor. The maximum rate for small tools shall not exceed the following:

1. **3% for Contractor:** For Contractor, 3% of direct labor costs.
2. **5% for Subcontractors:** For Subcontractors, 5% of direct labor costs.

Expendables and consumables supplies directly associated with the change in Work must be itemized.

e. **Subcontractor costs:** This is defined as payments Contractor makes to Subcontractors for changed Work performed by Subcontractors of any tier. The Subcontractors’ cost of Work shall be calculated and itemized in the same manner as prescribed herein for Contractor.

f. **Allowance for overhead:** This is defined as costs of any kind attributable to direct and indirect delay, acceleration, or impact, added to the total cost to Owner of any change in the Contract Sum. If the Contractor is compensated under Section 7.03D, the amount of such compensation shall be reduced by the amount Contractor is otherwise entitled to under this subsection (f). This allowance shall compensate Contractor for all noncraft labor, temporary construction facilities, field engineering, schedule updating, as-built drawings, home office cost, B&O taxes, office engineering, estimating costs, additional overhead because of extended time, and any other cost incidental to the change in the Work. It shall be strictly limited in all cases to a reasonable amount, mutually acceptable, or if none can be agreed upon to an amount not to exceed the rates below:

1. **Projects less than $3 million:** For projects where the Contract Award Amount is under $3 million, the following shall apply:
(a) **Contractor markup on Contractor Work:** For Contractor, for any Work actually performed by Contractor’s own forces, 16% of the first $50,000 of the cost, and 4% of the remaining cost, if any.

(b) **Subcontractor markup for Subcontractor Work:** For each Subcontractor (including lower tier subcontractors), for any Work actually performed by its own forces, 16% of the first $50,000 of the cost, and 4% of the remaining cost, if any.

(c) **Contractor markup for Subcontractor Work:** For Contractor, for any work performed by its Subcontractor(s) 6% of the first $50,000 of the amount due each Subcontractor, and 4% of the remaining amount if any.

(d) **Subcontractor markup for lower tier Subcontractor Work:** For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, 4% of the first $50,000 of the amount due the sub-subcontractor, and 2% of the remaining amount if any.

(e) **Basis of cost applicable for markup:** The cost to which overhead is to be applied shall be developed in accordance with Section 7.02B 7a. – e.

(2) **Projects more than $3 million:** For projects where the Contract Award Amount is equal to or exceeds $3 million, the following shall apply:

(a) **Contractor markup on Contractor Work:** For Contractor, for any Work actually performed by Contractor’s own forces, 12% of the first $50,000 of the cost, and 4% of the remaining cost, if any.

(b) **Subcontractor markup for Subcontractor Work:** For each Subcontractor (including lower tier subcontractors), for any Work actually performed by its own forces, 12% of the first $50,000 of the cost, and 4% of the remaining cost, if any.

(c) **Contractor markup for Subcontractor Work:** For Contractor, for any Work performed by its Subcontractor(s), 4% of the first $50,000 of the amount due each Subcontractor, and 2% of the remaining amount if any.

(d) **Subcontractor markup for lower tier Subcontractor Work:** For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, 4% of the first $50,000 of the amount due the sub-subcontractor, and 2% of the remaining amount if any.

(e) **Basis of cost applicable for markup:** The cost to which overhead is to be applied shall be developed in accordance with Section 7.02B 7a. – e.

g. **Allowance for profit:** Allowance for profit is an amount to be added to the cost of any change in contract sum, but not to the cost of change in Contract Time for which contractor has been compensated pursuant to the conditions set forth in Section 7.03. It shall be limited to a reasonable amount, mutually acceptable, or if none can be agreed upon, to an amount not to exceed the rates below:

(1) **Contractor / Subcontractor markup for self-performed Work:** For Contractor or Subcontractor of any tier for work performed by their forces, 6% of the cost developed in accordance with Section 7.02B 7a. – e.
(2) **Contractor / Subcontractor markup for Work performed at lower tier:** For Contractor or Subcontractor of any tier for work performed by a subcontractor of a lower tier, 4% of the subcontract cost developed in accordance with Section 7.02B 7a. – h.

h. **Insurance and bond premiums:** Cost of change in insurance or bond premium: This is defined as:

(1) **Contractor’s liability insurance:** The cost of any changes in Contractor’s liability insurance arising directly from execution of the Change Order; and

(2) **Payment and Performance Bond:** The cost of the additional premium for Contractor’s bond arising directly from the changed Work.

The cost of any change in insurance or bond premium shall be added after overhead and allowance for profit are calculated in accordance with subparagraph f. and g above.

C. **Change Order Pricing – Unit Prices**

1. **Content of Owner authorization:** Whenever Owner authorizes Contractor to perform Work on a unit-price basis, Owner’s authorization shall clearly state:

   a. **Scope:** Scope of work to be performed;

   b. **Reimbursement basis:** Type of reimbursement including pre-agreed rates for material quantities; and

   c. **Reimbursement limit:** Cost limit of reimbursement.

2. **Contractor responsibilities:** Contractor shall:

   a. Cooperate with Owner and assist in monitoring the Work being performed. As requested by Owner, Contractor shall identify workers assigned to the Change Order Work and areas in which they are working;

   b. Leave access as appropriate for quantity measurement; and

   c. Not exceed any cost limit(s) without Owner’s prior written approval.

3. **Cost breakdown consistent with Fixed Price requirements:** Contractor shall submit costs in accordance with paragraph 7.02B and satisfy the following requirements:

   a. **Unit prices must include overhead, profit, bond and insurance premiums:** Unit prices shall include reimbursement for all direct and indirect costs of the Work, including overhead, profit, bond, and insurance costs; and

   b. **Owner verification of quantities:** Quantities must be supported by field measurement statements signed by Owner.

D. **Change Order Pricing – Time-and-Material Prices**

1. **Content of Owner authorization:** Whenever Owner authorizes Contractor to perform Work on a time-and-material basis, Owner’s authorization shall clearly state:

   a. **Scope:** Scope of Work to be performed;
b. **Reimbursement basis:** Type of reimbursement including pre-agreed rates, if any, for material quantities or labor; and

c. **Reimbursement limit:** Cost limit of reimbursement.

2. **Contractor responsibilities:** Contractor shall:

   a. **Identify workers assigned:** Cooperate with Owner and assist in monitoring the Work being performed. As requested by Owner, identify workers assigned to the Change Order Work and areas in which they are working;

   b. **Provide daily timesheets:** Identify on daily time sheets all labor performed in accordance with this authorization. Submit copies of daily time sheets within 2 working days for Owner’s review.

   c. **Allow Owner to measure quantities:** Leave access as appropriate for quantity measurement;

   d. **Perform Work efficiently:** Perform all Work in accordance with this section as efficiently as possible; and

   e. **Not exceed Owner’s cost limit:** Not exceed any cost limit(s) without Owner’s prior written approval.

3. **Cost breakdown consistent with Fixed Price requirements:** Contractor shall submit costs in accordance with paragraph 7.02B and additional verification supported by:

   a. **Timesheets:** Labor detailed on daily time sheets; and

   b. **Invoices:** Invoices for material.

7.03 **CHANGE IN THE CONTRACT TIME**

A. **COP requests for Contract Time:** The Contract Time shall only be changed by a Change Order. Contractor shall include any request for a change in the Contract Time in its Change Order Proposal.

B. **Time extension permitted if not Contractor's fault:** If the time of Contractor's performance is changed due to an act of Force Majeure, or due to the fault or negligence of Owner or anyone for whose acts Owner is responsible, Contractor shall be entitled to make a request for an equitable adjustment in the Contract Time in accordance with the following procedure. No adjustment in the Contract Time shall be allowed to the extent Contractor’s changed time of performance is due to the fault or negligence of Contractor, or anyone for whose acts Contractor is responsible.

1. **Notice and record keeping for Contract Time request:** A request for an equitable adjustment in the Contract Time shall be based on written notice delivered within 7 Days of the occurrence of the event giving rise to the request. If Contractor believes it is entitled to adjustment of Contract Time, Contractor shall immediately notify Owner and begin to keep and maintain complete, accurate, and specific daily records. Contractor shall give Owner access to any such record and if requested, shall promptly furnish copies of such record to Owner.

2. **Timing and content of Contractor's Notice:** Contractor shall not be entitled to an adjustment in the Contract Time for any events that occurred more than 7 Days before Contractor's written notice to Owner. The written notice shall set forth, at a minimum, a description of: the event giving rise to the request for an equitable adjustment in the

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Contract Time; the nature of the impacts to Contractor and its Subcontractors of any tier, if any; and to the extent possible the amount of the adjustment in Contract Time requested. Failure to properly give such written notice shall, to the extent Owner’s interests are prejudiced, constitute a waiver of Contractor’s right to an equitable adjustment.

3. Contractor to provide supplemental information: Within 30 Days of the occurrence of the event giving rise to the request, unless Owner agrees in writing to allow an additional period of time to ascertain more accurate data, Contractor shall supplement the written notice provided in accordance with subparagraph 7.03B.2 with additional supporting data. Such additional data shall include, at a minimum: the amount of delay claimed, itemized in accordance with the procedure set forth herein; specific facts, circumstances, and analysis that confirms not only that Contractor suffered the delay claimed, but that the delay claimed was actually a result of the act, event, or condition complained of, and that the Contract Documents provide entitlement to an equitable adjustment in Contract Time for such act, event, or condition; and supporting documentation sufficiently detailed to permit an informed analysis of the request by Owner. Failure to provide such additional information and documentation within the time allowed or within the format required shall, to the extent Owner’s interests are prejudiced, constitute a waiver of Contractor’s right to an equitable adjustment.

4. Contractor to proceed with Work as directed: Pending final resolution of any request in accordance with this paragraph, unless otherwise agreed in writing, Contractor shall proceed diligently with performance of the Work.

C. Contractor to demonstrate impact on critical path of schedule: Any change in the Contract Time covered by a Change Order, or based on a request for an equitable adjustment in the Contract Time, shall be limited to the change in the critical path of Contractor’s schedule attributable to the change of Work or event(s) giving rise to the request for equitable adjustment. Any Change Order Proposal or request for an adjustment in the Contract Time shall demonstrate the impact on the critical path of the schedule. Contractor shall be responsible for showing clearly on the Progress Schedule that the change or event: had a specific impact on the critical path, and except in case of concurrent delay, was the sole cause of such impact; and could not have been avoided by resequencing of the Work or other reasonable alternatives.

D. Cost of change in Contract Time: Contractor may request compensation for the cost of a change in Contract Time in accordance with this paragraph, 7.03D, subject to the following conditions:

1. Must be solely fault of Owner or A/E: The change in Contract Time shall solely be caused by the fault or negligence of Owner or A/E;

2. Procedures: Contractor shall follow the procedure set forth in paragraph 7.03B;

3. Demonstrate impact on critical path: Contractor shall establish the extent of the change in Contract Time in accordance with paragraph 7.03C; and

4. Limitations on daily costs: The daily cost of any change in Contract Time shall be limited to the items below, less the amount of any change in the Contract Sum the Contractor may otherwise be entitled to pursuant to Section 7.02B 7f for any change in the Work that contributed to this change in Contract Time:

   a. Non-productive supervision or labor: cost of nonproductive field supervision or labor extended because of delay;

   b. Weekly meetings and indirect activities: cost of weekly meetings or similar indirect activities extended because of the delay;
c. Temporary facilities or equipment rental: cost of temporary facilities or equipment rental extended because of the delay;

d. Insurance premiums: cost of insurance extended because of the delay;

e. Overhead: general and administrative overhead in an amount to be agreed upon, but not to exceed 3% of the Contract Award Amount divided by the originally specified Contract Time for each Day of the delay.

PART 8 – CLAIMS AND DISPUTE RESOLUTION

8.01 CLAIMS PROCEDURE

A. Claim is Contractor’s remedy: If the parties fail to reach agreement on the terms of any Change Order for Owner-directed Work as provided in Section 7.01, or on the resolution of any request for an equitable adjustment in the Contract Sum as provided in Section 7.02 or the Contract Time as provided in Section 7.03, Contractor’s only remedy shall be to file a Claim with Owner as provided in this section.

B. Claim filing deadline for Contractor: Contractor shall file its Claim within 120 Days from Owner’s final offer made in accordance with paragraph 7.01E, or by the date of Final Acceptance, whichever occurs first.

C. Claim must cover all costs and be documented: The Claim shall be deemed to cover all changes in cost and time (including direct, indirect, impact, and consequential) to which Contractor may be entitled. It shall be fully substantiated and documented. At a minimum, the Claim shall contain the following information:

1. Factual statement of Claim: A detailed factual statement of the Claim for additional compensation and time, if any, providing all necessary dates, locations, and items of Work affected by the Claim;

2. Dates: The date on which facts arose which gave rise to the Claim;

3. Owner and A/E employee’s knowledgeable about Claim: The name of each employee of Owner or A/E knowledgeable about the Claim;

4. Support from Contract Documents: The specific provisions of the Contract Documents which support the Claim;

5. Identification of other supporting information: The identification of any documents and the substance of any oral communications that support the Claim;

6. Copies of supporting documentation: Copies of any identified documents, other than the Contract Documents, that support the Claim;

7. Details on Claim for Contract Time: If an adjustment in the Contract Time is sought: the specific days and dates for which it is sought; the specific reasons Contractor believes an extension in the Contract Time should be granted; and Contractor’s analysis of its Progress Schedule to demonstrate the reason for the extension in Contract Time;

8. Details on Claim for adjustment of Contract Sum: If an adjustment in the Contract Sum is sought, the exact amount sought and a breakdown of that amount into the categories set forth in, and in the detail as required by Section 7.02; and
9. **Statement certifying Claim:** A statement certifying, under penalty of perjury, that the Claim is made in good faith, that the supporting cost and pricing data are true and accurate to the best of Contractor’s knowledge and belief, that the Claim is fully supported by the accompanying data, and that the amount requested accurately reflects the adjustment in the Contract Sum or Contract Time for which Contractor believes Owner is liable.

D. **Owner’s response to Claim filed:** After Contractor has submitted a fully documented Claim that complies with all applicable provisions of Parts 7 and 8, Owner shall respond, in writing, to Contractor as follows:

1. **Response time for Claim less than $50,000:** If the Claim amount is less than $50,000, with a decision within 60 Days from the date the Claim is received; or

2. **Response time for Claim of $50,000 or more:** If the Claim amount is $50,000 or more, with a decision within 60 Days from the date the Claim is received, or with notice to Contractor of the date by which it will render its decision. Owner will then respond with a written decision in such additional time.

E. **Owner’s review of Claim and finality of decision:** To assist in the review of Contractor’s Claim, Owner may visit the Project site, or request additional information, in order to fully evaluate the issues raised by the Claim. Contractor shall proceed with performance of the Work pending final resolution of any Claim. Owner’s written decision as set forth above shall be final and conclusive as to all matters set forth in the Claim, unless Contractor follows the procedure set forth in Section 8.02.

F. **Waiver of Contractor rights for failure to comply with this Section:** Any Claim of the Contractor against the Owner for damages, additional compensation, or additional time, shall be conclusively deemed to have been waived by the Contractor unless made in accordance with the requirements of this Section.

8.02 **ARBITRATION**

A. **Timing of Contractor’s demand for arbitration:** If Contractor disagrees with Owner’s decision rendered in accordance with paragraph 8.01D, Contractor shall provide Owner with a written demand for arbitration. No demand for arbitration of any such Claim shall be made later than 30 Days after the date of Owner’s decision on such Claim; failure to demand arbitration within said 30 Day period shall result in Owner’s decision being final and binding upon Contractor and its Subcontractors.

B. **Filing of Notice for arbitration:** Notice of the demand for arbitration shall be filed with the American Arbitration Association (AAA), with a copy provided to Owner. The parties shall negotiate or mediate under the Voluntary Construction Mediation Rules of the AAA, or mutually acceptable service, before seeking arbitration in accordance with the Construction Industry Arbitration Rules of AAA as follows:

1. **Claims less than $30,000:** Disputes involving $30,000 or less shall be conducted in accordance with the Northwest Region Expedited Commercial Arbitration Rules; or

2. **Claims greater than $30,000:** Disputes over $30,000 shall be conducted in accordance with the Construction Industry Arbitration Rules of the AAA, unless the parties agree to use the expedited rules.

C. **Arbitration is forum for resolving Claims:** All Claims arising out of the Work shall be resolved by arbitration. The judgment upon the arbitration award may be entered, or review of the award may
occur, in the superior court having jurisdiction thereof. No independent legal action relating to or arising from the Work shall be maintained.

D. **Owner may combine Claims into same arbitration:** Claims between Owner and Contractor, Contractor and its Subcontractors, Contractor and A/E, and Owner and A/E shall, upon demand by Owner, be submitted in the same arbitration or mediation.

E. **Settlement outside of arbitration to be documented in Change Order:** If the parties resolve the Claim prior to arbitration judgment, the terms of the resolution shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of the Claim, including all claims for time and for direct, indirect, or consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity.

### 8.03 CLAIMS AUDITS

A. **Owner may audit Claims:** All Claims filed against Owner shall be subject to audit at any time following the filing of the Claim. Failure of Contractor, or Subcontractors of any tier, to maintain and retain sufficient records to allow Owner to verify all or a portion of the Claim or to permit Owner access to the books and records of Contractor, or Subcontractors of any tier, shall constitute a waiver of the Claim and shall bar any recovery.

B. **Contractor to make documents available:** In support of Owner audit of any Claim, Contractor shall, upon request, promptly make available to Owner the following documents:

1. Daily time sheets and supervisor’s daily reports;
2. Collective bargaining agreements;
3. Insurance, welfare, and benefits records;
4. Payroll registers;
5. Earnings records;
6. Payroll tax forms;
7. Material invoices, requisitions, and delivery confirmations;
8. Material cost distribution worksheet;
9. Equipment records (list of company equipment, rates, etc.);
11. Contracts between Contractor and each of its Subcontractors, and all lower-tier Subcontractor contracts and supplier contracts;
12. Subcontractors’ and agents’ payment certificates;
13. Cancelled checks (payroll and vendors);
14. Job cost report, including monthly totals;
15. Job payroll ledger;
16. Planned resource loading schedules and summaries;
17. General ledger;
18. Cash disbursements journal;
19. Financial statements for all years reflecting the operations on the Work. In addition, the Owner may require, if it deems it appropriate, additional financial statements for 3 years preceding execution of the Work;
20. Depreciation records on all company equipment whether these records are maintained by the company involved, its accountant, or others;
21. If a source other than depreciation records is used to develop costs for Contractor's internal purposes in establishing the actual cost of owning and operating equipment, all such other source documents;
22. All nonprivileged documents which relate to each and every Claim together with all documents which support the amount of any adjustment in Contract Sum or Contract Time sought by each Claim;
23. Work sheets or software used to prepare the Claim establishing the cost components for items of the Claim including but not limited to labor, benefits and insurance, materials, equipment, Subcontractors, all documents which establish the time periods, individuals involved, the hours for the individuals, and the rates for the individuals; and
24. Work sheets, software, and all other documents used by Contractor to prepare its bid.

C. Contractor to provide facilities for audit and shall cooperate: The audit may be performed by employees of Owner or a representative of Owner. Contractor, and its Subcontractors, shall provide adequate facilities acceptable to Owner, for the audit during normal business hours. Contractor, and all Subcontractors, shall make a good faith effort to cooperate with Owner's auditors.

PART 9 – TERMINATION OF THE WORK

9.01 TERMINATION BY OWNER FOR CAUSE

A. 7 Day Notice to Terminate for Cause: Owner may, upon 7 Days written notice to Contractor and to its surety, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for cause upon the occurrence of any one or more of the following events:

1. Contractor fails to prosecute Work: Contractor fails to prosecute the Work or any portion thereof with sufficient diligence to ensure Substantial Completion of the Work within the Contract Time;
2. Contractor bankrupt: Contractor is adjudged bankrupt, makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency;
3. Contractor fails to correct Work: Contractor fails in a material way to replace or correct Work not in conformance with the Contract Documents;
4. Contractor fails to supply workers or materials: Contractor repeatedly fails to supply skilled workers or proper materials or equipment;
5. Contractor failure to pay Subcontractors or labor: Contractor repeatedly fails to make prompt payment due to Subcontractors or for labor;
6. **Contractor violates laws:** Contractor materially disregards or fails to comply with laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction; or

7. **Contractor in material breach of Contract:** Contractor is otherwise in material breach of any provision of the Contract Documents.

**B. Owner's actions upon termination:** Upon termination, Owner may at its option:

1. **Take possession of Project site:** Take possession of the Project site and take possession of or use all materials, equipment, tools, and construction equipment and machinery thereon owned by Contractor to maintain the orderly progress of, and to finish, the Work;

2. **Accept assignment of Subcontracts:** Accept assignment of subcontracts pursuant to Section 5.20; and

3. **Finish the Work:** Finish the Work by whatever other reasonable method it deems expedient.

**C. Surety's role:** Owner's rights and duties upon termination are subject to the prior rights and duties of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.

**D. Contractor’s required actions:** When Owner terminates the Work in accordance with this section, Contractor shall take the actions set forth in paragraph 9.02B, and shall not be entitled to receive further payment until the Work is accepted.

**E. Contractor to pay for unfinished Work:** If the unpaid balance of the Contract Sum exceeds the cost of finishing the Work, including compensation for A/E’s services and expenses made necessary thereby and any other extra costs or damages incurred by Owner in completing the Work, or as a result of Contractor’s actions, such excess shall be paid to Contractor. If such costs exceed the unpaid balance, Contractor shall pay the difference to Owner. These obligations for payment shall survive termination.

**F. Contractor and Surety still responsible for Work performed:** Termination of the Work in accordance with this section shall not relieve Contractor or its surety of any responsibilities for Work performed.

**G. Conversion of “Termination for Cause” to “Termination for Convenience”:** If Owner terminates Contractor for cause and it is later determined that none of the circumstances set forth in paragraph 9.01A exist, then such termination shall be deemed a termination for convenience pursuant to Section 9.02.

### 9.02 TERMINATION BY OWNER FOR CONVENIENCE

**A. Owner Notice of Termination for Convenience:** Owner may, upon written notice, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for the convenience of Owner.

**B. Contractor response to termination Notice:** Unless Owner directs otherwise, after receipt of a written notice of termination for either cause or convenience, Contractor shall promptly:

1. **Cease Work:** Stop performing Work on the date and as specified in the notice of termination;
2. **No further orders or Subcontracts:** Place no further orders or subcontracts for materials, equipment, services or facilities, except as may be necessary for completion of such portion of the Work as is not terminated;

3. **Cancel orders and Subcontracts:** Cancel all orders and subcontracts, upon terms acceptable to Owner, to the extent that they relate to the performance of Work terminated;

4. **Assign orders and Subcontracts to Owner:** Assign to Owner all of the right, title, and interest of Contractor in all orders and subcontracts;

5. **Take action to protect the Work:** Take such action as may be necessary or as directed by Owner to preserve and protect the Work, Project site, and any other property related to this Project in the possession of Contractor in which Owner has an interest; and

6. **Continue performance not terminated:** Continue performance only to the extent not terminated.

C. **Terms of adjustment in Contract Sum if Contract terminated:** If Owner terminates the Work or any portion thereof for convenience, Contractor shall be entitled to make a request for an equitable adjustment for its reasonable direct costs incurred prior to the effective date of the termination, plus reasonable allowance for overhead and profit on Work performed prior to termination, plus the reasonable administrative costs of the termination, but shall not be entitled to any other costs or damages, whatsoever, provided however, the total sum payable upon termination shall not exceed the Contract Sum reduced by prior payments. Contractor shall be required to make its request in accordance with the provisions of Part 7.

D. **Owner to determine whether to adjust Contract Time:** If Owner terminates the Work or any portion thereof for convenience, the Contract Time shall be adjusted as determined by Owner.

**PART 10 – MISCELLANEOUS PROVISIONS**

**10.01 GOVERNING LAW**

Applicable law and venue: The Contract Documents and the rights of the parties herein shall be governed by the laws of the state of Washington. Venue shall be in the county in which Owner’s principal place of business is located, unless otherwise specified.

**10.02 SUCCESSORS AND Assigns**

Bound to successors; Assignment of Contract: Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party shall assign the Work without written consent of the other, except that Contractor may assign the Work for security purposes, to a bank or lending institution authorized to do business in the state of Washington. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations set forth in the Contract Documents.

**10.03 MEANING OF WORDS**

Meaning of words used in Specifications: Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the code of any governmental authority,
whether such reference be specific or by implication, shall be to the latest standard specification, manual, or code in effect on the date for submission of bids, except as may be otherwise specifically stated. Wherever in these Drawings and Specifications an article, device, or piece of equipment is referred to in the singular manner, such reference shall apply to as many such articles as are shown on the drawings, or required to complete the installation.

10.04 RIGHTS AND REMEDIES

No waiver of rights: No action or failure to act by Owner or A/E shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall action or failure to act constitute approval or an acquiescence in a breach therein, except as may be specifically agreed in writing.

10.05 CONTRACTOR REGISTRATION

Contractor must be registered or licensed: Pursuant to RCW 39.06, Contractor shall be registered or licensed as required by the laws of the State of Washington, including but not limited to RCW 18.27.

10.06 TIME COMPUTATIONS

Computing time: When computing any period of time, the day of the event from which the period of time begins shall not be counted. The last day is counted unless it falls on a weekend or legal holiday, in which event the period runs until the end of the next day that is not a weekend or holiday. When the period of time allowed is less than 7 days, intermediate Saturdays, Sundays, and legal holidays are excluded from the computation.

10.07 RECORDS RETENTION

Six year records retention period: The wage, payroll, and cost records of Contractor, and its Subcontractors, and all records subject to audit in accordance with Section 8.03, shall be retained for a period of not less than 6 years after the date of Final Acceptance.

10.08 THIRD-PARTY AGREEMENTS

No third party relationships created: The Contract Documents shall not be construed to create a contractual relationship of any kind between: A/E and Contractor; Owner and any Subcontractor; or any persons other than Owner and Contractor.

10.09 ANTITRUST ASSIGNMENT

Contractor assigns overcharge amounts to Owner: Owner and Contractor recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by the purchaser. Therefore, Contractor hereby assigns to Owner any and all claims for such overcharges as to goods, materials, and equipment purchased in connection with the Work performed in accordance with the Contract Documents, except as to overcharges which result from antitrust violations commencing after the Contract Sum is established and which are not passed on to Owner under a Change Order. Contractor shall put a similar clause in its Subcontracts, and require a similar clause in its sub-Subcontracts, such that all claims for such overcharges on the Work are passed to Owner by Contractor.

10.10 HEADINGS AND CAPTIONS

Headings for convenience only: All headings and captions used in these General Conditions are only for convenience of reference, and shall not be used in any way in connection with the meaning, effect, interpretation, construction, or enforcement of the General Conditions, and do not define the limit or describe the scope or intent of any provision of these General Conditions.
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These University of Washington Modifications to the General Conditions form a part of, and are incorporated in the Contract Documents and modify, delete, add, and replace provisions of the General Conditions. Provisions not altered remain in effect. All terms defined elsewhere in the Contract Documents shall have the same meaning here.

PART 2 – INSURANCE AND BONDS

2.01 Contractor’s Liability Insurance

- Add the following language to the end of the first paragraph of section 2.01:

  “The certificate holder shall be:
  Capital Planning & Development
  University of Washington
  Box 352205
  Seattle, WA 98195”

- Delete subparagraph 2.01A2 and replace it with the following language:

  “Automobile Liability Insurance: coverage for all owned, non-owned and hired automobiles.”

- Delete paragraph 2.01D and replace it with the following language:

  “Owner as Additional Insured: All insurance coverages shall name the Board of Regents of the University of Washington as an additional insured with respect to liability arising out of work performed by Contractor, and an additional insured endorsement to the policy must be provided to the Owner. All insurance coverages shall be endorsed to be primary and non-contributory with any insurance maintained by the University of Washington, provide a waiver of any rights of subrogation against the University of Washington, and contain a severability of interest provision in favor of the University of Washington, and all insurance certificates shall evidence full compliance with the above enumerated requirements. If the contract amount, including alternates, is less than $5 million, the primary and non-contributory endorsement is not mandatory.”

2.04 Payment and Performance Bonds

- Delete the last sentence of section 2.04 and replace it with the following language:

  “No payment or performance bond is required if the Contract Sum is $150,000 or less and Contractor agrees that Owner may, in lieu of the bond, retain 10% of the Contract Sum for the period allowed by RCW 39.08.010.”

PART 5 - PERFORMANCE

5.01 Contractor Control and Supervision

Add a new paragraph 5.01G as follows:

“Work During Off Hours: When work is to be performed during other than normal working hours or on University of Washington holidays, Contractor shall give Owner prior notice so that Owner's Police Department may be properly notified. Any construction activity between the hours of 10:00 p.m. to 6:00 a.m. is subject to approval of Owner.”

Add a new paragraph 5.01H as follows:
“Contractor to comply with University of Washington’s campus conduct code: Contractor shall ensure that its owner(s) and employees, and those of its Subcontractors, comply with the University’s conduct on campus code, WAC 478-124-020, which, among other things, prohibits the possession or use of firearms or other dangerous weapons or instrumentalities on the University campus, except for authorized University purposes. At the discretion of the University, Contractor shall remove from the University campus, at its sole cost and expense, any of its, or its Subcontractors’ employees, if they are in violation of this code.”

5.02 Permits, Fees and Notice

Add a new paragraph 5.02D as follows:

“For Work within the City of Seattle, Owner shall pay the City of Seattle directly for the cost of the Master Use and Building Permit. Prior to Final Acceptance, the building permit and City-approved drawings, signed inspection card(s), and any appropriate occupancy permits shall be submitted to Owner.”

5.07 Safety Precautions

• Add a new paragraph 5.07I as follows:

“In order to receive a Notice to Proceed, the Contractor must submit the following to Owner:

1. A copy of its company Safety Program. The Safety Program shall contain, at a minimum, the following:
   a. Organization, including names of individuals who will perform safety duties, titles, work assignments, authority and reporting relationships.
   b. Training Program. Who, how and when training is provided; method of employee training concerning safety rules and procedures; training in use of protective equipment.
   c. Protective Equipment. List of personal protective equipment to be provided to employees.
   d. Accident Prevention and Loss Control Plan. Work site inspection and hazard correction procedures; disciplinary procedures for safety infractions; accident response, investigation and reporting procedures.
   e. Regular Safety Meetings. On-site weekly or other frequency as appropriate, safety meetings mandatory for all employees.”

• Add a new paragraph 5.07J as follows:

“Prior to commencing any Work on-site, Contractor shall submit an appropriate site specific safety plan for Owner’s acceptance. The plan must be tailored to the needs of the particular project and to the types of hazards involved, and be in compliance with WISHA requirements. Contractor shall not begin any on-site Work until the site specific safety plan has been accepted by Owner.”

5.10 Unforeseen Physical Conditions

Add a new paragraph 5.10C as follows:
“If Contractor encounters mold in the course of its work it shall notify Owner to evaluate what action might be necessary. Contractor shall ensure that all building materials used during the work are dry prior to incorporation into the Work. If Contractor encounters water intrusion from any source it shall take immediate steps to ensure that any effected material is dry according to generally accepted industry standards.”

5.13 Material and Equipment
Add the following new sentence after the last sentence of paragraph 5.13A:

“Contractor shall ensure that all equipment, materials and articles incorporated into the Work shall be asbestos free.”

5.20 Subcontractors and Suppliers
Add the following new subparagraph 5.20A6 as follows:

“For contracts entered into between September 1, 2010 and December 31, 2013, not have violated the reporting requirements of RCW 39.04.370 more than one time, as determined by the Department of Labor and Industries.”

5.23 Contractor Performance Evaluation
Add a new section 5.23 as follows:

“CONTRACTOR PERFORMANCE EVALUATION
Owner shall evaluate Contractor for the performance categories as set forth in the “Contractor Performance Evaluation Report” in Appendix A. Section 00 73 20, Contractor Performance Evaluation Program, describes the evaluation process.”

PART 6 – PAYMENTS AND COMPLETION
6.07 Substantial Completion
Delete the second sentence of paragraph 6.07 and replace it with the following language:

“All Work other than incidental corrective and incidental punch list work shall be completed.”

PART 7 – CHANGES
7.02 Change in the Contract Sum
• Add the following new sentence after the second sentence of subparagraph 7.02B7a:

“When estimating labor hours for electrical work, such hours shall be no greater than the Labor Units for specific items included in the “Normal” project conditions column of the NECA Manual of Labor Units, most recent edition. When estimating labor hours for mechanical work, such hours shall be no greater than 75% of the Labor Units for specific items included in the MCAA Web-Based Estimating Manual (WebLEM), subject to the assumptions and notes in the WebLEM, except that the Labor Units for “Hangers, Sleeves, & Inserts” shall be no greater than 50% of the WebLEM Labor Units. Special exceptions for electrical and mechanical work may be made for work having to be performed under extraordinary conditions. Such
exceptions shall be identified and explained in any applicable pricing proposals and shall be subject to approval by Owner.”

- Delete the last sentence of subparagraph 7.02B7a(1) and replace it with the following:
  “No supervision markup shall be allowed in a Change Order that contains direct labor costs for a working supervisor’s hours (including any category of foreman).”

- Replace subparagraph 7.02B7b in its entirety with the following:
  “Material costs: This is an itemization of the quantity and cost of materials needed to perform the change in the Work. Material costs shall be developed first from actual known costs, including, but not limited to, Contractors’ supplier(s)’ actual cost(s) available from the standard industry pricing guide “Trade Service”, second from supplier quotations, or, if these are not available, and third from other standard industry pricing guides.

  Material costs shall include all available discounts. Freight costs, express charges, or special delivery charges, shall be itemized.”

- Add the following new language after the second sentence of subparagraph 7.02B7c:
  “The Contractor’s cost for utility vehicles and other items such as pickup trucks, vans, flatbed trucks, storage trailers, containers, etc., that are already in use or planned for use on the Project will not be compensated in Change Order work except for the time that, in the opinion of the Owner, such items: (1) are directly and necessarily used for the performance of the change work; and (2) the cost of using such items has not been included within the Contractor’s total project overhead costs.”

- Add the following new language after the last sentence of subparagraph 7.02B7c(2):
  “Equipment pricing shall be no greater than 75% of NECA monthly rates.”

- Delete the first sentence of subparagraph 7.02B7d and replace it with the following language:
  “Small tools consist of tools which cost $1,000 or less and are normally furnished by the performing contractor.”

PART 8 - CLAIMS AND DISPUTE RESOLUTION

8.02 Replace section 8.02 in its entirety with the following:

“LITIGATION

A. If Contractor disagrees with Owner’s decision rendered in accordance with paragraph 8.01D, Contractor shall serve and file a lawsuit in an appropriate court within 120 days of Owner’s decision. This requirement cannot be waived except by an explicit waiver signed by Owner. The failure to file a lawsuit within said 120-day period shall result in Owner’s decision rendered in accordance with paragraph 8.01D being final and binding on Contractor and all of its Subcontractors.”
B. At any time, either before or after a lawsuit has been commenced by Contractor in accordance with paragraph 8.02A, Owner may require Contractor to participate in further mediation or arbitration, or both, in any forum or format as determined by Owner.

C. Claims between Owner and Contractor, Contractor and its Subcontractors, Contractor and A/E, and Owner and A/E shall, upon demand by Owner, be submitted in a single forum, or Owner may consolidate such Claims or join any of the above-named parties in the same forum.”

PART 10 - MISCELLANEOUS PROVISIONS

10.11 Add a new section 10.11 as follows:

"MWBE REQUIREMENTS

A. General Requirements

Contractor shall comply with the following requirements:

In accordance with Chapter 39.19 RCW, it is the policy of the State of Washington to provide the maximum practicable opportunity for increased participation by minority and women-owned and controlled businesses (MWBE) in public works.

The Washington State Office of Minority and Women's Business Enterprises (OMWBE) certifies firms that are owned and controlled by minorities or women, and can provide information regarding the certification process. Information about the certification status of a particular firm is available at the following OMWBE website address: http://www.omwbe.wa.gov/biznetwas/, or by contacting OMWBE at (360) 753-9693, 406 South Water, P.O. Box 41160, Olympia, Washington 98504-4611.

B. Affirmative Action Efforts

1. Contractors shall at all times endeavor to:
   a. Advertise opportunities for subcontractors or suppliers in a manner reasonably designed to provide MWBEs capable of performing the work with timely notice of such opportunities, and all advertisements shall include a provision encouraging participation by MWBE firms. Advertising may be done through general advertisements (e.g., newspapers, journals, etc.) or by soliciting bids/proposals directly from MWBEs.
   b. Provide MWBEs that express interest with adequate and timely information about plans, specifications, and requirements of the Contract.

2. Contractors are further encouraged to:
   a. Break down total requirements into smaller tasks or quantities, where economically feasible, in order to permit maximum participation by MWBEs and other small businesses.
   b. Establish delivery schedules, where the requirements of this contract permit, that encourage participation by MWBEs and other small businesses.
   c. Reduce bonding requirements where practicable.
d. Utilize the services of available minority community organizations, minority contractor groups, local minority assistance offices and organizations that provide assistance in the recruitment and placement of MWBEs and other small businesses.

C. Reporting Requirements

1. Prior to Application of First Progress Payment, Contractor shall submit a list of all MWBE subcontractors/suppliers it intends to use.

2. Prior to Final Acceptance, Contractor shall submit a report of total dollar amounts paid to MWBEs.

D. Non-Discrimination

Contractors shall not create barriers to open and fair opportunities to all businesses including MWBEs to participate in University contracts and to obtain or compete for contracts and subcontracts as sources of supplies, equipment, construction and services. In considering offers from and doing business with subcontractors and suppliers, the Contractor shall not discriminate on the basis of race, color, creed, religion, sex, age, nationality, martial status, or the presence of any mental or physical disability in an otherwise qualified disabled person.

E. Sanctions

Failure to comply with any of the mandatory requirements of this part of the contract may subject the Contractor to sanctions or damages as provided for by RCW 39.19.090, or by other applicable laws.”

END OF SECTION
These Supplemental Conditions form a part of, and are incorporated in, the Contract Documents and modify, delete, add, and replace provisions of the General Conditions. Provisions not altered remain in effect. All terms defined elsewhere in the Contract Documents shall have the same meaning in these Supplemental Conditions.

00 73 01 TIME OF COMPLETION AND LIQUIDATED DAMAGES

The Work shall be commenced on the effective date specified in the Notice to Proceed and shall be substantially complete within a period not to exceed two hundred and twenty five (225) calendar days. For failure to achieve Substantial Completion of the Work within the time provided, Contractor shall pay Owner $470.00 for each calendar day from the date when Substantial Completion should have been achieved to the date Substantial Completion is actually achieved. The provisions of the General Conditions section 3.07, for liquidated damages, remain in effect.

00 73 02 CONTRACTOR’S LIABILITY INSURANCE

Delete paragraph 2.01D and replace it with the following language:

“Owner as Additional Insured: All insurance coverages shall name King County and the University of Washington, their boards, their officers, agents and employees, as an additional insured with respect to liability arising out of work performed by Contractor, and an additional insured endorsement to the policy must be provided to the Owner. All insurance coverages shall be endorsed to be primary and non-contributory with any insurance maintained by the University of Washington, provide a waiver of any rights of subrogation against the University of Washington, and contain a severability of interest provision in favor of the University of Washington, and all insurance certificates shall evidence full compliance with the enumerated requirements. If the contract amount, including alternates, is less than $5 million, the primary and non-contributory endorsement is not mandatory.”

Add the following language to the end of the first paragraph of section 2.01:

Products Completed Operations Additional Insured. The Contractor’s CGL insurance must include the King County, and the University of Washington, their boards, their officers, agents, and employees as an additional insured status on ISO CG 20 10 11 85 or CG 20 37 endorsement, or by an equivalent policy or endorsement provisions. The Product Completed Operations additional insured status for the Owner must remain in effect for not less than 6 years following Final Completion.

Add item 3 to Section 2.01.A as follows:

3. Contractor’s Pollution Liability (CPL) policy covering against claims for bodily injury, property damage and cleanup costs/environmental damages arising from pollution conditions caused in the performance of covered operations.

a. If the work involves remediation, abatement, repair, maintenance or other work with asbestos containing lead-containing products (paint, coatings, components), mercury, underground storage tanks, and/or other regulated materials, the CPL policy shall not exclude such coverage, or a specific policy covering such exposure shall be required from the Contractor or the subcontractor performing such work.
b. If the work involves transporting regulated materials, a separate policy or endorsement to the CPL policy specifically providing coverage for liability and cleanup, arising from an upset or collision during transportation of regulated materials is required from the Contractor or subcontractor performing such work.

Such policy shall name the Owner as an additional insured, be primary and noncontributory, and provide at least 45 days notice of cancellation or non-renewal to the Owner. If the work is performed by a subcontractor and such coverage is provided by the subcontractor, coverage shall name both the Contractor and Owner as additional insureds.

00 73 03 COVERAGE LIMITS

Add item E to Section 2.02 as follows:

$2,000,000 each claim, $2,000,000 aggregate, Contractor's Pollution Liability

00 73 04 BUILDER'S RISK

Delete Section 2.06 A and B and replace with the following new Section 2.06 A: “Owner will purchase and maintain Builder’s Risk property insurance on an “all risk” basis, insuring against the perils of fire and extended coverage and physical loss or damage including theft, vandalism, malicious mischief, collapse, false work, temporary buildings, and debris removal including demolition resulting from the enforcement of any applicable legal requirements, and excluding earthquake and flood coverage, in the amount of the Contract Sum including all Change Orders for the entire Work on a replacement cost basis until Substantial Completion. The policy will cover the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors as their interests may appear. Contractor shall be responsible for all losses up to the policy deductible amount of $5,000 per occurrence for projects with a Contract Sum less than $500,000; and $10,000 per occurrence for projects with a Contract Sum valued at $500,000 or more. A specimen policy is available for inspection. Contractor is not required to obtain Builder’s Risk property insurance. If the Contractor believes it has a loss that is covered by Builder’s Risk property insurance, and it is likely to exceed the policy deductible, the Contractor shall notify the Owner within 48 hours.”

In Section 2.06, delete the following from paragraph C: “A/E, A/E’s subconsultants” and renumber paragraph C as paragraph B.
00 73 07 PERMITS REQUIRED

Washington State DOH Permits have all been applied for and permit fees have been paid for by the Owner. Building Permit, Mechanical Permit and Electrical Permit have all been applied for and permit fees have been paid to the City of Seattle Department of Construction and Inspection (SDCI) by the Owner. The Contractor will be responsible for all other permits, applications and fees, including Fire Alarm, Plumbing and Fire Sprinklers. The Electrical Permit will need to be picked up and signed off by a licensed electrical contractor from SDCI as part of this project.

00 73 08 ENVIRONMENTAL MITIGATION (NOT USED)

00 73 09 FINAL PAYMENT

Requests for final payment will not be processed until the post-job asbestos abatement submittal package has been reviewed and approved by the Owner and the Asbestos A/E.

00 73 10 APPRENTICESHIP UTILIZATION REQUIREMENTS (NOT USED)

00 73 11 MWBE REQUIREMENTS

Add item F to section 10.11 as follows:

E. Solicitation of Proposals

As required by RCW 28B.20.744(10), contractors shall solicit proposals from OMWBE certified firms. Within fourteen (14) days after the issuance of the Notice to Proceed, the Contractor shall submit to the Owner a report documenting that the Contractor solicited proposals from OMWBE certified firms. The report shall include the names and contact information for all firms, and the dates of solicitation.

END OF SECTION
I. POLICY

The University of Washington through its Capital Planning and Development service group (Owner), is charged with the responsibility of ensuring that all public works improvement projects are awarded to the responsible bidder submitting the lowest responsive bid, and are performed in compliance with the Contract Documents and applicable federal, state, and local laws and regulations. The Owner is responsible to the citizens of the State to oversee the expenditure of public funds, and to secure the best possible results for that expenditure. To assist the Owner in evaluating a Contractor's responsibility, as well as its performance on contracts of the Owner, the Contractor Performance Evaluation Program has been developed. The implementation of a mandatory, standardized system of evaluating Contractors' performance is expected to yield consistency, objectivity, fairness, and accountability.

II. PURPOSE

The purpose of the Contractor Performance Evaluation Program is to better assure that Contractors considered for contract award on public works projects either possess, or will likely possess at the time contract performance is set to begin, all qualifications necessary to successfully complete the project on time. Among other things, the Program is intended to:

° Assist the Owner in exercising its discretion to determine a Contractor's qualifications and abilities to successfully perform a particular contract.

° Provide the Owner with a rational basis for determining that a Contractor is or is not responsible.

° Provide Contractors with a means of enhancing their qualifications and reputation by receiving recognition for high standards of performance.

° Encourage better working relationships between the Owner and Contractors.

° Provide official, verifiable references for Contractors who may be under consideration for award of, or approval on, contracts to be awarded by other public owners.

° Provide a history and an assessment of a Contractor's performance on prior contracts of the Owner for use in suspension or debarment proceedings.

The Contractor Performance Evaluation Program is not intended to determine whether a Contractor has breached a contract with the Owner, or to determine the acceptability of any particular noncompliance with Contract requirements.

III. PERFORMANCE CATEGORY EVALUATION GUIDE

The Performance Category Evaluation Guide establishes criteria to be used in evaluating the Contractor's performance in connection with each Performance Category, and describes five Performance Levels, which range in ascending order of merit from "Inadequate" to "Superior".
The "Standard" Performance Level is considered a baseline; it characterizes the level of acceptable performance normally associated with a reasonably prudent, diligent, and skilled Contractor working on projects of the same general type and size. Both the "Superior" and "Good" Levels characterize performance levels that exceed the baseline; they respectively connote consistent and substantial positive contributions to the overall project. Both the "Deficient" and "Inadequate" Levels characterize levels of performance that fall below the baseline, and respectively connote substantial and serious detriment to the overall project. The "No Evaluation" Level is to be used only where the Contractor had no direct or indirect responsibility for performance.

The five Performance Levels are more specifically described as follows, and the criteria set forth for each shall be applied in evaluating the Contractor's performance in connection with each of the Performance Categories listed in Section III of the Contractor Performance Evaluation Report:

A. **Superior** To merit an evaluation of "Superior" in any Performance Category, the Contractor must have consistently demonstrated:

   (1) Command or virtual mastery of the Contract Documents related to that Performance Category;

   (2) Performance of the work or activity being evaluated under that Performance Category that always exceeded or surpassed the material requirements of the Contract;

   (3) A highly cooperative attitude in dealing with Owner's employees, consultants, and the public in connection with that Performance Category, which attitude made a substantial, positive contribution to the Project; and

   (4) Initiative in carrying out his or her duties in connection with that Performance Category in a responsive, thorough, and timely manner without prompting by the Owner's Representative.

If the Contractor fails to satisfy any one of the Performance Level criteria set out above, then his or her performance will be re-evaluated under the "Good" Level by applying the criteria for that Level.

B. **Good** To merit an evaluation of "Good" in any Performance Category, the Contractor must have demonstrated:

   (1) Thorough knowledge of Contract Documents related to that Performance Category;

   (2) Performance of the work or activity being evaluated under that Performance Category that always met, and often exceeded, the material requirements of the Contract;

   (3) A cooperative attitude in dealing with Owner's employees, consultants, and the public in connection with that Performance Category, which attitude made a positive contribution to the project; and
(4) Initiative in carrying out his or her duties in connection with that Performance Category in a responsive, thorough, and timely manner with only minimal prompting by the Owner’s Representative.

If the Contractor fails to satisfy any one of the Performance Level criteria set out above, then his or her performance will be re-evaluated under the "Standard" Level by applying the criteria for that Level.

C. Standard  To merit an evaluation of "Standard" in any Performance Category, the Contractor must have demonstrated:

(1) Acceptable knowledge of the Contract Documents related to that Performance Category;
(2) Performance of the work or activity being evaluated under that Performance Category that met all material Contract requirements;
(3) A generally cooperative attitude toward Owner’s employees, consultants, and the public in connection with that Performance Category; and
(4) Initiative in carrying out his or her duties in connection with that Performance Category in a responsive, thorough, and timely manner with only moderate prompting by the Owner’s Representative.

If the Contractor fails to satisfy any one of the Performance Level criteria set out above, then his or her performance will be re-evaluated under the "Deficient" and "Inadequate" Levels by applying the criteria for those Levels.

D. Deficient  To merit an evaluation of "Deficient" in any Performance Category, the Contractor must have demonstrated:

(1) Marginal knowledge of the Contract Documents related to that Performance Category;
(2) Performance of the work or activity being evaluated under that Performance Category that did not always meet the material Contract requirements, and such failures were not excusable as the sole fault and responsibility of one or more other parties;
(3) An occasionally uncooperative attitude toward Owner’s employees, consultants, or the public in connection with that Performance Category; or
(4) Performance of his or her duties in connection with that Performance Category in a moderately unresponsive, inattentive, or dilatory manner, or after frequent or repeated prompting by the Owner’s Representative.

E. Inadequate  To merit an evaluation of "Inadequate" in any Performance Category, the Contractor must have either: (a) failed to satisfy the criteria listed for the Performance Levels of "Superior", "Good", "Standard", and "Deficient" set out above and did not qualify for treatment under Section III.F below; or (b) must have demonstrated:
(1) Inadequate knowledge of the Contract Documents related to that Performance Category;

(2) Performance of the work or activity being evaluated under that Performance Category which seldom met the material Contract requirements, and such failures were not excusable as the sole fault and responsibility of one or more other parties;

(3) A seriously uncooperative attitude toward Owner’s employees, consultants, or the public in connection with that Performance Category; or

(4) Performance of his or her duties in connection with that Performance Category in a seriously unresponsive, inattentive, or dilatory manner, or only after frequent prompting by Owner’s Representative.

F. No Evaluation. This rating should only be used in those circumstances where the Contractor had no contractual responsibility, either directly or through its subcontractors, suppliers, or materialmen, for performance related to that Performance Category.

IV. OVERALL EVALUATION GUIDE

The Contractor's Overall Evaluation can be determined by placing the Overall Percentage Score calculated on the Contractor Performance Evaluation Report within the numerical ranges of the following narrative ratings in the Overall Evaluation Guide:

A. SUPERIOR (Overall Percentage Score of 90% or above)

The Contractor exceeded the Contract requirements and expectations in most or all of the areas evaluated. The Contractor was extremely or completely knowledgeable regarding Contract requirements and applicable laws and regulations. A consistently high level of cooperation, project management, and job site control appreciably contributed to an unusually good result. The Contractor is commended for excellent performance.

B. GOOD (Overall Percentage Score of 70% to 89%)

The Contractor met Contract requirements evaluated, and exceeded them in some areas. The Contractor was generally cooperative, and performed his/her work with a minimum of prompting. The results of the performance were very good.

C. STANDARD (Overall Percentage Score of 50% to 69%)

The Contractor generally satisfied the minimum requirements of the Contract as evaluated. The Contractor occasionally had to be prompted or reminded of Contract requirements, but overall management of the Project was good, producing a good result.

D. DEFICIENT (Overall Percentage Score of 30% to 49%)

Even though the Project may have been accepted, the Contractor's performance as evaluated was marginal overall. While the Contractor
performed some tasks satisfactorily, most elements evaluated reflected a less than satisfactory response to Contract requirements.

E. INADEQUATE (Overall Percentage Score of 29% or below)

The Contractor's performance as evaluated did not meet minimum Contract requirements, or so otherwise detracted from the Project as to seriously call it into jeopardy. While the Project may have been accepted by the Owner, the effort expended by the Owner's Representative in prompting the Contractor to perform was excessive. The Contractor's poor or uncooperative performance created serious unnecessary or avoidable difficulties in achieving contract completion.

A Contractor's Overall Evaluation, being based upon an averaged rate on a discrete number of Performance Categories, should not be read or interpreted as a measure of whether the Contractor did or did not breach the contract in question.

V. PERFORMANCE EVALUATION REPORTS

Each Contractor Performance Evaluation Report shall be prepared by, or at the direction of, the Owner's Representative who will include numerical ratings substantiated, when necessary, by one or more narratives which describe the Contractor's performance.

Every Contractor Performance Evaluation Report containing Performance Level evaluations of "Deficient" or "Inadequate", and all Overall Evaluations on projects the total cost of which is $500,000 or more, shall contain one or more narratives which provide details substantiating the evaluations. Narratives may be provided for other Performance Categories as the evaluator deems necessary.

Narratives provided with a Contractor Performance Evaluation Report shall be based upon documentation prepared during the life of the project, e.g., project diaries, inspectors' reports, and other pertinent documents. Such documentation shall constitute a major portion of the administrative record to be used for any review, appeal, or litigation that may arise from the evaluation process.

Every Contractor Performance Evaluation Report shall be signed by the Owner's Representative and the supervisor of the Owner's Representative before a copy of the Report shall be transmitted to the Contractor. The Report shall not be considered final until such time as the review/appeal periods described in Section VI herein have been completed.

Generally, only one Contractor Performance Evaluation Report shall be issued, following completion of the contract Work. However, in addition to a final Report, one or more interim Reports may be issued at the discretion of the Owner when:

- A contract is of long duration, particularly those in excess of one year.
- An individual charged with primary responsibility for administration of the Contract will cease his or her involvement with the Project prior to completion of the Work.
- Contractor's performance at 50% completion is deficient or inadequate.
Interim Contractor Performance Evaluation Reports shall be considered to be preliminary and shall be designated as such, and shall be processed administratively in the same manner as a Final Report. A Contractor may request review of an Interim Report by the applicable project Director in Capital Planning and Development; and appeal to the Owner’s Associate Vice President for Capital Planning and Development or his/her designee pursuant to the provisions of Section VI below. All Interim Reports shall be attached to, and considered when preparing, the Final Report.

If a Contractor Performance Evaluation Report is an Interim Report, the Report should indicate on its face that it is Interim, and shall contain the following language:

This Performance Evaluation Report is not the final report on this Contractor on this Project. The Contractor may dispute the Report or any part thereof, and need not seek review or appeal until completion and acceptance of the Project.

VI. NOTICE, REVIEW, AND APPEAL

A. Notice. Contractors shall be mailed a copy of their Contractor Performance Evaluation Report within a reasonable time after completion of the Report. A Contractor who is given an Overall Evaluation of "Deficient" or "Inadequate" in connection with a project shall be provided with a copy of the Contractor Performance Evaluation Report via certified mail (return receipt requested).

B. Review. A Contractor who disputes, or is otherwise dissatisfied with, his or her Contractor Performance Evaluation Report may request review of the Report by the applicable project Director in Capital Planning and Development. The request must be submitted in writing within thirty (30) calendar days of receipt by the Contractor of the Final Contractor Performance Evaluation Report. The request must also state, with specificity, all bases for the requested review.

The applicable project Director shall, upon receipt of a proper and timely request, review the Contractor Performance Evaluation Report and any documentation submitted by the Contractor with his or her request. The applicable project Director shall, on the basis of his or her review, issue findings which may affirm, correct, or modify all or any part of the Report. A copy of the findings shall be mailed to the Contractor via certified mail, return receipt requested.

C. Appeal. Within ten (10) calendar days of receipt by the Contractor of the applicable project Director's findings on review, the Contractor may appeal therefrom to the Owner’s Associate Vice President for Capital Planning and Development or his/her designee. Any such appeal shall be in writing, and shall state with specificity the bases or grounds for the appeal.

The Associate Vice President for Capital Planning and Development or his/her designee shall review and consider the objectivity, accuracy, completeness, and fairness of the Contractor Performance Evaluation Report, together with the applicable project Director’s findings, engineers’ diaries, job records and other documentation, including such documentation as the Contractor may provide with the appeal.

Upon hearing and review of the applicable Director’s findings, the Associate Vice President for Capital Planning and Development or his/her designee shall issue a determination and findings which may affirm or modify the Contractor's Contractor Performance Evaluation Report. The
VII. NOT RESPONSIBLE DETERMINATION FOR WORK ON SPECIFIC PROJECT

The Owner’s Associate Vice President for Capital Planning and Development may determine, from Contractor Performance Evaluation Reports and other public documents relating to the project in question, that a Contractor who has received one or more Overall Evaluations of "Deficient" or "Inadequate" is not a responsible bidder and not able to successfully perform a specific project of the Owner for which the Contractor submitted a bid, and is therefore ineligible for award of that contract.

When, on that basis, the Owner’s Associate Vice President for Capital Planning and Development believes that the low bidder is not a responsible bidder and not able to successfully perform a project, the Owner shall notify the low bidder in writing of its determination that the bidder is not a responsible bidder. The bidder may appeal the determination within the time period specified in the Instructions to Bidders by presenting additional information to the Owner. The Owner shall consider the additional information before issuing its final determination. In evaluating the additional information, the Owner may or may not meet with the bidder to hear additional information. If the final determination affirms that the bidder is not responsible, the Owner will not execute a contract with any other bidder until two business days after the bidder determined to be not responsible has received the final determination.

VIII. DEBARMENT OF CONTRACTOR

The Owner’s Associate Vice President for Capital Planning and Development or his/her designee, after conducting a hearing with the Contractor and evaluating the evidence, may debar a Contractor from contracting with the Owner for a period of up to two years if a Contractor has received overall evaluations of their performance of "Deficient" or "Inadequate" on three or more projects of the Owner physically completed during the preceding five (5) year period.

IX. RELEASE OF INFORMATION

Contractor Performance Evaluation Reports are public documents subject to disclosure to other governments and to the public. Because the Reports and the Overall Evaluations they contain may be used as a basis for contract award and may reflect upon the Contractor’s reputation, care must be taken to assure that only accurate, complete, and current information is released.

A. Final Reports. Contractor Performance Evaluation Reports may be released when:

1. The Report becomes final as set forth in Section V herein; or
2. The Owner has relied upon the Report for the purpose of taking further action with respect to the Contractor; or
3. A court has ordered release of the Report.

B. Interim Reports. Interim Contractor Performance Evaluation Reports may only be released when:

1. The Contractor has consented in writing to the release; or
(2) The Contractor has requested and received final administrative review of an Interim Report; or

(3) The Owner has used or relied upon the Interim Report to take action with respect to the Contractor; or

(4) A court has ordered release of the Report.

C. Termination for Cause and Pending Litigation. In the event that the Contract is terminated by Owner for cause, this fact shall be noted on the Contractor's Contractor Performance Evaluation Report. In the event that a Contractor commences suit against the Owner, that Contractor's Performance Evaluation Report shall not be released without approval from the Washington State Attorney General's Office.

D. Intergovernmental Cooperation. All requests for Contractor references from agencies of foreign, federal, state, or local governments shall be referred to the Owner's applicable project Director or his/her designee. If such a request is honored, the requesting agency shall be provided with copies of all Contractor Performance Evaluation Reports on the Contractor, together with any written objections or refutations filed with the Owner by the Contractor in connection therewith.

X. INSTRUCTIONS FOR COMPLETING EVALUATION FORMS

The Owner's Representative shall complete Sections I (Contractor Data) and II (Project Data), and then evaluate the Contractor's performance in each of the Performance Categories listed in Section III (Performance Data) of the Contractor Performance Evaluation Report, and shall assign points for each category based on the Performance Level applicable for the Contractor's performance.

The descriptions provided on the Contractor Performance Evaluation Report form for each Performance Category will not necessarily match precisely with the Contractor's actual performance of the task(s) on a given portion of the project.

The Owner's Representative should consider the general character of the Contractor's performance for each Performance Category evaluated and select the Performance Level that most closely matches the actual performance.

If the Contractor was not responsible for any performance in connection with a given Performance Category, then the Contractor's evaluation in that Category should be "No Evaluation," and no points should be assigned.

When rating a Contractor, the Owner's Representative should consider all the work performed by the Contractor as well as work performed by all subcontractors, since the Contractor is contractually responsible to the Owner for all of the work under the Contract, whether or not the Contractor actually performs the work. Interim Reports, if issued, shall be attached to the Final Report.

Comments are always encouraged, and may be written on the Contractor Performance Evaluation Report or on an attachment to the Report.

However, for each Performance Category evaluated as "Deficient" or "Inadequate", the Owner's Representative must prepare a written narrative substantiating the facts and circumstances giving rise to the evaluation.
After evaluating the Contractor on Performance Categories listed in Section III of the Contractor Performance Evaluation Report, the Owner’s Representative shall total all of the points assigned and divide that into the total points possible (excluding those Performance Categories evaluated as "No Evaluation"). The evaluator will enter the resulting Overall Percentage Score on the Report, and will enter the appropriate Overall Evaluation on the basis of the following ranges:

- **Superior** Overall percentage score of 90% or above
- **Good** Overall percentage score of 70% to 89%
- **Standard** Overall percentage score of 50% to 69%
- **Deficient** Overall percentage score of 30% to 49%
- **Inadequate** Overall percentage score of 29% or below

The Owner’s Representative shall sign the Report and forward it to his or her supervisor for concurrence signature and submission to the Owner’s Contracts Department. The Contracts Department staff shall then forward signed copies of the completed Report to the Contractor.
PART 1 - GENERAL

1.1 PROJECT DESCRIPTION

A. The Work of the Contract Documents can be summarized as follows:
   1. Interior alterations of approximately 1700sf of existing spaces in the Pediatric Burn Unit on Level 8 of the East Hospital building of the Harborview campus. The project includes the following:
      a. Conversion of two Offices and Playroom into larger Playroom
      b. Conversion of Therapy Room and Staff Break Room into larger Therapy Room
      c. Conversion of Office into Staff Break Room
      d. Finish upgrade to existing bathroom
      e. Conversion of 8EH into suite, and addition of suite doors
      f. Upgrade to existing infant security system (to be bidder designed)
      g. Addition of interactive surfaces in Playroom and Therapy Room (to be bidder designed)
   2. Architectural work includes non-load bearing walls, architectural finishes, and casework.
   3. Structural work includes ceiling infrastructure to accommodate new equipment.
   4. Mechanical & electrical work includes upgrades to existing HVAC & electrical systems as required by renovations. Electrical work will be permitted separately.
   5. Site will be accessed via entry to Pediatric Burn Unit
   6. The project will not impact the continuous operation of the remainder of the Pediatric Burn Unit and surrounding support spaces during construction. Project will be conducted in three major phases with two sub-phases.

1.2 GENERAL INFORMATION

A. Title of Contract Documents:
   1. University of Washington
      HMC 8EH Burn Upgrades
      Project Number: 206970

B. Owner and A/E Defined:
   1. Owner:
      University of Washington
      Facilities - Project Delivery Group
      Seattle, Washington 98195-2205

      Project Manager: Ibo Sezgin
      E-mail: ibo@uw.edu
      Phone: 206-744-2481
      Owner’s Representative: The Owner shall designate, in writing, the Owner’s Representative for this Project during construction.

   2. A/E:
      Ankrom Moisan Architects
      1505 5th Ave Suite 300
      Seattle, WA 98101
Representative: Britt Beushausen  
E-mail: brittb@ankrommoisan.com  
Phone: 206-876-3036

3. The Owner, the A/E, and various consultants hereinafter or otherwise listed shall be given access to the Work insofar as their interests are concerned.

C. A/E's Sub-Consultants: The sub-consultants under contract with the A/E in preparation of the Contract Documents are:

1. Mechanical:  
Sazan Group  
600 Stewart St. Suite 1400  
Seattle, WA 98101

   Representative: Chris English  
   E-mail: cenglish@sazan.com  
   Phone: 206-479-8710

2. Electrical:  
Stantec  
4100 194th Street SW Suite 400  
Lynnwood, WA 98036

   Representative: Catherine Duvall  
   E-mail: Catherine.Duvall@stantec.com  
   Phone: 206-667-0535

D. Owner's Consultants: The consultants under contract with the Owner in preparation of the Contract Documents are:

1. Environmental:  
PBS  
214 E Galer Street Suite 300  
Seattle, WA 98102

   Representative: Willem Mager  
   E-mail: willem.mager@pbsusa.com  
   Phone: 206-766-7622

1.3 SPECIAL CONDITIONS

A. Description of special conditions of the Work:
1. Full time Superintendent is required for the project.
2. No MC Cable is allowed unless approved in advance by the Owner.
3. Flexible conduit is only allowed when connecting to boxes in existing walls, where demolition is not possible, and special circumstances approved in advance by Owner.
4. Cut in electrical boxes are not allowed.
5. Any work associated with working out of a containment cube is not considered part of infection control allowance.
6. Material storage at HMC is very limited, materials needed for the project should be
delivered to the site as they are needed. Materials cannot be stored on site for more than 2 days outside the designated construction area. Materials delivered on site prior to their use in the building will need to be removed and delivered at a later date so they are not stored on site.

7. All shutdowns will be performed during off hours, unless previously agreed to by the Owner.

8. Parking: Parking at Harborview Medical Center is limited. Refer to Section 01 50 00 – Temporary Facilities and Controls for more information regarding parking availability.

9. Noise Restrictions: Adjacent spaces in the building will be occupied throughout construction. Refer to Section 01 50 00 - Temporary Facilities and Controls, and the Summary of Work above regarding noise control and working hours.

10. Infection Control: Infection control measures will be implemented throughout construction. Refer to Section 01 35 33 – Infection Control, and Section 01 21 00 – Allowances.

11. Work Area Access: Building access, elevator use and corridor travel to be coordinated with Owner.

12. Above-ceiling and below-floor areas are congested.

13. See Section 00 73 00, Supplemental Conditions to the General Conditions for Time of Completion and Liquidated Damages.

14. All construction operations must comply with the most current COVID-19 related rules and guidance from the Governor’s Office including the “Stay Home, Stay Healthy” addendum, dated April 24, 2020, and additional guidance issued April 29, 2020. All activities must also comply with all related and applicable requirements issued by the Washington State Department of Labor and Industries and Public Health Agencies having jurisdiction.

1.4 PROVISION OF CONTRACT DOCUMENTS

A. After award of the Contract, the Owner will provide to the Contractor, without cost to the Contractor, three (3) sets of the Contract Documents for the Project. All other sets of the Contract Documents required by the Contractor or their Subcontractors for the Project shall be obtained by the Contractor at the Contractor’s sole cost.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)
PART 1 - GENERAL

1.1 DESCRIPTION

A. Regulated materials requiring special handling or abatement or protection during construction include hazardous materials and dangerous wastes. The Owner has investigated the Project Site and determined that the following regulated materials could be encountered during construction and may be impacted by the Work:
   1. Asbestos-containing materials (ACM)
   2. Heavy metals (including lead-containing materials)
   3. Polychlorinated Biphenyls (PCBs) in light ballasts
   4. Mercury-containing fluorescent light tubes
   5. Silica containing materials.

B. Related Sections: This Section and the following related Construction Documents were prepared by the Owner’s environmental consultant:
   1. Section 02 80 00 “Facility Remediation”
   2. Section 02 82 00 “Asbestos”

C. Owner’s Environmental Consultant: The Owner’s environmental consultant and the AHERA-certified designer for this Project is:
   Firm Name: PBS Engineering & Environmental
   Project Designer: Willem Mager
   Certification number: 177530
   Expiration date: 3/5/2021

D. Survey: The Owner has included in Appendix C of the Specifications a Regulated Materials “Good Faith” Survey report of the Project site area to be impacted by the Work. The Contractor shall ensure that a copy of this report is provided to all bidders and Subcontractors. A copy of this Survey must be retained and available for review on the Project site at all times throughout the duration of the Project.

1.2 GENERAL REQUIREMENTS

A. Laws, Regulations, Codes and Ordinances: The Contractor shall comply with all applicable laws, regulations, codes, and ordinances concerning the impact, removal, handling, storage, disposal, monitoring and employee protection against exposure or environmental protection against pollution, related to regulated materials requiring special handling or abatement or protection during construction.

B. Supervisory Authority: The Contractor is solely and completely responsible related to the Contractor’s supervisory authority over Subcontractors and personnel performing work of this Section.

C. Asbestos Awareness Training: The Contractor shall provide asbestos awareness training for its onsite employees and the onsite employees of the Contractor’s Subcontractors (of any tier), in accordance with WAC 296-62-07722(6).

D. Access Restrictions: Access to various construction work areas by the general public, Subcontractors, and other individuals is restricted during certain hazardous materials work sequences, as specified in the Contract Documents. The Contractor shall coordinate the Work
to facilitate access by Subcontractors while enforcing work area restrictions, and shall minimize disruption to building occupants and services.

E. Hazwoper Training: The Contractor shall provide the appropriate level of HAZWOPER training for its onsite employees and the onsite employees of the Subcontractors (of any Tier) when working on a federal or state-listed contaminated site in accordance with WAC 296-843-100.

F. Working Hours: No hazardous materials work shall occur when building users have access to work areas. All hazardous materials work shall be scheduled to occur in accordance with schedule requirements outlined elsewhere in the Contract Documents, and when work areas have been vacated by building users.

G. Emergency Contacts: Designated qualified representatives of the Contractor and specific hazardous materials Subcontractors are to be available on a 24-hour emergency basis for the duration of the Work. Contact information shall be provided to the Owner’s Representative for inclusion in the Project emergency contact list.

H. Submittals: Contractor shall review the scope of work requirements outlined in the Contract Documents and shall submit, and require all Subcontractors performing the work of handling or disposing of any regulated materials to submit, pertinent information required by the Contract Documents.

I. Regulated, Hazardous, and Dangerous Waste Disposal:
1. The Owner’s Environmental Consultant will conduct all testing required to designate the waste streams. The Contractor shall not remove any suspect wastes from the site until the test data has been reviewed by the UW EHS, Environmental Programs and they have made a determination on the waste designation.
2. Transportation and disposal of all hazardous materials and dangerous wastes will be managed by, and the costs will be borne by, the Owner through the Owner’s Environmental Programs Office. The Contractor shall be responsible for packaging and staging hazardous materials and dangerous wastes onsite, and for scheduling pickup through the Owner’s Representative.
3. Transportation and disposal of PCB-containing ballasts (2 parts per million or greater) and TSCA-Regulated PCB Waste (50 parts per million or greater) will be managed by, and the costs will be borne by, the Owner through the Owner’s UW EH&S Environmental Programs. The Contractor shall be responsible for packaging (in Owner-provided containers) and staging TSCA-Regulated wastes onsite, and for scheduling drop-off of containers and pick up through the Owner’s Representative.
4. All other regulated waste materials (including asbestos-containing materials) must be disposed of by the Contractor at an Owner audited and approved disposal facility. Approved facilities can be viewed online at http://www.ehs.washington.edu/epowaste/disposalfaclist.pdf.
   a. Lead-containing materials and materials with lead-containing coatings, which are not designated as hazardous or dangerous waste, must be handled and disposed of as a regulated waste and cannot be recycled.
      1) Exception for metal items which contain lead: Metal items which contain lead (e.g., lead flashings, vent caps, lead painted metal) may be recycled at a scrap facility which is permitted to accept and process such materials.
      2) Building materials coated with lead-containing paints (including concrete) shall not be recycled.
3) Brick and mortar waste streams that do not designate as a dangerous or hazardous waste may be recycled at a facility which is permitted to accept and process such materials.

J. Regulated Materials - Waste Manifests: Prior to Final Completion, the Contractor shall submit to the Owner copies of all transportation and disposal manifests, including signed landfill receipts and chain-of-custody, for all regulated wastes disposed of by the Contractor during the course of the Project.

1.3 SPECIAL CONDITIONS

A. The following are special conditions which will impact the Work performed under this and related Project Specifications:
   1. Refer to other Sections for Infection Controls and Enclosure under negative pressure requirement at HMC.
   2. All construction operations must comply with the most current COVID-19 related rules and guidance from the Governor’s Office including the “Stay Home, Stay Healthy” addendum, dated April 24, 2020, and additional guidance issued April 29, 2020. All activities must also comply with all related and applicable requirements issued by the Washington State Department of Labor and Industries and Public Health Agencies having jurisdiction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements of “Allowances”.

1.2 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in the same manner as for other portions of the Work.

D. Submit daily timesheets for the hours used in fulfillment of each allowance.

E. Submit purchase orders, invoices, and timesheets in the form specified for Change Orders for each allowance.

1.3 COORDINATION

A. Coordinate allowance items with other portions of the Work.

1.4 ALLOWANCES

A. Use the allowance only as directed by Owner’s Representative for purposes as described in the allowance schedule.

B. Contractor’s and subcontractor’s overhead, profit, bonds, insurance, and related costs for each allowance shall be included in the Base Bid amount and shall not be part of the allowance.

C. Allowances include only the direct material, labor, and supervisions costs.

D. At project closeout, credit unused amounts remaining in the allowance to Owner by Change Order.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damages or defects. Return damaged or defective products to manufacturer for replacement.
3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Include $90,000 in the Total Base Bid amount for infection control and prevention measures as shown on the drawings and specified in Section 01 35 33, “Infection Control”.

B. Allowance No. 2: Include $10,000 in the Total Base Bid amount for support measures for existing non-code compliant utilities in the area of work.

C. Allowance No. 3: Include $10,000 in the Total Base Bid amount for floor preparation and floor leveling in the area of work.

D. Allowance No. 4: Include $1,000 in the Total Base Bid amount for installation of wall hung items furnished by the Owner in the area of work.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor’s selection for products for use in the Work, and administrative procedures for handling requests for substitutions made before and after receipt of bid.

B. Owner’s forms referenced in this Section include (see Appendix A):
   1. Substitution Request Form

1.2 DEFINITIONS

A. Definitions used in this Section are not intended to negate the meaning of other terms used in the Contract Documents.
   1. “Products” are items purchased for incorporation in the Work, regardless of whether they were specifically purchased for the Project or taken from previously purchased stock.
   2. “Named Products” are products identified by use of the manufacturer’s name for a product, including such items as a make or model designation, as recorded in the most recent published product literature as of the date of the Contract Documents.
   3. “Materials” are products that must be cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
   4. “Equipment” is a product with operational parts, whether motorized or manually operated, and in particular, a product that requires service connections such as wiring or piping.

1.3 QUALITY ASSURANCE

A. Source Limitations: Provide products of same kind, to fullest extent possible, from a single source.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use (on the Project) the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Nameplates: Except for labels required by Authorities Having Jurisdiction (AHJ), do not attach or imprint manufacturer’s or producer’s nameplates, trademarks or operating data on surfaces exposed to view in occupied spaces or on the building exterior.
   1. Labels: Locate required product labels and stamps on a concealed surface, or where required by AHJ for observation after installation, on an accessible surface that is not conspicuous.

1.4 PRODUCT SELECTION

A. General Product Requirements: Unless otherwise indicated, provide products that comply with the Contract Documents and that are undamaged and unused at the time of installation.
   1. Provide products complete with all accessories, trim, finish, safety guards and other devices and with details needed for a complete installation for the intended use and effect.
   2. Where available, provide standard products of a type and manufacturer used successfully in similar situations on other projects.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations. Procedures governing product selection include the following:
1. Performance Specifications: Performance specifications may be one of the following:
   a. One or more named reference(s) with no accompanying conditioning language such as “or approved equal” or “no substitutions”; or
   b. No named reference is specified, and requirements are specified by means of any of the following:
      1) Descriptive requirements
      2) Design requirements
      3) Performance requirements
      4) Regulatory requirements and/or industry standards

2. References to equipment, material, articles or patented processes by trade name, manufacturer, make or catalog number, are presumed to set a standard of quality so as to encourage competition. The term “equal” is presumed and need not be repeated in the Specifications. Where Specifications set a standard of quality, provide product options complying with or exceeding the provisions of the Contract Documents, and which are recommended by a manufacturer for the applications indicated. No Substitution Request is required. However, Owner may request, and Contractor shall provide, documentation of the manufacturer’s recommendations for a particular product application.

3. Closed Proprietary Specifications: Products by one or more manufacturers are specified, and the specification section includes the term “no substitution(s),” “no other(s),” or “no exceptions.” No other product options will be accepted. Provide products and work as specified.

4. Open Proprietary Specifications: Products by one or more manufacturers are specified, and the specification section includes the term “or approved equal,” or “other acceptable.” Submit the Substitution Request Form for other products to Owner under the provisions of this Section.

5. Visual Matching: Where matching an established sample is required, the Owner’s decision will be final on whether a proposed product matches satisfactorily.
   a. Where there is no product available within the specified product category which matches satisfactorily and also complies with other specified requirements, the contractor shall comply with the provisions of the Contract Documents concerning substitutions for the selection of a matching product in another product category.

6. Visual Selection: Where specified product requirements include the phrase “…as selected from the manufacturer’s standard colors, patterns, textures...” or similar phrases, select a product and manufacturer that complies with other specified requirements. Owner will select the color, patterns and texture from the product line selected.

1.5 PRODUCT SUBSTITUTION

A. General:
   1. No substitution request will be considered unless submitted in accordance with the requirements of this Section.
   2. If a bidder or Contractor desires approval of some material or product other than that specified by the Contract Documents, it must submit a written request for approval of the proposed substitute item to the Owner in accordance with the following requirements:
      a. All requests must be made on the Owner’s Substitution Request Form
      b. After receipt of bid, substitution requests shall be prepared, transmitted, and processed in accordance with Section 01 33 00 “Submittal Procedures.”
   3. Final decision as to whether an item is an equal or acceptable substitution rests solely with the Owner.

B. Substitution Requests: Every substitution request must state whether the item offered is equal or superior to the specified product. The substitute material or product must be accompanied by its reference in the Contract Documents and complete catalog, technical and other information. If applicable, include samples showing comparison of physical and other pertinent characteristics as required to establish equivalence of acceptability for the proposed
application. Where specific test results are required by the Contract Documents, the comparison data for the proposed item shall be based upon the same test methods as those specified, or they shall be correlated to clearly demonstrate comparability. The same warranty of the Work described for the specified product is required for the substitution.

C. During Bid Period:
1. Submit Substitution Request Form prior to the date identified in Section 00 21 00 “Instructions to Bidders.”
2. Bidders will be notified by addendum of products accepted in addition to those specified. NO OTHER FORM OF APPROVAL, INCLUDING VERBAL OR IMPLIED, IS ACCEPTABLE AS AN INDICATOR OF ACCEPTED SUBSTITUTION REQUESTS.

D. After Receipt of Bid: Contractor shall indicate one or more reasons why a product substitution is required with a Substitution Request Form. Owner will notify Contractor in writing of decision to accept or reject the Substitution Request. Substitution Requests will not be considered except for the following reasons, which must be substantiated by the Contractor:
1. Unavailability: Specified item has been discontinued or is unavailable in time to meet Construction Schedule through no fault of the Contractor or Subcontractor.
2. Unsuitability: Subsequent information discloses the specified item as unsuitable, inappropriate, or unable to perform properly or fit the designated space.
3. Regulatory Requirements: A substitution is required to comply with code interpretations by AHJ or insurance regulations.
4. Warranty: A manufacturer or fabricator declares the specified item to be unsuitable for the use intended or refuses to certify or warrant the performance of the specified item for the Project.
5. Owner’s Benefit: In the judgment of Contractor, acceptance of the proposed substitution is clearly in Owner’s best interest because of cost, quality, or other consideration.

E. Coordination: In making a Substitution Request, the Contractor certifies that it will coordinate all Subcontractor work required by the substitution and waives all claims for additional costs and/or time which subsequently become apparent as a consequence of the substitution.

F. Re-design: At the Owner’s sole discretion, the Contractor shall bear all Owner costs related to the substitution, including costs of A/E’s services for investigation, evaluation and re-design, if necessary.

G. Owner will not consider:
1. Substitutions, if they are indicated or implied on Shop Drawings or other Project data submittals;
2. Substitutions which, if accepted, will require substantial revisions of Contract Documents; or
3. Substitution Request Forms which do not provide adequate or clearly defined information for complete and timely appraisal.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the administrative and procedural requirements for executing a change in the Work as herein specified and further described in Part 7 of the General Conditions.

B. Owner’s forms references in this Section include (see Appendix A):
   1. Change Order Proposal;
   2. Change Order Transmittal;
   3. COP General Contractor Breakdown Summary;
   4. COP Subcontractor Breakdown Summary;
   5. COP Cost Breakdown;
   6. COP Wage Rates; and
   7. COP Equipment Rates.

1.2 PRELIMINARY REQUIREMENTS:

A. Prior to submitting the Contractor’s first Change Order Request (COR), or responding to the first Change Order Proposal (COP), the Contractor shall submit a breakdown of journeyman and apprentice, where applicable, wage rates using the Owner’s COP Wage Rates form. The breakdown shall show:
   1. Basic wage rate (based on L&I Intent to Pay Prevailing Wages or union agreement);
   2. Fringe Package (based on L&I Intent to Pay Prevailing Wages or union agreement);
   3. FUI (Federal Unemployment Insurance);
   4. FICA (Federal Insurance Compensation Act);
   5. Medicare;
   6. SUI (State Unemployment Compensation Act);
   7. WC (Workers Compensation).

B. Contractor shall submit verification of the above rates, if requested by Owner’s Representative.

C. Prior to submitting Contractor’s first COR or responding to Owner’s first COP that involves equipment owned by the Contractor, the Contractor shall submit a list of all equipment anticipated to be used on the Project. Contractor shall provide the hourly rate based on the Equipment Watch Rental Rate Blue Book and as modified by the current AGC/WSDOT Agreement or other sources as referenced in the General Conditions. The Contractor shall use the Owner’s COP Equipment Rates form to compute the equipment rate.

1.3 CHANGE ORDER PROCEDURES

A. Owner Change Order Proposal (COP): Changes may be initiated by Owner through a Publics Work Change Order Proposal form submitted to the Contractor. Such a request is for information and pricing only and is not an instruction to execute changes or to stop work in progress, unless issued as a Field Order.
   1. The COP will include:
      a. A detailed description of changes, products, and location of modification in Project and a statement as to whether overtime work is authorized; and
      b. Supplementary or revised Drawings or Specifications.
   2. An updated Construction Progress Schedule may be requested if the COP impacts the existing Construction Progress Schedule.
B. Contractor Change Order Request (COR): The Contractor shall initiate changes by submitting written correspondence, in letter format, signed and dated to the Owner's Representative requesting a Change Order Proposal. The letter shall include:
1. Description of proposed changes;
2. Reason for making changes;
3. A specific period of time during which requested price will be considered valid;
4. Actions required by Owner;
5. Effect on Contract Sum and Contract Time;
6. Documentation consistent with the requirements of Part 7.02 and/or 7.03 of the General Conditions supporting any change in Contract Sum or Contract Time, as appropriate;
7. Statement of why proposed change is not covered in Contract Documents; and
8. Date the Work is to be completed.

C. Field Order: In situations where time is of the essence or an emergency condition exists, the Owner's Representative may directly order a change to the Work by a written Field Order signed by Owner's Representative. Field Orders will only be issued on an agreed upon not-to-exceed cost basis, either lump sum or time and materials.

D. Change Order Pricing:
1. The cost of the change shall be marked-up in accordance with General Conditions and Modifications to the General Conditions. NO ADDITIONAL MARK-UPS SHALL BE ALLOWED.
2. Contractor shall provide all backup pricing documentation for a change on the following forms (THESE FORMS SHALL ALSO BE THE ONLY ACCEPTABLE DOCUMENTATION FOR ALL SUBCONTRACTORS.):
   a. COP General Contractor Breakdown Summary
   b. COP Subcontractor Breakdown Summary
   c. COP Cost Breakdown
3. Owner's Representative may require Contractor to provide certified payroll.
4. Provide all other supporting documentation as required to substantiate the requested costs such as invoices for rental equipment and freight cost. Total cost and time shall be brought forward to the COP form and signed and dated by Contractor.

E. Change Order Authorization:
1. A/E recommendation of COP acceptance to Owner is indicated by A/E's signature.
2. Upon signature and execution by Owner, the Change Order Proposal becomes a Change Order altering the Contract Sum and/or Contract Time, as indicated.
3. Contractor may only request payment for changes in the Work against an approved Change Order.
4. If Owner disapproves the Change Order Proposal, the reason for disapproval will be stated. A request for a revised proposal or cancellation of the proposal will be shown and returned to the Contractor.

F. Correlation with Contractor's Submittals:
1. Application of Payment forms shall record each Change Order as a separate item of work (see Section 01 29 76, “Progress Payment Procedures”).
2. Revise Construction Progress Schedule to reflect changes in Contract Time.
3. Upon completion of Change Order work, record pertinent modifications in the Project Record documents.

G. Distribution:
1. Upon authorization of a Change Order, Owner will transmit one (1) signed copy to Contractor.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the administrative and procedural requirements for Contractor progress payment and release of retainage as herein specified and further described in Part 6 of the General Conditions.

B. Owner’s forms referenced in this Section include (see Appendix A):
   1. Application and Certificate for Payment on Contract (Application for Payment)
   2. Construction Invoice Voucher
   3. Retainage Invoice Voucher
   4. Monthly Subcontractors List and Certifications
   5. Certificate of Payment of Labor and Materials

1.2 PREREQUISITES FOR FIRST APPLICATION FOR PAYMENT

A. Progress Schedule: Submit and receive approval of the "preliminary" Progress Schedule.

B. Prevailing Wage Forms: Submit Statement of Intent to Pay Prevailing Wages form, approved by the Department of Labor and Industries, prior to commencing the Work (see Part 5.04B of the General Conditions). The Owner will not make payment on an Application for Payment until the Contractor has filed with the Owner an approved copy of the form for the Contractor and every Subcontractor of every tier that performed work during the payment period and are included in an Application for Payment. The form shall list every classification of laborer, worker, or mechanic employed by the Contractor and its Subcontractors. THERE ARE NO EXCEPTIONS TO THIS REQUIREMENT.
   1. The website address link to the prevailing wage forms is included in Appendix A.
   2. The website address link to the “Washington State Prevailing Wage Rates for Public Works Contracts” is included in Appendix B.

C. Schedule of Values: Before submitting the first Application for Payment, submit and receive approval of the Schedule of Values allocating the detail of the Contract Award Amount, in a breakdown acceptable to the Owner, which shall be documented on the Application for Payment (see 1.5A8 “Building Componentization Report” in this Section for additional Final Completion construction cost reporting requirements). The approved Schedule of Values will be used by the Owner as the basis for progress payments. PAYMENT FOR WORK WILL ONLY BE MADE FOR, AND IN ACCORDANCE WITH, THOSE ITEMS INCLUDED IN THE APPROVED SCHEDULE OF VALUES.
   1. Format: On 8-1/2” x 11” paper
   2. Content: Include as a minimum the following:
      a. Individual Items of Work.
      b. Major cost items, which are not directly a cost of actual work-in-place, shall be shown as separate items in the Schedule of Values, and shall include the following items:
         1) General Conditions, mobilization, and distinct temporary facilities shall not exceed 3% of the Contract Award Amount.
         2) Section 01 77 00 “Closeout Procedures” shall not be less than 4% of the Contract Award Amount.
         3) Preparation and submittal to Owner of Construction Baseline Schedule and Submittal Schedule shall not be less than 1/4% of the Contract Award Amount.
         4) Preparation of monthly Progress Schedule updates shall not be less than 1/4% of the Contract Award Amount, with the value of each update apportioned equally.
c. For items on which progress payments will be requested for materials or equipment purchased/fabricated/delivered, but not yet installed, show “initial value” for payment request and “value added” for subsequent stage(s) of completion on that unit of work.
d. For each line item of installed value exceeding 10% of Contract Award Amount, show breakdown by major products or operations under each item.
e. Breakdown major work efforts by floor or phases or systems as appropriate for ease of review and confirmation of Work completed.
f. Breakdown mechanical and electrical systems or phases with material and labor as separate items.

3. Round figures to nearest dollar amount.
4. Make sum of total scheduled costs equal to the Contract Award Amount. Do not include State of Washington sales tax.
5. Coordinate items of the Schedule of Values so that there is a corresponding item in the Progress Schedule.
6. Revise as requested by Owner.

D. Subcontractors List: Submit a list of all Subcontractors and major material suppliers consistent with Part 5.20B of the General Conditions.

E. Retainage: Submit instructions for the disposition of retainage funds.
   1. In accordance with Part 6.04B of the General Conditions and Chapter 60.28 RCW, the Owner shall reserve a Contract retainage in an amount not-to-exceed 5% of the moneys earned by the Contractor as a trust fund for the protection and payment of:
      a. The claims of any person arising under the Contract Documents;
      b. The State of Washington with respect to taxes imposed pursuant to Titles 50, 51, and 82 RCW which may be due from the Contractor, and;
      c. The Owner for claims it may have against the Contractor.
   2. Contractor’s written instructions should be addressed to the University of Washington, Capital Planning & Development, Capital Planning & Development Accounting, Box 352205, Seattle, Washington 98195 - 2205.
   3. At the option of the Contractor, the moneys reserved by the Owner shall be:
      a. Retained in a fund by the Owner; or
      b. Bonded by the Contractor (if approved by Owner) for all of the Contract retainage in a form acceptable to the Owner; or
      c. Deposited by the Owner in an Owner’s interest bearing account in a bank, mutual savings bank, or savings and loan association; or
      d. Placed in escrow with a bank or trust company by the Owner.
         1) Escrow Agent: If the retained funds are to be placed in escrow, Contractor will select the escrow agent, subject to approval by the Owner. The selected agent must be a bank or trust company in the State of Washington.
         2) Escrow Agreement: Pursuant to electing the escrow option, an escrow agreement shall be executed by Contractor, Owner, and bank. A completed and signed escrow agreement in a form acceptable to the Owner must be on file with the Owner for payment before the Contractor's first Application for Payment is processed.
         3) Escrow Payments: As each progress estimate is presented for payment, Contractor shall make a voucher request for the retained funds that are to be placed in escrow. Such requests should be prepared on the Owner’s Retainage Invoice Voucher form and submitted in four (4) copies with the related Application for Payment. Upon receiving a retainage invoice, the Owner will issue a check payable to the Contractor and the bank jointly. Such checks will be mailed to the bank and the Contractor will receive copies of check transmittal letters.
4) Escrow Investments: The bank shall invest the retained funds in bonds and other securities selected by the Contractor from the following list approved by the Owner:
   a) Bills, certificates, notes or bonds of the United States;
   b) Other obligations of the United States or its agencies;
   c) Obligations of any corporation wholly owned by the government of the United States;
   d) Indebtedness of the Federal National Mortgage Association;
   e) Time deposits in commercial banks, mutual savings banks, and savings and loan associations in the State of Washington;
   f) Deposits in savings accounts in commercial banks, mutual savings banks, and savings and loan associations in the State of Washington.

5) The investments selected must mature on or prior to the date set for Substantial Completion, including extensions thereof or no later than forty five (45) days following the Final Acceptance of the Work. Interest on such investments shall be paid to the Contractor by the escrow agent as it accrues.

6) Escrow Costs and Fees: All escrow costs and fees shall be paid by the Contractor, in accordance with the escrow agreement.

1.3 DRAFT APPLICATION FOR PAYMENT

A. Submit a draft Application for Payment for Owner’s review and comment. The cutoff date shall be five (5) days prior to actual application or as otherwise agreed. Include projected costs to the end of the month in the pay request. Provide the following documents (draft documents may be marked by hand):
      a. Mechanical and electrical Subcontractor’s draft monthly payment requests shall be submitted, for review and comment, prior to the A/E’s and Owner’s review of the Contractor’s draft monthly Application for Payment.
      b. List Change Orders approved prior to the submission date individually (last on the form). Use Owner’s Change Order designation and description (similar to an original component item of work). DO NOT BILL FOR CHANGE ORDER PROPOSALS UNTIL AN APPROVED CHANGE ORDER HAS BEEN RECEIVED FROM THE OWNER INCORPORATING THE PROPOSAL.
   3. Stored Materials: The Contractor is solely responsible for the stored materials. Requests for payment on materials stored shall be for materials properly stored on the Project site. In addition to the requirements of the General Conditions, payment for materials stored off-site shall be at the sole option of the Owner and comply with conditions stipulated by the Owner. These conditions may include, but are not limited to:
      a. Provide supplier invoice
      b. Provide insurance or a bond to cover the total loss of material and time impact to Project

B. The A/E and/or Owner and the Contractor shall review the Project Record for completeness and accuracy.

1.4 APPLICATION FOR PAYMENT

A. The Contractor shall submit two (2) hardcopies of the Application for Payment to the Owner after responding to the Owner’s comments to the draft application.

B. The Contractor is cautioned to carefully check all extensions, totals, and required information for accuracy before submittal.
C. Applications are to be signed by a responsible officer of the Contractor. Do not sign in black ink. (NO PHOTOCOPIES OF SIGNATURE ARE PERMITTED)

D. The Application for Payment shall include the following Owner forms and documents:
   1. Application and Certificate for Payment on Contract
   2. Construction Invoice Voucher (for the total amount due)
   3. Retainage Invoice Voucher (for the retainage amount)
   4. Monthly Subcontractors List and Certifications
   5. Invoices for materials stored off-site

E. Do not include certified payrolls unless requested by the Owner’s Representative or required elsewhere.

F. When the Owner’s Representative and A/E find the Application for Payment properly completed and correct, they will sign and transmit all copies of the Application for Payment to the Capital Planning & Development accounting office for processing.

G. If the A/E or Owner’s Representative find the Application for Payment improperly or incorrectly executed, an annotated copy will be returned for a new submittal.

H. Only minor corrections are allowed on the original, with approval of Owner.

1.5 PRIOR TO FINAL APPLICATION FOR PAYMENT

A. The final Application for Payment request will be accepted for processing only after providing satisfactory completion of the following:
   1. Application and Certificate for Payment on Contract
   2. Construction Invoice Voucher (for the total amount due)
   3. Retainage Invoice Voucher (for the retainage amount)
   4. Monthly Subcontractors List and Certifications
   5. Invoices for materials stored off-site
   6. Final Completion procedures per Section 01 77 00 "Closeout Procedures"
   7. Final Schedule of Values "Contract Sum"
   8. "Building Componentization Report" allocating the final Contract Sum to each of the following categories:
      a. Site Preparation
      b. Exterior construction
      c. Foundations and building structure
      d. Exterior walls
      e. Roofing
      f. Interior construction
      g. Floor covering
      h. Fixed equipment
      i. Elevators
      j. HVAC
      k. Plumbing and piping
      l. Fire protection
      m. Lighting and electrical

1.6 RELEASE OF RETAINAGE

A. Pursuant to the completion of Work performed in accordance with the Public Works Contract and Final Acceptance by the Owner, the following requirements must be satisfied prior to the release of retained Contract funds.
1. “Notice of Completion of Public Works Contract (REV 31 0020)”: This Department of Revenue form will be completed by the Owner, establishing the date of Final Acceptance thereon. Three copies of the notice will be mailed to the Department of Revenue and a copy will be transmitted to Contractor.

2. “Certificate of Payment of State Excise Taxes by Public Works Contractor (REV 31 0028)”: Following receipt of the Owner’s Notice of Completion of Public Works Contract form and after determining that all taxes, interest and penalties due from Contractor have been paid, the Department of Revenue will issue this certificate to Owner, thereby notifying the Owner that it has no objection to the release of retainage to the Contractor.

3. “Certificate of Payment of Contributions, Penalties and Interest on Public Work Contract (EMS 8449 760)”: Upon receiving a copy of the Owner’s Notice of Completion of Public Works Contract form from the Department of Revenue and determining that the Contractor is in compliance with the provisions of the Employment Security Act, the Employment Security Department will issue this certificate to Owner, thereby notifying the Owner that it has no objection to the release of retainage to the Contractor.

4. Upon receiving a copy of the Owner’s Notice of Completion of Public Works Contract form and determining that the Contractor is in compliance with the provisions of Chapter 51 RCW for payment of industrial insurance premiums, the Department of Labor and Industries will issue a certificate for the Owner, thereby notifying the Owner that it has no objection to the release of retainage to the Contractor.

5. “Affidavit of Wages Paid on Public Works Contract” (F700-007-000): An Affidavit of Wages Paid, for the Contractor, each Subcontractor, and each sub-tier Subcontractor, approved by the Industrial Statistician of the Department of Labor and Industries, must be submitted by the Contractor to the Owner. Contractors and Subcontractors may file the Affidavit of Wages Paid either on-line at the website link provided in Appendix A or by completing the forms manually.

6. “Certificate of Payment of Labor and Materials”: This Owner’s form shall be completed by the Contractor and returned to the Owner. If the only exception to full payment to all Subcontractors is retainage owed to Subcontractors, the appropriate box on the form should be checked.

7. Invoice Voucher: If the retained funds are on deposit in Owner accounts, the Contractor shall prepare a Retainage Invoice Voucher for the total amount retained and submit to the Owner for payment. If these funds have been placed in escrow at the direction of Contractor, no further invoice is required.

B. Retainage will be paid by the Owner to the Contractor sixty (60) days following the published date of Final Acceptance, contingent upon the Contractor’s compliance with provisions of public works statutes and as stated above. If there are either unpaid taxes or unsatisfied claims of lien against the retained percentage, disbursement of retainage funds will be made in accordance with State of Washington law.

C. Address all transmittal of retainage documents to the Owner’s Contracts Office at: University of Washington, Capital Planning & Development, Box 352205, Seattle, Washington, 98195 - 2205.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for project management and coordination during construction, in addition to the requirements specified elsewhere in the Contract Documents.

B. Owner’s forms referenced in this Section include (see Appendix A):
   1. Request for Information (RFI)
   2. Non-Conformance Report (NCR)

C. The Owner intends to utilize an internet-based construction management system (CMS) for communications and documents controls with the Contractor and A/E on this Project (see Section 01 35 00 “Electronic Controls”).

1.2 GENERAL COMMUNICATION

A. The Owner shall designate, in writing, the Owner’s Representative for this Project.

B. All verbal communications between Owner, A/E, and Contractor shall be for clarification and collaboration purposes and are not binding unless issued in writing through the Owner’s Representative.

C. Contractor communications by and with A/E’s consultants shall be through the A/E, and A/E’s communications by and with the Contractor’s Subcontractors shall be through the Contractor.

D. In case of an emergency:
   1. Contact the Owner’s Representative; and
   2. Follow emergency procedures in accordance with Section 01 35 23 "Owner Safety Requirements."

1.3 CORRESPONDENCE

A. Address all correspondence to Owner’s Representative.

B. All correspondence to and from Contractor will be routed through the Owner’s Representative.

1.4 CONTRACTOR REQUEST FOR INFORMATION

A. When field conditions or Contract Documents require clarification or verification by the A/E or A/E’s consultants, a written RFI is to be submitted per the following:
   1. Identify the nature and location of each requested clarification and/or verification using the RFI form. Provide as a minimum the following information:
      a. Project name and number
      b. Date
      c. Date response required by
      d. RFI number
      e. Subject
      f. Initiator of the question
      g. Indication of costs, if known
      h. Location on site
      i. Contract Drawing reference
2. Number each RFI sequentially beginning with #001. Submit only one question per RFI. Also, RFI’s shall be categorized as ARCH, MECH, ELEC, etc.

1.5 CLARIFICATIONS

A. Clarifications may be discussed with A/E, or A/E’s consultants, with concurrence of Owner. Following the discussion, the Contractor shall document on an RFI form any agreed upon modification which does not require a Change Order. The A/E may provide supplemental information to clarify the Contract Documents. RFIs and A/E supplemental information (ASI) which modify or change the Work will be authorized only by Change Order.

1.6 NON-CONFORMANCE REPORT

A. Non-Conforming Work: Work found defective, or in any way not in accordance with the requirements of the Contract Documents, is defined as non-conforming Work.

B. Procedure: If, after an oral discussion or written notification, the Contractor fails to correct Work that is found defective or not in accordance with the Contract Documents, the Owner will issue a Non-Conformance Report (NCR). Upon receipt of an NCR, the Contractor shall take immediate action to resolve the Work to the Owner's satisfaction, or remove and replace with conforming Work at Contractor's expense and with no increase in Contract Time. Corrective actions for non-conforming Work shall be discussed at construction progress meetings and be completed no later than prior to Final Completion.

1. Where non-conforming Work requires re-design by the A/E, such re-design costs shall be borne by the Contractor.

1.7 COORDINATION

A. General Coordination:

1. The Contractor shall be in charge of this Contract and the Project, as well as directing and scheduling of all Work. Final responsibility for performance, interface, and completion of the Project shall be the Contractor’s.
   a. Anticipate interrelationship of all Subcontractors and their relationship with the total Work.
   b. Resolve differences or disputes between Subcontractors and materials suppliers concerning coordination, interference, or extent of the Work. Contractor’s decisions, if consistent with Contract Document requirements, shall be final.

2. Cooperation with other contractors during the term of this Project may be required within the building or other adjacent locations to the construction limits of this Project. The Contractor is to cooperate with the Owner in coordination of all work to prevent impact to this or other Owner sponsored construction projects.

3. Cooperation with building occupants may be required when scheduling construction activities that create excessive noise or structure-borne vibration. The Contractor is to cooperate with the Owner in coordination of all work to minimize these impacts to the Owner’s operations (see Section 01 50 00 “Temporary Facilities and Controls”).

B. Special Coordination:

1. The Contractor is responsible for receiving, unloading, storage and handling of Owner Furnished Contractor Installed (OFCI) items from the time of receipt through Substantial Completion.
   a. The Contractor is responsible for protecting OFCI and Owner Existing Contractor Installed (OECI) items from damage, such as: damage from exposure to the elements; or from damage to a warranty due to Contractor’s improper installation
and testing. The costs to repair or replace items damaged while in the Contractor's possession shall be borne by the Contractor.

1) The Contractor shall consult with the Owner to determine the warranty requirements of OFCI and OECI items.

2. Coordination with work of other contractors.

3. Coordination with building occupants.

4. Coordination with Owner’s custodial services.

5. Coordination with Owner’s security services, including:
   a. Escorts in sensitive areas where required.
   b. Obtaining and displaying badges. Obtain badges from Owner’s Representative after successfully passing a background check.

6. Loading dock restrictions including usage times, number of spaces allowed and parking for loading and unloading only.

7. Material/equipment staging areas, including parking restrictions.

8. Access routes to and within the building for material deliveries and debris removal.


10. Coordination of elevator use, including:
    a. Assigned elevators for contractor use.
    b. Time restrictions.
    c. Elevator security.
    d. Protection of elevator interior and exterior finishes.

C. Mechanical and Electrical Coordination:
   1. Resolve all tight or restricted conditions involving work of various sections in advance of installation.

   2. Coordinate the Work of all sections to ensure that all fixtures, devices, switches, outlets, ducts, pipes, and similar items can be installed as shown.

D. Job Site Field Measurements and Templates:
   1. Obtain field measurements required for accurate fabrication and installation of work included in the Contract Documents. Exact measurements are the Contractor’s responsibility.

   2. Furnish or obtain templates, patterns, and setting instructions as required for installation of all work. Verify in field.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for meetings during construction in addition to requirements specified elsewhere in the Contract Documents.

B. Contractor and Subcontractor representatives attending meetings must be qualified and authorized to act on behalf of their firms.

C. The Owner will utilize an internet-based construction management system (CMS) for communications and documents controls with the Contractor and A/E on this Project (see Section 01 35 00 “Electronic Communications”).
   1. Meeting minutes, Contractor construction activity data and work plans, A/E field reports and other such communications shall be distributed electronically by e-mail.

D. Related Sections:
   1. Section 01 32 16 “Construction Progress Schedule”

1.2 PRECONSTRUCTION MEETING

A. The Owner will schedule a preconstruction meeting to be held prior to the Contractor mobilizing and beginning any Work. This meeting will review Contract administration requirements and mobilization procedures.

B. Meeting location: To be determined

C. Participants shall include:
   1. Contractor's Project Manager, Superintendent, CQC Representative, Safety and Health Officer, and for projects with LEED requirements, LEED Coordinator;
   2. Owner's Representative, Project Manager, and for projects with LEED requirements, the Owner’s Sustainability Manager;
   3. A/E and the A/E's sub-consultants, as appropriate;
   4. Owner's consultants, as appropriate; and
   5. Others, including the Contractor’s major Subcontractors as appropriate.

D. Owner's Representative will: Administer the meeting

E. A/E will: Record and distribute copies of the minutes within seven (7) days of the meeting to all meeting participants.

F. Agenda:
   1. The Work including, but not limited to:
      a. Schedule and phasing requirements
      b. Contractor's use of premises
      c. Special conditions and coordination
   2. Communications including, but not limited to:
      a. Chain and persons authorized to direct changes
      b. Requests for Information (RFI), field decisions, and clarifications
      c. Non-Conformance Reports
      d. Hazard communication
      e. Project meetings
   3. Contractor's "Site Specific Safety Plan"
4. Administrative and procedural requirements including, but not limited to:
   a. Contract modification
   b. Progress payment
   c. Submittals - including Contractor’s Progress Schedule
   d. Electronic communications
5. Project LEED requirements and documentation, if any
6. Testing and inspection
7. Contractor quality control
8. Temporary facilities and controls including, but not limited to:
   a. Deliveries and storage
   b. Temporary utilities and enclosures
   c. Security procedures
   d. Noise and vibration control
   e. Cutting, patching, and field engineering
   f. Utility shutdowns
   g. Contractor parking
   h. Housekeeping and waste management
   i. Infection control - for medical facilities projects
9. Closeout procedures - including Project Record requirements
10. Other information as appropriate

G. Contractor shall conduct a like meeting, covering the same body of information, with each Subcontractor’s project manager and foreman supervising the Work prior to the performance of any work on-site by that Subcontractor.

1. Provide Owner copies of meeting minutes prepared by the Contractor with each Subcontractor, when requested by Owner.

1.3 CONSTRUCTION PROGRESS MEETINGS

A. Progress meetings shall occur weekly until Substantial Completion has been achieved.

B. Meeting location: To be determined

C. Participants shall include:
   1. Contractor’s Project Manager, Superintendent, CQC Representative, and Safety and Health Officer as appropriate;
   2. Owner’s Representative and Project Manager;
   3. A/E and the A/E’s sub-consultants, as appropriate; and
   4. Others, including the Owner’s consultants, as appropriate.

D. Owner’s Representative will: Administer the meeting

E. Contractor shall: Provide schedules, logs and other construction activity data to support the issues discussed at the meeting.

F. A/E will: Record and distribute copies of the minutes prior to the next progress meeting to all meeting participants and provide copies at each meeting.

G. Agenda:
   1. Review and approve the minutes of the previous meeting noting exceptions, if any
   2. Review the progress of the Work since the previous meeting
   3. Review the Short Interval Schedule and work plans for progress during the period
      a. Identify pending meetings
      b. Discuss safety activities and job hazards analysis
4. Discuss field observations, problems, and conflicts  
   a. Identify problems impeding the construction Progress Schedule  
5. Review Quality Control  
   a. Non-Conformance Reports - discuss corrective Work actions  
   b. Infection control – for medical center projects  
6. Review the Submittal Schedule and RFIs - present methods to expedite as required  
7. Review off-site fabrication and delivery schedules  
8. Review proposed changes in the Work and substitution requests for:  
   a. Timely processing  
   b. Effect on the Progress Schedule and Substantial Completion  
   c. Effect on any other contracts of the Project  
9. Review any other business  

1.4 PRE-INSTALLATION MEETINGS  
A. Pre-installation meetings shall be held prior to the Contractor or Subcontractors beginning  
   work on each definable feature of the Work identified in the Contract Documents to require a  
   pre-installation meeting and/or as required by the Owner’s Representative. Notify Owner’s  
   Representative at least ten (10) working days in advance of each pre-installation meeting.  
   1. At the Owner’s discretion, the Owner may conduct this meeting as part of the  
      Construction Progress Meeting.  

B. Meeting examples include, but not by way of limitation:  
   1. Site clearing and excavation  
   2. Demolition and regulated materials remediation  
   3. Site utilities  
   4. Landscaping and site restoration  
   5. Concrete  
   6. Masonry  
   7. Structural steel  
   8. Exterior cladding systems  
   9. Water and damp proofing and roofing  
   10. Doors, including frames and hardware  
   11. Millwork  
   12. Finishes  
   13. Equipment, including elevators  
   14. Mechanical and Electrical systems, such as high voltage, fire alarm, and communications  
   15. Specialty items  

C. Meeting location: To be determined  
D. Participants shall include:  
   1. Contractor’s Superintendent, CQC Representative, and Safety and Health Officer as  
      appropriate;  
   2. Subcontractor’s project manager or foreman supervising the Work, as appropriate;  
   3. Owner’s Representative;  
   4. A/E and the A/E sub-consultants, as appropriate;  
   5. Owner’s consultants as appropriate; and  
   6. Others as appropriate.  

E. Agenda:  
   1. Review of the pre-installation CQC Work Plan and Contract requirements  
   2. Materials - available and ready for use  
   3. Submittals  
   4. Persons responsible for performing the work
5. Tests - required tests, criteria for performance, who samples and how often
6. Safety procedures and requirements
7. Substrate - criteria for substrate
8. Other items as appropriate

F. Contractor shall: Administer the meeting, and record and distribute copies of the minutes within seven (7) days of each meeting to all meeting participants.

1.5 CHANGE ORDER MEETINGS

A. Change order meetings shall be held to review and resolve any Change Order Proposals, change order requests, or other change order issues pertaining to Contract Modification. Meetings shall be held monthly until all Change Order Proposals are resolved.
   1. At the Owner’s discretion, the Owner may conduct this meeting as part of the Construction Progress Meeting.

B. Meeting Location: To be determined

C. Participants shall include:
   1. Contractor’s Project Manager, or cost engineer as appropriate;
   2. Owner’s Representative;
   3. A/E and the A/E’s sub-consultants, as appropriate;
   4. Others, including the Owner’s consultants as appropriate.

D. Owner’s Representative will: Administer the meeting

E. Agenda: Review Change Order Proposals for scope and estimated costs, and negotiate Change Order Proposal prices.

1.6 DRAFT APPLICATION FOR PAYMENT REVIEW MEETINGS

A. Draft Application for Payment review meetings shall occur monthly.
   1. At the Owner’s discretion, the Owner may conduct this meeting as part of the Construction Progress Meeting.

B. Meeting location: To be determined

C. Participants shall include:
   1. Contractor’s Project Manager;
   2. Owner’s Representative;
   3. A/E and A/E’s sub-consultants, as appropriate; and
   4. Owner’s consultants as appropriate.

D. Owner’s Representative will: Administer the meeting

E. Contractor shall: Present the draft monthly Application for Payment together with the required back up information for review and comment by the Owner and A/E.

F. Agenda - Discussion will pertain to items such as:
   1. Percentage of work complete
   2. Off-site storage
   3. Bill of quantities
   4. Percentage of subcontract payment allocations
   5. Apprentice Utilization and Journey Level Report
1.7 SPECIAL MEETINGS

A. Special meetings may be called at the discretion of the Owner or Contractor for the purpose of coordinating specific information or resolving special issues related to the Project.

B. Contractor shall record and distribute minutes within three (3) days of the meeting to all meeting participants.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements, in addition to those defined in the General Conditions, for Baseline Progress Schedule preparation, monthly Progress Schedule updates, change in Contract Time analysis, submittal schedules, and short interval schedules.

B. Related Sections:
   1. 01 26 00, “Contract Modification Procedures”
   2. 01 29 76, “Progress Payment Procedures”
   3. 01 50 00, “Temporary Facilities and Controls”
   4. 01 77 00, “Closeout Procedures”

C. Owner’s forms included by reference for this Section include (see Appendix A):
   1. Short Interval Schedule

D. Total Float is defined as the amount of time between the earliest start date and the latest start date, or between the earliest finish date and the latest finish date of an activity on the Progress Schedule. Float is not for the exclusive use of either the Contractor or the Owner unless otherwise identified in the Contract Documents.

   1. Extensions of time for Contract performance will be granted only to the extent that equitable time adjustments to the affected activity or activities exceed the total float time along the affected paths of the current Progress Schedule at the time a Field Order, or Change Order, was issued for the change.

E. All Progress Schedule submittals, including monthly Progress Schedule updates, will be reviewed jointly by the Owner’s Representative and the Contractor. Such review of the Contractor’s schedules shall not constitute an approval or acceptance of the Contractor’s construction means, methods, or sequencing, or its ability to complete the Work in a timely manner.

F. As used in this Section, “Progress Schedule” refers collectively to “Baseline Progress Schedule” and “monthly Progress Schedule updates.”

1.2 PROGRESS SCHEDULE

A. Within ten (10) calendar days after Notice-to-Proceed, the Contractor shall prepare and submit to the Owner, for review and comment, electronic copy of a preliminary Progress Schedule utilizing a Critical Path Method (CPM) logic based on the Contract Documents. The Owner will review the preliminary schedule for conformance with the Contract Documents and provide comments within ten (10) calendar days of receipt from the Contractor. The Contractor shall respond to all comments and provide the Owner a Baseline Progress Schedule within ten (10) calendar days of receipt of the Owner’s comments.

B. Once the Baseline Progress Schedule is submitted to the Owner, the Progress Schedule shall be formally established as the baseline file within the Contractor’s scheduling software. This baseline file shall not be modified without the Owner’s written approval.

   1. The amount specified in Section 01 29 76 shall be withheld from the Contractor's monthly Application for Payment if the Baseline Progress Schedule and Submittal Schedule, referenced in 1.5 of this Section, are past due and such amount may, at the Owner's sole judgment and discretion, be reduced from the Contract Sum by unilateral Change Order (see Section 01 29 76, "Progress Payment Procedures").
C. The Baseline Progress Schedule shall be the basis that the Contractor shall use to: plan, organize, and execute the Work; record and report actual performance and progress through updates, and; show how the Contractor plans to complete all remaining Work. The Baseline Progress Schedule and monthly Progress Schedule updates shall be the basis for consideration and analysis of requests for time extensions as specified below. The schedule shall be in the form of an activity based precedence diagram.

D. The Baseline Progress Schedule and monthly Progress Schedule updates shall be constructed to show the order in which the Contractor proposes to carry out the Work, and to indicate the restrictions of access to and availability of the work area, and availability and use of manpower, materials, equipment, and all activities of trade contractors, equipment vendors, and suppliers. The Progress Schedule shall incorporate contractually specified limitations and restrictions, and contractually specified milestones. Construction activities shall match or be correlated with the pay items in the approved Schedule of Values. The Progress Schedule shall be prepared in sufficient detail with the assignment and coding of all activities by the Contractor and Subcontractors in consideration of, but not limited to, the following Work activities:

1. Access and availability to the Project Site, including road closures;
2. Identification of interfaces and dependencies with preceding, concurrent, and succeeding contractors, if applicable;
3. The type of work to be performed and labor trades involved;
4. All procurement, manufacturing, fabrication (both on-site and off-site), and delivery activities for all major materials and equipment;
5. Shutdowns of existing Owner’s equipment and utility services;
6. Required delivery dates of OFCI equipment and materials;
7. Testing, air balancing, and commissioning activities, including submission and approval of test results;
8. Approvals by regulatory agencies or other third parties, including obtaining an Occupancy Permit;
9. Coordination for Owner’s occupancy including Owner’s cleaning, OFOI equipment and furnishings installations;
10. Planning for phased occupancy by the Owner, with intermediate completion dates;
11. Contractor’s preliminary cleaning and final cleaning operations;
12. Contractor’s Final Punch List Report, Owner’s Final Inspection (Punch List), Contractor’s corrections, and Owner’s re-inspection;
13. Substantial Completion and Final Completion activities and milestones, and Final Acceptance.

E. The activities defined in the Progress Schedule shall represent the planned durations in anticipation of normal man-power and equipment utilization in durations of whole working days. No activity durations shall exceed twenty two (22) working days. If approved by the Owner, longer durations may be allowed for non-construction activities such as procurement, delivery, or submittal activities. All durations shall be determined based upon resource planning under contractually defined on-site work conditions. In calculating activity durations, normal inclement weather shall be considered. The Contractor shall schedule the Work to minimize the effect of adverse weather. The Contractor shall also protect the work site from the effects of adverse weather or take other necessary measures such that the Work can be completed within the time established in the Contract Documents and include these provisions in the schedule as appropriate.

F. Schedule activity identification codes shall not be alphanumeric unless approved by Owner.
1. Activity Description: Provide adequate information to readily identify each activity up to 48 characters in the general descriptive format: action, item, location (such as Install Steel Studs 3rd Floor).
2. The Critical Path shall be clearly indicated on all diagrams submitted. An activity is critical when it is part of the longest duration pathway(s) through the CPM network or when total float is less than or equal to zero.
3. Clearly identify activities that are planned to use overtime, double shifts, work on weekdays or holidays.
4. Include a listing of activities with open ends and out-of-sequence progress.

G. Certification: When requested by Owner, submit certification that each Subcontractor and major equipment supplier has participated in, reviewed, and concurs with the Progress Schedule as it relates to their Work.

1.3 MONTHLY PROGRESS SCHEDULE UPDATES

A. The Contractor is required to prepare and submit monthly Progress Schedule updates and to participate in monthly schedule update meetings with the Owner as described below.
1. Timely submission of updates is of significant and crucial importance to the management of this Project. Lack of, or late receipt of, updates diminishes their value to the Owner. If a monthly Progress Schedule update is not submitted to and reviewed with the Owner prior to the Contractor submitting its monthly Application for Payment, the monthly Schedule of Values amount for Progress Schedule updates may, at the Owner’s sole judgment and discretion, be reduced from the Contract Sum by unilateral Change Order (see Section 01 29 76, "Progress Payment Procedures").

B. The Contractor shall prepare a monthly Progress Schedule update to reflect work progress achieved since the previous update. Historical performance data and/or records shall not be changed without the approval of the Owner.

C. The Contractor shall use and maintain a fixed end date when generating the required reports and diagrams for the Owner as specified by this Section. The fixed end date shall be the Substantial Completion date. The fixed end date will be adjusted in subsequent updates only to reflect approved time extensions incorporated by Change Order.

D. The Project shall be rescheduled each reporting period with:
1. An updated data date.
2. Actual start/finish dates.
3. Percent complete.
4. Remaining durations (for each activity) in the “status” or “current” file.

E. Show changes occurring since the previous schedule submission, such as:
1. Any major changes in scope.
2. Activities modified since previous submission including, but not limited to, logic changes.
3. Revised projections for progress and completion, as applicable.
4. Any other identifiable changes.

F. The Contractor shall account for all rain days, for major events, and similar excusable non-compensable delays, during which little or no work is progressed and that are acknowledged by the Owner, in the period within which the events occur.

G. The Construction Progress Meeting shall be held prior to Owner’s review and comment of the Contractors draft Application for Payment, unless otherwise approved by Owner.
1. The Contractor shall provide copies of two tabular reports:
   a. A total float report clearly indicating the current critical path through Substantial Completion.
   b. A report of activities sorted by early start dates commencing with the previous monthly progress update and including all updated activities during the previous
month. Actual progress of the previous month will be recorded and incorporated into the update.

2. The Contractor shall provide copies of a narrative report to include:
   a. A description of the Work that has progressed.
   b. An explanation of the Work that had been scheduled to be performed in the previous period but was not performed, and why it was not performed.
   c. Anticipated delay and impact on the schedule.
   d. Corrective action recommended and its effect.
   e. A discussion of the Work scheduled for the upcoming period noting any issues or events that could impact this Work.
   f. If the Contractor intends to make a logic or original activity duration change(s), the report shall include such changes.

3. The Contractor and Owner shall review these reports and discuss any differences or issues raised.

1.4 CHANGE IN CONTRACT TIME ANALYSIS

A. It is the Owner’s desire and intent to resolve all issues affecting the Substantial Completion date in a timely, efficient, and effective manner. To achieve this goal, the Owner and Contractor shall participate in an analysis of all delays and advances of the schedule.

B. Assessment of impacts due to changes or other events must be performed on the most recent update of the Progress Schedule. Further impacts due to changes or other events shall be assessed utilizing the Progress Schedule update that represents the data date closest to, and just prior to, the date of the impacting event.

C. The logic and planning elements of the Progress Schedule are the Contractor’s responsibility. 1. No Contract Time shall be modified unless directed by an approved Change Order.

D. Submission of a valid monthly Progress Schedule update and the completion of a delay analysis impacting the critical path are conditions precedent to the review and approval of any request for an extension in the Contract Time. Failure to complete monthly Progress Schedule updates and to participate in the analysis will defer consideration of any time extensions by the Owner until the Work is completed and all as-built progress can be analyzed by the Owner. Further, the Owner will assess liquidated damages, if any, regardless of the status of any requests for time extensions pending, until any such requests are resolved.

1.5 SUBMITTAL SCHEDULE

A. General: Within ten (10) calendar days following Owner’s receipt of the Baseline Progress Schedule, the Contractor shall prepare and submit to the Owner a complete schedule of work-related submittals based on the Progress Schedule, as required by the Contract Documents (“Submittal Schedule”). Correlate Submittal Schedule with the listing of principal Subcontractors.

B. Form: Prepare Submittal Schedule in chronological sequence of submittals. Show category of submittal, name of Subcontractor, generic description of work covered, related Specification Section numbers, activity or event code on the Progress Schedule baseline file, scheduled date for first submission, and blank columns for actual date of submittal, re-submittal, and final release or acceptance by the A/E. The Submittal Schedule shall be prepared in sufficient detail and in consideration of, but not limited to, the following:
   1. Preparation and submission of shop drawings, layout drawings, product data, material samples, and mock-ups.

C. Update the Submittal Schedule monthly and submit to Owner.
1.6 SHORT INTERVAL SCHEDULE

A. Short Interval Schedule: Prepare and update weekly a four (4) week Short Interval Schedule. Show previous week of actual progress (planned vs. actual performance). Forecast three (3) weeks of start and completion dates for each activity, task, or event in comparison to the Contractor’s Construction Progress Schedule.
   1. Activities in the Short Interval Schedule shall relate directly to activities in the Progress Schedule.

B. Format for the Short Interval Schedule should be similar to the Owner’s form. The Contractor may submit an alternative format that must first be approved by the Owner. The format shall include comment annotation as necessary.

C. Copies of the Short Interval Schedule shall be provided at the Construction Progress Meetings and will be used as the basis for discussion of progress and planned work at the meetings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies general administrative and procedural requirements for submittals required by the Contract Documents.

1.2 SUBMITTAL PROCEDURES

A. The Owner intends to utilize an internet-based construction management system (CMS) for submittals (see Section 01 35 00 “Electronic Communications”).

1. The electronic submittal process is not intended to be used for color samples, color charts, or material samples.

B. Coordination: Contractor shall review submittals for completeness, accuracy, and compliance with the Contract Documents, and shall coordinate the transmittal of submittals to ensure there is no delay in the construction Progress Schedule. Submittal sequencing should coincide with the Contractor’s Submittal Schedule.

1. Allow fourteen (14) calendar days turnaround for each submittal, from time of receipt by the Owner. For complex submittals or submittals requiring coordination with subsequent submittals, plan additional turnaround time.
   a. Provide a “Priority List” when submitting several submittals within a short time.

2. A/E reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

3. Submittals received from sources other than Contractor will be returned without action.

C. Submittal Preparation: Contractor shall place a label on each submittal for processing. Include the following information on the label:

1. Date
2. Owner’s Project name
3. Name of Contractor and submittal number
4. Name of the entity that prepared the submittal
5. Specification reference number
6. For Shop Drawing submittals, Contractor’s certification that the submittal has been coordinated and reviewed for compliance with the requirements of the Contract Documents, and is approved for A/E’s action

D. Submittal Transmittal: Contractor shall include a transmittal with each submittal package.

1. Address no more than one topic, or related topics, on a single transmittal (i.e., mechanical items shall not be submitted with electrical items; miscellaneous specialties shall not be grouped; shoring shall be submitted separate from foundations).

2. Record relevant information including, but not limited to: the requested review return date (in order to maintain the construction Progress Schedule) and for Shop Drawings, variations from the requirements of the Contract Documents.

3. Provide the minimum number of each required submittal as noted in the Contract Documents and/or as follows:
   a. Shop Drawings: one (1) PDF
   b. Product data: one (1) PDF
   c. Samples: five (5) samples
   d. Mock-ups: As required by the Contract Documents
   e. Reference the Contract Documents for additional submittal requirements

4. Material and Color Samples: Submit samples of actual materials and colors.
Where variation in color, pattern, texture or other characteristics are inherent in the material, submit no less than four (4) variations of each sample to show approximate limits of the variations.

E. Portable Document Format (PDF) Requirements:
1. All documents are to be created as PDF files from the original source files, unless approved otherwise in writing by Owner.
2. The CAD printer shall be Autodesk DWG to PDF.pc3 print configuration.
   a. Layer information shall not be included.
3. All documents are to be created with a resolution of not less than 300 dpi.
4. All fonts are to be embedded in the PDF.
5. When compression is used, the algorithm must be LZW, CITT Group 4, or PackBits.
6. The PDF document size must be the same as the original document size if the document were printed (e.g., a 24"x36" print should have a PDF sheet size of 24x36).
7. Each document must be submitted as a single file.
   a. A single O&M product reference is one file.
   b. A single drawing is one file.
   c. A document larger than 11"x17" is defined as single document and is one file.

F. A/E’s Action: Except for submittals provided for the Owner’s information, the A/E will: review each submittal, mark each submittal with a uniform self-explanatory action stamp indicating action taken, and return promptly. Typically action stamps indicate:
1. Accepted without exception;
2. Subject to noted corrections;
3. Returned for re-submittal after correction; and
4. Rejected as non-compliant with the Contract Documents.

G. Compliance with Contract Documents requirements is the Contractor’s responsibility.
1. A/E’s approval of submittals does not relieve the Contractor from responsibility for a proper installation, compliance with applicable codes, or coordination of the Work.
2. All submittals required by the Contract Documents will be reviewed by the Owner for CAD drafting compliance, PDF compliance, and to determine completeness of the documents provided.

1.3 SHOP DRAWINGS

A. General: Shop Drawing submittals are defined in the General Conditions and include, but are not limited to, product data, samples and mock-ups, and layout drawings.
1. Do not reproduce Contract Documents as Shop Drawings.
2. For CAD Shop Drawing submittals, see 01 77 00 “Closeout Procedures.”

B. Product Data: Product data includes manufacturer's printed installation instructions, catalog cuts, standard color charts, rough-in diagrams and templates, standard wiring diagrams, and performance curves.
1. Submittal of standard product data is acceptable only when specific reference to the requirements of the Contract Documents is included. Submit specially prepared manufacture’s product data when standard product data is insufficient.
2. Mark each product data submittal and show the following information:
   a. Compliance with specified product requirements, including LEED requirements
   b. Compliance with any specified industry standards and testing agency standards, with testing agency labels and seals
   c. Manufacturer’s printed recommendations
   d. Applicable choices and options
   e. Notification of coordination requirements
   f. Notation of dimensions established by field measurement, as appropriate
C. Samples and Mock-ups: Samples include, but are not limited to, actual colors, materials and products to be provided. Mock-ups include field installations and partial assemblies of components.
   1. Prepare samples to facilitate review. Provide the following information:
      a. Generic description of the sample
      b. Source of the sample
      c. Confirmation of availability and delivery time
   2. Where samples are for selection of appearance characteristics from a range of standard choices, submit a full set of choices for the material or products.
   3. Maintain sets of approved samples and mock-ups at the Project site for quality comparisons throughout the course of construction.

D. Layout Drawings: Drawings include, but are not limited to, fabrication and installation drawings, layouts, schematics, diagrams, schedules, patterns, and templates.
   1. Submit drawings drawn to accurate scale. Indicate, at a minimum, the following information:
      a. Dimensions
      b. Identification of products and materials included
      c. Compliance with product installation requirements and/or industry standards
      d. Notation of coordination requirements
      e. Notation of dimensions established by field measurement

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for electronic communications and document control between the Owner, A/E and Contractor in supporting the Work of the Contract Documents.

B. The Owner will provide the Contractor and its Subcontractors access to the Owner’s internet-based integrated construction management system (CMS) which shall be used for communications and document control.
   1. Not all Project documents are tracked in the CMS. For most documents not in the system, the Owner provides electronic forms created with other industry standard software.
   2. Owner’s forms are included in Appendix A of these Specifications.

1.2 ADMINISTRATIVE REQUIREMENTS

A. System Access: The Owner will provide the required access codes necessary for the Contractor’s access to the Owner’s CMS website. The Owner will host the software and administer authority levels and classifications to users to control security access. Access levels will be provided to match only the level necessary to maintain and process electronic documents specified in this Section.
   1. Owner shall not be responsible for temporary or intermittent outages.

B. System Users: The Contractor shall provide a list of all parties from the Contractor’s and Subcontractors’ staffs and others that will be given access to the system. The Owner will provide the Contractor with access for a maximum of four (4) users, unless otherwise requested by the Contractor and approved by the Owner. The Contractor may, at its sole discretion, elect to enter all required data into the system including input from Subcontractors or may require the Subcontractors to enter their own data, but in either case the Contractor will be responsible for the accuracy of the data entered.

C. System Training: The Owner will provide initial training in the use of the CMS website at no cost to the Contractor commensurate with requirements for document control specified in this Section.
   1. The Owner will provide a training seminar for up to four (4) representatives from the Contractor’s organization at no cost to the Contractor. A training location and dates for the training will be provided after the award of the Contract. Training is anticipated to begin within two weeks of Contract execution.
   2. Additional training requested by the Contractor shall be subject to approval by the Owner.

D. Documents Requiring Signatures: All documents requiring signatures for approval shall be processed with the CMS to expedite preliminary concurrence of information only. Receipt of a “hard copy” signature on forms is required prior to implementing action or work as the conditions may require.

E. Equipment and Software Requirements: A computer with high speed internet access will be required in the Contractor’s home office and field office and in the offices of each of its Subcontractors using the CMS. Each computer must utilize Internet Explorer 8 or above and must be equipped to handle current versions of Microsoft Excel and Word documents, as well as pdf and tif files.
F. Information Input: The responsibility of the Owner, A/E, and Contractor to enter information and data into the Owner’s internet-based CMS shall correlate with the responsibilities of the same parties as specified in all other sections within these Contract Documents. Responsibilities include, but are not limited to:

1. The Owner will input Project and cost information from the Contract Award and maintain emergency contact lists, reports, logs, and enter all change documents.
2. The A/E will enter the Contract Documents and design clarifications with attached drawings and details, after Owner’s approval, and field reports.
3. The Contractor will enter all meeting minutes, submittals, utility shutdown requests, Requests for Information and other reports and documents required by the Contract Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies minimum requirements for safety on the construction site including:
   1. Contractor responsibility (regarding safety)
   2. Contractor safety program and plan submittals
   3. Contractor safety requirements
   4. Contractor safety reporting
   5. Construction “fire safety” requirements
   6. Chemical hazard communication
   7. Chemicals of interest reporting
   8. SARS-CoV-2/COVID-19 exposure control, mitigation, and response plan
      Note: Refer to the UW Project Delivery Group (PDG) website for information on current
      regulatory/agency guidelines and University requirements
      (https://facilities.uw.edu/unit/project-delivery)

B. Owner’s forms referenced in this Section include (see Appendix A):
   1. Chemicals of Interest – Contractor Declaration and Reporting Form

C. For additional provisions related to safety precautions, refer to the General Conditions.

1.2 CONTRACTOR RESPONSIBILITY

A. The Contractor is solely and completely responsible for compliance with all applicable laws,
   codes and regulations regarding safety (whether noted in this Section or not) and for creating
   and maintaining a safe working environment, including safety of all persons and property on
   the jobsite (whether the requirements of this Section address a particular situation or not).

B. The Contractor shall maintain the jobsite and perform the Work in a manner which meets or
   exceeds statutory and regulatory requirements for the provision of a safe place to work and
   which minimizes safety risks to personnel of the Contractor, Subcontractors, Owner, general
   public or other parties. This obligation shall apply continuously and not be limited to normal
   working hours.
   1. The Contractor shall ensure that all Contractor and Subcontractor personnel are provided
      sufficient training, and shall take such actions as are necessary to maintain a safe
      environment on the construction site. Such training and actions shall include, but not be
      limited to, ensuring that such employees are familiar with governing construction safety
      requirements and the requirements for compliance with applicable regulations.
   2. The Contractor shall monitor the jobsite to ensure that employees do not create unsafe
      conditions for others, and to comply with the provisions of the Site Specific Safety Plan.
   3. The Contractor shall establish and communicate clear expectations to its employees and
      Subcontractors of any tier (and their employees) of their obligation to notify the
      Contractor and any at risk party of any potential health or safety hazard affecting
      themselves or others.
   4. The Contractor shall conduct on-site safety meetings weekly, or other frequency as
      appropriate, that shall be mandatory for all employees.

C. The Contractor shall designate a full-time on-site competent individual to be the “Safety and
   Health Officer” who is qualified and authorized to supervise and enforce compliance with the
   Contractor’s Site Specific Safety Plan during the performance of the Work. The Contractor is
   responsible to ensure that all necessary monitoring equipment, protective clothing, and other
   supplies and equipment are available to implement the Plan.
1. The Contractor shall require each Subcontractor to provide a fulltime on-site safety manager (competent individual) for the duration of work at the Project site. If the man-load is below fifty (50) field workers, the Subcontractor may designate its Superintendent as the safety manager. If the man-load is fifty (50) or above field workers on-site, the Subcontractor shall provide and designate a dedicated competent individual as safety manager whose sole responsibility is Project safety including, but not limited to: review pre-task plans, critical lift plans, rigging and installation means and methods, fall protection, trenching excavations, electrical safety, Occupational Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act of 1973 (WISHA) regulations compliance, and second tier Subcontractor safety monitoring and compliance.

D. Safety Violations: In the event of WISHA violations by the Contractor or any of its suppliers or Subcontractors of any tier for unsafe practices involving imminent danger to personnel of the Owner, Contractor, Subcontractors, or others, the Contractor shall immediately correct the hazardous situation which caused the violation prior to any work continuing in the affected area. If such violations exist and corrective actions have not been taken by the Contractor, the Owner may order the Contractor to stop work (to be followed up in writing the same day), until satisfactory corrective action has been taken per Article 3.04 of the General Conditions.

1.3 CONTRACTOR SAFETY PROGRAM AND PLAN SUBMITTALS

A. Company Safety Program: The Contractor shall submit a copy of its Company Safety Program to the Owner. The Company Safety Program shall contain, at a minimum, the following elements:
   1. Organizational Structure: Include names of individuals who will perform safety duties, titles, work assignments, authority and reporting relationships.
   2. Training Program: Who, how, and when training is provided; method of employee training concerning safety rules and procedures; and training in use of protective equipment.
   3. Protective Equipment: List of personal protective equipment to be provided to employees.
   4. Accident Prevention and Loss Control Plan: Work site inspection and hazard correction procedures; disciplinary procedures for safety infractions; and accident response (investigation and reporting procedures).

B. Site Specific Safety Plan: The Contractor and each of the Contractor’s Subcontractors shall review the Contract Documents, and the Contractor shall develop and submit a copy of a “Site Specific Safety Plan” to the Owner. The Site Specific Safety Plan shall be tailored to the unique issues of the Project and the specific types of hazards likely to be encountered throughout all phases of the Work, be in compliance with WISHA and all other regulatory requirements, and contain, at a minimum, the following elements:
   1. Application of Company Safety Program: The Site Specific Safety Plan shall address how the elements listed in this Section 1.3A will be specifically applied and modified in addressing the unique issues related to the Project.
   2. Specific Hazards: The Site Specific Safety Plan shall address, as applicable, the following, and other specific hazards for the Project:
      a. Odor notification
      b. Excavation and rescue plans
      c. Pedestrian safety (including on Husky Game and/or other special event days)
      d. Overhead hazards and flying objects
      e. Hot works
      f. Hazardous materials and chemical exposure
      g. Methane abatement
      h. Safety issues related to Owner’s “Prior Occupancy”
      i. Working over water
      j. Rigging - aerial lifts and forklifts
k. Electrical safety
l. Scaffolding and personnel lifts
m. Noise and dust
n. Lockout/Tagout and control of hazardous energy
o. Work in confined spaces
p. Housekeeping and safe access
q. Silica
r. Fall prevention
s. Steel erection activities
t. Crane safety
t. SARS-CoV-2/COVID-19 viruses

1.4 CONTRACTOR SAFETY REQUIREMENTS

A. Safety Training: Contractor shall provide construction site orientation for all employees (including Subcontractor employees) to become familiar with the Site Specific Safety Plan prior to commencing work. Contractor shall, on a weekly basis, perform safety training on hazards specific to the phase of work for all employees. These meetings shall be mandatory for all construction employees.
   1. Subjects should include site specific safety issues and procedures and discussion of corrections resulting from any violation in safety procedures. A log of subjects covered and a copy of the attendance records of each meeting shall be submitted to the Owner's Representative on the day the meeting occurs.

B. Respiratory Equipment: Any personnel performing work requiring the use of respiratory protective equipment shall be fully trained in the use of such equipment. Contractor must have a respiratory protection program and ensure that all workers wearing respirators have medical clearance and fit testing, as appropriate, for the type of respirators used.

C. Personal Protective Equipment: Contractor shall ensure all construction personnel are equipped with and utilize personal protective equipment in accordance with Labor and Industries standards. As a minimum requirement, all personnel working on the construction site shall be required to use approved hardhats, safety glasses, appropriate gloves, and substantially constructed work boots. In addition, high-visibility safety apparel shall be worn in accordance with the American National Standards Institute and the International Safety Equipment Association (ANSI/ISEA) standard 107-2004.

D. First Aid: The Contractor shall maintain at the Contractor's field office, or other well known place at the Project site, all materials (e.g., a first aid kit) necessary for giving first aid to the injured, and shall establish, publish, and make known to all employees procedures for ensuring immediate removal to a hospital or a doctor's care, persons (including personnel) who may have been injured on the construction site. Construction personnel shall not work on the construction site before the Contractor has established, and made known, procedures for removal of injured persons to a hospital or a doctor's care. If the Contractor and/or any Subcontractors work crew consist of five or more employees, the Contractor shall ensure that at least one of such employees has a valid and effective first aid card.

E. Safety Walkthrough: In addition to WISHA requirements, the Contractor shall conduct a safety walkthrough of the Project with the Owner's Representative a minimum of once a month during the course of construction. If a safety manager is required for any Subcontractor, the safety manager shall also attend the safety walkthrough. The Contractor shall:
   1. Document and maintain a written record of the hazards and unsafe practices noted during the walk-through and provide copies to the Owner as requested;
   2. Ensure that corrective action is promptly taken to eliminate the items recorded; and
3. Maintain copies of all inspections performed by other competent individuals on the construction site during the course of construction.

F. Job Hazards Analysis: The Contractor shall plan daily work, considering procedures with the potential for personnel injury and implement appropriate practices to avoid injuries with focus on engineering controls, personal protective equipment needs, and mitigation for exposure to cuts and lacerations. At each construction progress meeting, the Contractor shall present its plan for addressing hazards likely to be encountered in the next week.

1. The Contractor shall develop and implement a program requiring task planning at the foreman level, including at the Subcontractor’s foreman level.

1.5 CONTRACTOR SAFETY REPORTING

A. Reporting Injuries and Incidents: Contractor shall immediately notify the Owner’s Representative of any injury or incident to persons, including personnel, on the construction site. Contractor shall conduct an immediate investigation with an emphasis on preventative actions and lessons learned. The Contractor and its Subcontractor shall document the investigation and submit a hard copy of the report on OSHA Form 301 “Injury and Illness Report,” or equivalent, to the Owner within 24 hours of the incident. The Contractor shall report on a monthly basis the total number of hours worked on-site by the Contractor’s employees and Subcontractors, and the total number of recordable incidents and lost time accidents. Contractor shall submit copies of the Project First Aid Log to the Owner’s Representative on a monthly basis.

B. Reporting Potentially Serious Hazards: Contractor shall immediately notify the Owner’s Representative of any potentially serious hazard to persons, including personnel, on the construction site. Contractor and its Subcontractor shall conduct an immediate investigation and submit a report to the Owner’s Representative within 24 hours of becoming aware of the potentially serious hazard. The report shall describe the potentially serious hazard, the results of the Contractor’s investigation, and any steps the Contractor has taken to prevent an injury or incident from occurring based on the potentially serious hazard.

C. Emergency Procedures:
   1. The Contractor is responsible for obtaining copies of and complying with all Harborview Medical Center emergency response protocols.

1.6 CONSTRUCTION FIRE SAFETY REQUIREMENTS

A. Fire Safety During Construction and Demolition: The Contractor shall conform to Chapter 1, “Fire Safety During Construction and Demolition,” of the International Fire Code, as locally amended, and any additional provisions as outlined herein for precautions against fire, flammable and combustible liquids, flammable gases, explosive materials, fire protection, fire reporting, fire fighting access, means of egress, standpipes, fire sprinklers, and roofing operations.

   1. The Contractor shall provide adequate separation between Owner-occupied buildings and construction trailers and sheds.

B. Hot Work Procedures:
   1. Contractor shall establish a system for documentation and control of "hot work” activities which include the use of portable gas, grinding, or arc welding equipment and conduct operations in a manner that is fire-safe for the work area and adjacent areas. Hot work permits are to be posted at the jobsite in an accessible and conspicuous location. Maintain the premise clear of rubbish, debris, or other materials constituting a potential fire hazard. The local fire code is incorporated herein by reference; adhere to all applicable provisions as determined by the local fire department. Contractor and
Subcontractors shall obtain from the local Fire Department engineering inspection section a permit for all hot work activities prior to performing this Work.

a. Whenever practical, the Contractor shall perform cutting and welding operations off-site.

2. Maintain copies of all hot work related permits for Owner’s review upon request, including, but not limited to:

a. Cutting and welding;
b. Roofing / hot-tar kettle; and
c. Storage of flammable materials (e.g., propane, butane) and/or compressed gases.

3. Prior to conducting hot work activities, the Contractor shall ensure all of the following fire safety precautions have been taken:

a. Cutting and/or welding equipment must be thoroughly inspected and found to be in good repair, free of damage or defects.
b. A multi-purpose dry chemical, portable fire extinguisher must be located so that it is immediately available to the area of work and is fully charged and ready for use.
c. At least one fire alarm pull station or means of contacting the fire department (i.e., site telephone) must be immediately available and accessible to person(s) conducting the cutting/welding operation.
d. Floor areas under and at least 35 feet around the cutting/welding operation must be swept clean of combustible and flammable materials.
e. All construction equipment fueling activities and fuel storage must be located at least 35 feet away from cutting/welding operations.
f. Fire resistant shields (e.g., fire retardant plywood, flameproof tarpaulin, metal, etc.), must cover combustible floors.
g. Combustible materials and finished surfaces, equipment, electrical cables, and personnel must be provided with protection to prevent damage or injury from molten metal, falling sparks, and welding arcs.
h. Spark / slag catchers (e.g., fire retardant plywood, flameproof tarpaulin, metal, etc.) must be suspended below any elevated cutting/welding operation.
i. All floor and wall openings must be covered to prevent sparks/slag from traveling to other unprotected area.
j. Containers in or on which cutting/welding will take place must be purged of flammable vapors.

C. Fire Systems Shutdowns, Impairments, and Fire Watch

1. When it is necessary to shut down existing fire alarm systems or suppression systems for switch-over purposes, or any other reason that leaves the building unprotected, the Contractor shall provide a continuous Owner-approved “fire watch” in accordance AHJs and the following (unless the Contractor provides an Owner-approved temporary equivalent system or the Contractor is specifically excepted by the Owner):

a. Person(s) assigned to a fire watch must be trained in the use of the portable fire extinguisher.
b. Fire watch personnel must have an immediate means of providing notification to the fire department (e.g., cellular phone, land-line phone, two-way radio to a continuously staffed position) and the University Police.
c. Continuous rounds to cover all areas of the building where the fire protection system is out-of-service are required every 15 minutes.

1) Exception for Building Code type “B occupancy” buildings: During the hours a B occupancy building is occupied, building occupants performing their duties, including construction personnel, may act as a fire watch in lieu of a designated fire watch, when approved in writing by Owner.

a) A fire watch is required at all times in unoccupied areas.
b) Other building code occupancy types may be allowed this exception when approved in writing by the Owner.
d. A log of rounds shall be maintained to include the name of the person performing the fire watch, the hours worked (including start and stop times), and comprehensive notes.

2. Fourteen (14) calendar days written notification shall be provided to the Owner’s Representative requesting approval for fire protection system shutdown or functional impairment; receipt of written approval from the Owner’s Representative is required before any system shutdown or functional impairment.
   a. In occupied buildings, include a plan indicating a method to notify all occupants.
   b. Notify the local fire department. In Seattle, the number to report out-of-service systems and equipment is 206-233-7219.

3. The Contractor shall work in cooperation with the Owner to identify fire alarm initiating devices in and adjacent to the Project site that may activate from construction activities (i.e., work that creates dust, smoke, steam, heat, etc.) and develop a plan to temporarily cover, remove, or disable through programming these devices to eliminate the potential for false alarms.
   a. The Owner may authorize in writing some devices to be disabled for the duration of the Work or for a particular activity without requiring a continuous “fire watch” for one shift or several days depending on circumstance.
   b. ONLY OWNER PERSONNEL SHALL DEACTIVATE OR DISABLE EXISTING FIRE DETECTION AND SUPPRESSION SYSTEMS, unless the Contractor is specifically authorized in writing by the Owner to do so.
   c. If the fire alarm system has been deactivated at the request of the Contractor and the Contractor leaves the construction site without informing the Owner of the need to reactivate the fire alarm system, a charge of $500 shall be assessed for each event. The Contract Sum will be amended for such amount by Change Order.

D. Fire Alarm/Suppression Systems False Activation or Discharge: Most existing Owner buildings have active fire detection and suppression systems. If proper procedures as outlined in the Contract Documents and this Section 1.6C are not followed to ensure the unnecessary activation or deactivation of these systems, the Owner may at its sole discretion impose an emergency response charge of $350 per occurrence to the Contractor and require a fire watch at the Contractor’s cost. The Contract Sum will be amended for such amount by Change Order.

E. Fire Extinguishers Required for Construction: Provide multipurpose dry chemical portable fire extinguishers for the Work in accordance with the International Fire Code Chapter 14, as locally amended, and as required by WISHA and other applicable regulations. Existing building fire extinguishers or new fire extinguishers specified by the Contract Documents for the Project do not alleviate Contractor’s responsibility to provide temporary fire extinguishers for the Work.

F. Standpipes Required for Construction: In new multi-story construction (four or more stories in height) a Class I standpipe shall be provided in accordance with Chapter 14 of the International Fire Code, as locally amended, for use during construction. Fire Department connections at bottom of standpipe shall be clearly marked and accessible at all times for fire department personnel and equipment. This requirement shall be reviewed and approved by the Owner’s Representative.

G. Existing Fire Separations: Existing fire separations, including floor-to-floor separations, shall not be impaired by construction activities.

H. Occupant Egress in Existing Buildings: The Contractor shall not block active exits, exit hallways, exit corridors and the exit access to a public way.
   1. Exits are to remain free of construction materials, equipment, and rubbish at all times, unless approved by Owner.
2. Work which blocks or restricts exit corridors shall only occur at night with prior approval of the Owner. If approved, work that blocks or restricts exit corridors must be cleared by 6:00 a.m. each day.

I. Emergency Access: Outdoor storage and staging operations and construction fencing shall not impede egress, restrict or narrow fire fighting access (including roads or lanes), or present a fire exposure to existing buildings.
   1. Access to emergency services including, but not limited to, fire hydrants, fire department connections, fire command centers, fire alarm panels, valves and similar equipment and systems for emergency vehicles and emergency response personnel must be kept free and unobstructed at all times, unless specifically approved by the Owner.
   2. Temporary obstruction of emergency access may be allowed for special cases (e.g., crane installations and hoisting) on a short-term basis. A written plan must be submitted to the Owner for approval at least two weeks prior to the scheduled date of obstruction.

1.7 CHEMICAL HAZARD COMMUNICATION

A. General: The Owner and the Contractor are responsible under the Washington Administrative Code 296-800-170 through 296-800-18020 (Employer Chemical Hazard Communication) to provide a safe and healthy environment for their employees.

B. Responsibilities:
   1. The Owner maintains a centralized collection of all Material Safety Data Sheets (MSDS) for Owner materials. These MSDS are available to the Contractor if an unknown chemical is discovered in the work area; a worker is concerned about exposure; and the Contractor suspects the material originates with the Owner.
      a. The Contractor shall coordinate with the Owner’s Representative to receive this information.
   2. The Contractor shall establish a Chemical Hazard Communication Program (WAC 296-155-180) which includes multiemployer workplaces (WAC 296-800-17007), and provide hazard communication information and training to its employees and the employees of the Contractor’s Subcontractors (of any tier).
      a. The information shall include: signage demarcating regulated areas and entrances; signage indicating the location of the Contractor’s binder containing all MSDS used for Construction; and prominently posted lists identifying all hazardous chemicals present in the workplace.
      b. In addition to MSDS training which is regulated by the Employer Chemical Hazard Communication standard, training shall include those MSDS that are available for any Owner’s chemical product present at the jobsite.
   3. The Contractor shall provide the Owner chemical hazard information (MSDS) for all chemical products the Contractor and the Contractor’s Subcontractor’s (of any tier) bring onto the jobsite for Owner’s information prior to application including, but not limited to, all paints, glues, mastics, epoxies and cleaning products.
      a. At the jobsite, the Contractor shall establish and maintain a binder(s) of all hazardous chemicals MSDS used for Construction and indicate where utilized.
         1) The MSDS shall be bound in a slant-D, 3-ring, view binder with clear vinyl overlay inserts on the front cover and spine. The binder shall have heavy duty nylon reinforced hinges.
         2) The binder shall have a cover slip sheet and a spine sheet typed with “MSDS used for Construction,” University Project name, University Project number, University Facility number, A/E name, and Contractor name.
         3) The MSDS shall be organized by specification division and section with tabbed dividers between the sections or, when presented in a logical format by Contractor and approved by Owner, between categories.
1.8 CHEMICALS OF INTEREST REPORTING

A. Prior to work being performed by the Contractor and/or the Contractor’s Subcontractors (of any tier), the Contractor shall submit to Owner a completed “Contractor Declaration and Reporting Form for Department of Homeland Security – Chemicals of Interest” for chemicals listed in 6 CFR (Code of Federal Regulations) Appendix A to Part 27 that will be used on the jobsite. Individual declarations shall be provided by the Contractor and the Contractor’s Subcontractors (see Appendix A of the Specifications for a copy of the form).

1.9 SARS-CoV-2/COVID-19

A. All construction operations must comply with the most current COVID-19 related rules and guidance from the Governor’s Office including the “Stay Home, Stay Healthy” addendum, dated April 24, 2020, and additional guidance issued April 29, 2020. All activities must also comply with all related and applicable requirements issued by the Washington State Department of Labor and Industries and Public Health Agencies having jurisdiction.
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies minimum administrative and procedural requirements that the Contractor shall implement for “infection control” as extensions of other provisions in the Contract Documents.

1. All construction work at a medical center is a potential health risk in that mold spores and other microbial organisms that result from the disturbance of dust can become exposed and airborne which may cause disease in sensitive patients. The Contractor shall:
   a. Not allow any dust to escape the work area within the medical center;
   b. Control any dust, due to construction Work, from entering the medical center; and
   c. Minimize dust and debris from construction operations.

1.2 DEFINITIONS OF CONSTRUCTION ACTIVITIES

A. “Inspection and Non-Invasive Activities” (Applies to Low Risk, Medium Risk and High Risk Patient Groups): Lifting of ceiling tiles or opening of hard ceiling access panels for visual inspection only; painting (but not sanding); application of wall coverings; and other Owner approved activities which do not move or mobilize uncontrolled dust or require cutting of walls or floor coverings, such as electrical trim work and minor plumbing. (Inspection and Non-Invasive Activities do not include opening access doors in HVAC ductwork.)

1. Uncontrolled and uncontained Inspection and Non-Invasive Activities are not permitted in “highest risk” patient areas.

B. “Standard Risk Activities” (Applies to Low Risk, Medium Risk and High Risk Patient Groups): Small scale, short duration activities that are completed in a single work shift and/or that create minimal dust where dust migration is completely contained and controlled from dispersing into the atmosphere, such as installation of energy limited cabling (e.g., telephone, computers), access to chase spaces, cutting of walls or ceilings, and the performance of Inspection and Non-Invasive Activities in “highest risk” patient areas.

1. Standard Risk Activities are not permitted in “highest risk” patient areas without proper infection control practices to contain dust and debris.

2. During construction, the Contractor shall ensure:
   a. There is an active means to prevent airborne dust from dispersing into the atmosphere.
   b. Unused enclosure doors are sealed with painter’s tape.
   c. HVAC system air vents (supply and exhaust) within enclosures are sealed shut.
   d. Dust containment (sticky) mats are located at entrance and exit to work area enclosure doors.

3. Upon completion of the Project, the Contractor shall ensure:
   a. Work surfaces are cleaned and wiped with approved disinfectants.
   b. The work area is damp mopped and/or vacuumed with a HEPA filtered vacuum.
   c. HVAC system isolation is removed and functioning within original conditions or new design standards.

C. “High Risk Activities” (Applies to all Patient Risk Groups): All requirements specified herein apply to any Work that generates or disturbs a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies, such as sanding of walls for painting or wall coverings, removal of floor coverings, ceiling tiles and/or casework, and new wall construction. Also, includes HVAC ductwork and electrical work above ceilings, major cabling work, and any activity that cannot be completed within a single work shift.
1.3 TYPES OF PATIENT “RISK GROUP” AREAS

A. Low Risk Areas

B. Medium Risk Areas

C. High Risk Areas

D. Highest Risk Areas

1.4 PROJECT RISK GROUP

A. The Risk Group for this Project is **Highest Risk**.

1.5 DESCRIPTION OF GENERAL REQUIREMENTS

A. The Contractor shall identify a competent person responsible for establishing, coordinating and maintaining infection control interventions and safety training for the Project who shall be on-site at all times during the Work.

B. The Contractor shall submit a written "Infection Control and Monitoring Plan" for Owner's review and approval prior to performing Work within the medical center. The plan shall include, but not be limited to, locating dust proof enclosures, HEPA equipment locations and negative air routing, fire safety and security, noise and vibration control, construction access and exit path routing, temporary signage design and locations, odor control, waste management, and proposed cleaning equipment.

1. Submit temporary facilities drawings showing the locations of dust proof enclosures and negative air machines, with ductwork routing, required for performance of the Work.
   a. For relocations required by the Work, revise and resubmit.

2. Submit a water control plan for concrete core drilling and saw cutting.

3. When requested by Owner, the Contractor shall assist in completing the Owner’s "Infection Control Risk Assessment" forms to identify the appropriate interim life safety measures required for the Work.

C. Daily Reports: Contractor shall submit daily infection control reports that document:
   1. A general description of the activities completed during the shift;
   2. Infection Control enclosure checks and modifications, if necessary;
   3. Manometer readings; and
   4. Next-day work plans.

D. Infection Control Training: The Contractor shall provide jobsite orientation for all construction personnel and suppliers of materials to the Project site to become familiar with the Project specific infection control requirements prior to performing any on-site construction activities.
   1. For Projects at the UW Medical Center only: All construction personnel involved in construction activities shall observe a training video "Dust Containment in a Medical Setting" on construction risks in health care facilities as part of their safety training.

E. All infection control requirements shall be in place before commencing Work and shall remain in place and be maintained in good working order until the Work is complete, including but not limited to completing the following work:
   1. Punch List work is fully and finally complete;
   2. Door locks/keys are changed over;
   3. Owner’s air sampling has met infection control completion criteria, and;
4. Contractor’s final cleaning and/or Owner’s transplant cleaning and disinfection is complete.
   a. Contractor’s final cleaning shall occur after Punch List work is complete to the satisfaction of the Owner.

F. Contractor shall not permit its employees, the employees of its Subcontractors of any tier, or delivery personnel to expectorate (spit) inside Owner’s facilities.

1.6 INFECTION CONTROL REQUIREMENTS

A. Dust Proof Enclosures: The Contractor shall provide dust proof enclosures for all Work (except for Owner approved “Inspection and Non-invasive Activities”). Dust proof enclosures shall be constructed per the requirements of Section 01 50 00 “Temporary Facilities and Controls” prior to start of Work. Dust proof enclosures must: enclose the entire work area to completely isolate it from all surrounding areas; cut off any flow of particles from work areas to patient areas; and be functioning continuously. Doors shall remain closed and penetrations or openings to dust proof enclosures shall be tightly sealed at the end of each work shift.
   1. All dust proof enclosures shall be maintained on a daily basis to ensure proper airflow, appearance, and workplace security. Enclosure failure requires immediate corrective action by the Contractor.
      a. Enclosures which are not immediately repaired by the Contractor may be repaired by the Owner and all Owner costs required to repair the failure may, at the Owner’s sole discretion, be back-charged to the Contractor.
   2. When performing construction activities of a “high risk” classification, in highest risk patient areas, an anteroom to the enclosure entrance shall be required.
   3. Portable mini enclosures shall be equipped with a HEPA vacuum for vacuuming the work area prior to removing the enclosure.
   4. On phased projects, where dust proof enclosures are to be relocated as a part of the phasing of the work area, the work area shall be fully cleaned prior to the relocation of any dust proof enclosures to prevent dust from leaving the work area.

B. Work Area Air Pressure Requirements: The Contractor shall use negative air machine equipment to maintain a negative air pressure relationship of the work area from surrounding areas. Negative air pressurization of the work area is required at all times, and constant maintenance of that pressure differential is the responsibility of Contractor, unless exempted in writing by the Owner. A minimum negative pressure relationship of .03” water column must be maintained between areas under construction and surrounding areas.
   1. Appropriate equipment shall be used to constantly monitor the negative air pressure relationship. Acceptable options to visually assure negative air pressure is maintained are: for rigid wall containment (usually in longer duration projects) manometer units shall be employed; for plastic or polypropylene dust proof enclosures (in longer duration projects) flutter strips of light weight ribbons or “survey tape” shall be employed; and for short duration projects involving single shifts the actual visual movement of the plastic or polypropylene dust proof enclosure wall into the construction space is acceptable.
      a. For projects utilizing manometers: The Contractor shall record manometer readings at the beginning and the end of each work shift and shall maintain a log of readings, and any corrective actions taken, to be included in the daily report.
   2. Work area ventilation must be exhausted 100% to the exterior of the building and directed away from building air intakes to an approved location, unless otherwise approved in writing by the Owner.
      a. If the Owner agrees exhausting to the exterior of the building is not feasible, HEPA filtered air may be exhausted to adjacent areas provided existing air relationships remain unchanged and the Contractor provides confirmation with an air balancing report. The air balancing report shall be provided to the Owner prior to the Contractor performing construction work.
1) When exhausting indoors, exhaust near the ceiling through a velocity reducing pre-filter material approved by the Owner.

A. Negative Air Machines: The Contractor shall utilize Owner-provided HEPA equipped air filtration "negative air" machines and heavy duty flexible steel reinforced exhaust hoses.
   3. HEPA equipped air filtration machines shall be connected to normal power and ganged to a single switch for emergency shut-off.
   4. Exhaust hoses shall be of adequate size to ensure necessary air flow and be in place and intact at all times.
   5. The Contractor is to take care in maintaining the negative air machines in accordance with the manufacturer’s written instructions, including but not limited to, monitoring and changing all filters and seals as needed to ensure adequate airflow and complete filtering.
   6. The Contractor shall provide all necessary HEPA filters for the negative air machines.

C. Materials and Material Handling: The Contractor shall ensure that all materials, including new materials, construction debris, and tools, are transported clean and contained or wrapped in “dust impermeable” enclosures when transported within the medical center. Containers and/or carts shall be tightly covered and their open surfaces shall be wrapped and taped closed unless there is a solid lid. Wrappings and/or bags shall be hermetically sealed.
   1. Wheels of containers and/or carts shall be wiped clean prior to entering the medical center and entering or leaving the work area.
   2. Debris removal shall occur through approved routes and only at times approved by Owner.

D. Owner Air Monitoring: The Owner will perform periodic field inspections and air quality testing inside and outside the work area and will approve removal of dust proof enclosures based upon air quality testing results. If Owner’s air monitoring indicates failure of negative pressurization of the work area enclosure, or Owner’s measurements and/or observations indicate the construction work is releasing particulates, dust, or vapors outside the work area, upon Owner’s notification to Contractor, Contractor shall implement immediate corrective actions to stop such emissions and to prevent future emissions.
   1. Air sample results require approximately five (5) days. Areas that “fail” air sampling at the end of the Project will require additional visual inspection, assessment and remediation, with possible repeat cleaning. Retesting will be performed until the work area meets “passing” criteria.

E. Housekeeping:
   1. Infection Control Cleaning: The Contractor shall provide infection control cleaning during all construction activities within the medical center.
      a. Construction work areas and access routes shall be clean within the medical center. Contractor shall continuously clean all work areas within the Project site and those work areas outside enclosure containment, including construction access routes, free from dust, debris, and construction materials. Clean and disinfect all existing surfaces and materials outside containment that are impacted by construction immediately upon completion of an activity.
      b. Damp mop, electrostatic cloth sweep, and/or vacuum with HEPA filtration the construction site and construction access routes during the work and before leaving work areas at the end of a shift to eliminate tracking and dust migration. Prior to the removal of any dust proof enclosures the Project site must be damp mopped and/or vacuumed and all surfaces wiped down with disinfectant. Submit disinfectant for Owner’s review and approval.
         1) Quaternary ammonium compounds are required for damp mopping.
2. Maintain sufficient supplies of cleaning equipment on-site including but not limited to: HEPA filtered vacuum cleaners; dust attracting mops; wet mops; brooms; buckets; and clean wiping rags.

3. Any materials capable of absorbing moisture must be fully dried within 48 hours of becoming wet. If material, either new or existing, inside or outside the work area, becomes wet as a result of the Contractor’s actions and is unable to be dried to an “as-new” condition within 48 hours, the Contractor shall remove the materials within the same 48 hour period. Any visible mold growth caused by or observed by Contractor inside the work area must be reported to Owner immediately. Owner will determine corrective actions to be taken in consultation with Contractor.
   a. Materials removed from the work area for this reason shall be replaced with new materials at Contractor’s expense.

4. Contractor shall take measures to control vermin and other pest infestations within the Project site. Food waste is to be removed daily and all food is to be stored in tightly sealed containers that are clearly labeled.
   a. Any visible bird or rodent droppings observed by the Contractor inside the work area must be reported to Owner immediately. Owner will determine corrective actions to be taken in consultation with Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PERFORMANCE REQUIREMENTS

A. The Contractor shall implement the following, but not limited to, work procedures for Work in the medical center:
   1. Construction materials stored on-site shall be kept dry.
   2. Immediately remove spills or excess applications of solvent containing products.
   3. Existing supply and exhaust air grills serving the building HVAC system within dust proof enclosures shall be covered and sealed to prevent airflow and contamination of the duct system at all times.
   4. At the end of the work day, all openings in pipes and ductwork shall be covered or sealed.
   5. Work surfaces are misted with wetting agents to control dust during demolition and while cutting.
   6. Vacuum subfloor surfaces prior to the application of resilient flooring materials.
   7. Concealed spaces shall be vacuumed clean before covering or enclosing, including but not limited to: chases; stud tracks; above ceilings (including top surfaces of ductwork and cable trays); and surfaces covered by resilient flooring materials, casework, and accessories.
   8. Immediately replace any ceiling tile briefly lifted for visual inspection outside of dust proof enclosures. Removed tiles shall not be left open and unattended. Limit tile removal to 1 tile per 50 square feet of area, unless otherwise approved by Owner.
   9. Work shall be performed in rooms where patients are not present, and at least five (5) feet from patients or visitors in ambulatory or general public settings, when approved by Owner.
   10. When an anteroom is required for a dust proof enclosure, all personnel must pass thru the anteroom before leaving the work site and they shall vacuum debris from their person using a HEPA vacuum cleaner or they shall wear cloth or paper coveralls that are removed within the anteroom each time they leave the work site. Anterooms shall be negatively pressurized the same as the associated dust proof enclosures.
   11. All construction personnel and material suppliers entering a dust proof enclosure at a “High Risk Activity” work site in a “Highest Risk Area” shall wear shoe covers. Shoe covers must be changed each time the person exits the work site.
12. Dust proof enclosures shall be removed only after receiving Owner’s written approval of the Project site air quality. Remove dust proof enclosure materials carefully to minimize spreading of dirt and debris associated with the Work.
   a. Mini-enclosures shall be cleaned inside prior to dismantling, to prevent dust from escaping into occupied areas.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. The Section further describes basic Contract definitions, specification format and content explanations, and industry standards in the Contract Documents.

1.2 DEFINITIONS

A. Accepted: The term “accepted” is used in conjunction with the A/E’s duties and responsibilities as stated in the conditions of the Contract.

B. Concealed: Spaces out-of-sight such as above ceilings, below floors, between double walls, furred-in areas, pipe and duct shafts, and similar spaces.

C. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the A/E, requested by the A/E, and similar phrases.

D. Exposed: Open to view. For example, pipe installed in a walkway tunnel or pipe installed in a room and not covered by other construction.

E. Furnish: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar subsequent requirements.

F. Indicated: The term “indicated” refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference.

G. Install: Operations at Project site to place in position for service or use including unloading, unpacking, assembly, erection, placing, anchoring, applying, working-to-dimension, finishing, curing, protection, cleaning, and similar requirements.

H. Installer: An installer is the contractor or another entity engaged by the Contractor, either as an employee, Subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers shall be experienced in the operations they are engaged to perform.

I. Project site: Is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built. Certain construction activities may extend beyond the Project site.

J. Provide: Furnish and install, complete and ready for intended use.

K. Regulations: The term “regulations” includes laws, codes, ordinances, statutes, and lawful orders issued by authorities having jurisdiction (AHJ), as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

L. Trades: Using terms such as carpentry does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as
1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into divisions and sections based on the Construction Specification Institute’s (CSI) MasterFormat.

1. Title: The Specifications are divided into division and section for the convenience of writing and using. The titles of these are not intended to imply a particular meaning or to fully describe the work of each division, subdivision, or section and are not an integral part of the text which specifies the requirements.

2. Three Part Section: Each section of Specifications has been subdivided into three parts for uniformity and convenience (Part 1 – GENERAL, Part 2 - PRODUCTS, and Part 3 - EXECUTION). These do not imply a particular meaning and are not an integral part of the text which specifies requirements. Where text for one of the parts is lacking due to project requirements, the part title is included followed by the words "Not Used."

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B. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. The conventions are explained as follows:

1. Abbreviated language: Abbreviated words and meanings used in the Contract Documents shall be interpreted as appropriate. Words implied, but not stated, shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicate.

2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarify to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

a. The words ‘shall be’ are implied wherever a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: All construction shall be in accordance with industry standards. Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the industry standards in effect as of the Bid date of the Contract Documents.

C. Conflicting Requirements: Where compliance with two (2) or more standards are specified and where the standards may establish, different or conflicting requirements for minimum
quantities or quality levels, the Contractor shall promptly report to the A/E, in writing, requesting a decision before proceeding with the Work.

1. Minimum quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum, within reasonable limits, to comply with these requirements. Indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements.

D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound within the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Acronyms or abbreviations, as referenced in Contract Documents are defined to mean the recognized name of the trade association. Names and addresses are subject to change and are believed, but not assured, to be accurate and up-to-date as of the date of the Contract Documents. Refer to the latest edition of the “Encyclopedia of Associations” published by Thomson Gale for a listing of associations and general standards abbreviations.

F. Federal Government Agencies: Names and titles of federal government standard - or Specification -producing agencies are often abbreviated. Acronyms or abbreviations referenced in the Contract Documents may indicate names of standard - or Specification-producing agencies of the federal government. Names are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. General Requirements: Comply with the quality control provisions specified in the Contract Documents and perform quality control testing and inspection, and the surveillance of the Work for quality, unless specifically designated to be performed by Owner.

B. Owner’s forms referenced in this Section include (see Appendix A):
   1. Contractor Quality Control Daily Report

C. Contractor Quality Control (CQC) shall consist of plans, procedures, and organization necessary to provide materials, equipment, workmanship, fabrication, construction, and operations that comply with the requirements of the Contract Documents. CQC shall cover construction operations keyed to the Progress Schedule including, but not limited to, fabrication on-site and off-site, and field and factory tested construction mock-ups.

D. Owner’s special inspection and Testing Agency services are specified in Section 01 45 23 "Testing and Inspecting Services" which may be required to ensure the Work is in accordance with the Contract Documents, except where those tests are specifically indicated to be performed by the Contractor in the Contract Documents. These services do not relieve the Contractor of responsibility for compliance with Contract Documents requirements.

1.2 CQC MEETINGS

A. General Work Plan Meeting: Contractor shall meet with Owner’s Representative and A/E to discuss CQC procedures for the Project. Items for discussion shall include, but not be limited to:
   1. Identification of the Contractor’s CQC Representative;
   2. Interrelationship of Contractor, AE and Owner’s Representative;
   3. CQC administrative procedures and pre-installation work plans;
   4. Submittals and persons responsible for Shop Drawing review;
   5. Forms for recording the CQC program;
   6. Testing, inspections and approvals records;
   7. On-site and off-site fabrication and installation procedures; and
   8. Field constructed mock-ups.

B. Pre-installation CQC Work Plan Meetings: Develop a “CQC Work Plan” for each definable feature of the Work. Complete the work plan and submit to Owner with each notification requesting a pre-installation meeting. The work plan shall serve as the basis for discussion and review of the Contract Documents requirements. The work plan will assist to assure that materials and equipment delivered and assembled for construction conform to Contract requirements, and that control testing and CQC procedures are documented.
   1. When requested by the Owner, the Contractor shall revise a CQC Work Plan and provide the Owner a final CQC work plan with changes addressing comments or clarifications from the A/E and/or Owner’s special inspection services or Commissioning Authority.

1.3 CONTRACTOR QUALITY CONTROL REQUIREMENTS

A. Contractor’s Quality Control Organization: Staff the CQC organization, as required, to perform the activities outlined in this Section and elsewhere in the Contract Documents.
   1. Identify a dedicated full-time “CQC Representative” who shall be on the Project site at all times during progress of the Work, and as appropriate for all work subsequent to
Substantial Completion. The CQC Representative shall have complete authority to take those actions necessary to ensure compliance with the Contract Documents.

2. Identify persons responsible for review and approval of Shop Drawings and other submittals required by the Contract Documents.

B. Qualifications of CQC Representative: The Contractor shall propose and Owner shall approve, in writing, the Contractor’s CQC Representative. The CQC Representative must have construction management experience including prior experience with projects of similar construction, size, and complexity.

1. During progress of the Work, the Owner will monitor and evaluate the performance of the CQC Representative based on the conformance of the Work with the Contract Documents and an assessment of the accuracy, timeliness and completeness of the daily QC Report. If the CQC Representative fails to perform to the sole satisfaction of the Owner, the Contractor shall propose a replacement CQC Representative for the Owner’s approval.

C. Daily Quality Control Reports: CQC Representative shall maintain daily Quality Control (QC) Reports. The QC Reports shall be factual records containing numerical data of the Work and quality control activities and observations, including examination of work areas to verify the substrate upon which new work is to be placed. Submit QC Reports on Owner’s form, or another Owner approved form, by the next workday following the day of the report.

1. CQC Representative shall verify and sign all reports. Verification shall contain the statement that all supplies and materials incorporated in the Work are in compliance with the Contract Documents.

D. Control of On-Site and Off-Site Construction: Contractor's Quality Control procedures shall include the following phases of control and management for each definable feature of the Work:

1. Pre-installation Meeting: A pre-installation meeting shall be held prior to beginning work on each definable feature of the Work specified in the Contract Documents (see Section 01 31 19 “Project Meetings”).

2. In-Progress Inspection Phase: In-progress quality control testing and inspection, and surveillance of the Work for quality shall be performed continuously to verify that quality standards are maintained throughout the Work. Adjustment to quality control procedures and CQC work plans may be required, based upon the results of the inspections and testing.

a. The Contractor shall:
   1) Discuss quality control procedures at construction progress meetings;
   2) Report the results of the inspections and any changes to quality control procedures in the daily QC Report; and
   3) Revise CQC work plans for Owner’s records, if changes are required.

3. Above-Ceiling Final Inspections: The Contractor shall provide to the Owner a minimum two (2) week notice prior to ceiling installations for the A/E to conduct above-ceiling final inspections.

a. The Contractor shall perform corrective work and provide reasonable time for the A/E to validate the work complete prior to covering from sight.

4. Contractor’s Final Punch List Report: The CQC Representative shall thoroughly inspect all aspects of the construction (including the Subcontractor’s Work) and produce a final punch list report of work requiring correction and/or incomplete work that shall be issued to the Subcontractors with instructions to complete prior to requesting the Owner’s final inspections. The Contractor’s written request for Owner’s final inspection shall certify that all features of the Work are installed and have been reviewed by the Contractor to determine compliance with the Contract Documents.
a. The Contractor’s final punch list report shall be prepared by the Contractor utilizing the Owner’s internet-based construction management system (CMS), in a format acceptable to the Owner.

1) The report shall include a comprehensive Project room number list and additional entry listings for site work, building enclosure, roofs, and other items not designated with a room number to document the entire Project.

2) The Owner’s final inspections items will be added to the Contractors final punch list report by the A/E.

3) The Owner will manage the consolidated listing of all open inspection items until all items are signed-off by the Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. General Requirements: Comply with the testing and inspection, and correction of Non-Conforming Work provisions specified in this Section and elsewhere in the Contract Documents.

B. Owner’s Responsibilities:
   1. The Owner will select and employ an independent “Testing Agency” to conduct the tests and inspections in accordance with applicable standard methods of the American Society for Testing and Materials (ASTM) or other standards as a requirement of the building permit.
   2. The Owner may provide other special inspection services to inspect and verify that the Work installed is in accordance with the Contract Documents and construction industry standards.

C. Contractor's Responsibilities:
   1. All other tests and inspections which are required to obtain regulatory approval by Authorities Having Jurisdiction (AHJ) shall be provided by and paid for by the Contractor.
   2. The Contractor shall provide other testing services where specified in the Contract Documents.

1.2 DESCRIPTION

A. Definition: For the purpose of this Section, all references made to Testing Agency, or waterproofing and roofing inspections, or geotechnical consulting firm shall be referred to as those tests or inspections which will be conducted by an inspector provided by the Owner.

B. Testing and Inspection: Materials to be tested and inspected are specified by the Contract Documents. In addition, testing and inspection of other materials maybe required by the building permit or as directed by the Owner or AHJ. Quantities and extent of tests and inspections shall be as specified and/or required by the Owner’s inspector or AHJ.

1.3 QUALITY ASSURANCE

A. Qualifications: The inspector for all work of this Section, except for geotechnical and waterproofing and roofing special inspectors, shall be a registered inspector employed by an approved inspection and/or Testing Agency as listed by the Washington Association of Building Officials (WABO) Special Inspection Registration Program. All inspection personnel used on this Project are subject to being disapproved from the Project at the sole discretion of the Owner's Representative. Minimum levels of qualifications as stated in the WABO Special Inspection Registration Program for various portions of the required Testing Agency inspections and testing must be complied with.
   1. The special Inspector for waterproofing and roofing must have the required technical knowledge and experience for the product being installed.
   2. The Owner may select a Testing Agency, other than the agency employed by the Contractor, to perform tests required by the building permit.
   3. Geotechnical inspection will be performed by a licensed geotechnical consulting firm.
1.4 DUTIES OF OWNER’S TESTING AGENCY

A. General: The Testing Agency shall conduct testing and inspection services, interpret them, evaluate the results for compliance with the building permit and the Contract Documents, and report the findings to the Owner’s Representative, A/E, Contractor, and AHJ. Testing and inspection services shall be in accordance with applicable standard methods of ASTM or other standards specified by AHJ, the Contract Documents, and construction industry standards. The Testing Agency shall reasonably support overtime, second shift, and out-of-area activity if requested by the Contractor and approved at the Owner’s sole discretion.

B. Non-Conforming Work: The Owner’s inspectors will document and immediately notify the Contractor and the Owner’s Representative of any Work found defective or not in accordance with the requirements of the Contract Documents.

C. The Owner’s inspectors are not authorized to:
   1. Release, revoke, alter, or enlarge on the requirements of Contract Documents;
   2. Approve or accept any portion of the Work, except as allowed by the special inspection duties delegated by AHJ for building permit inspections and testing;
   3. Perform any duties of the Contractor; or
   4. Stop the Work.

1.5 COSTS

A. The Owner’s Testing Agency and special Inspector costs for initial testing and inspection as specified in the Contract Documents will be paid for by the Owner. Initial tests and inspections are defined as those required to complete the first tests and inspections specified.

B. Additional tests and inspections not specified but requested by the Owner or A/E shall be paid for by the Owner.
   1. However, if the results of such tests and inspections are found to be not in accordance with the Contract Documents, the Contractor will be back-charged for all costs of this testing and inspection as well as re-testing, re-inspection and Owner's consultants' services.

C. Costs for additional tests or inspections required because of a Contractor change in products or materials, or source, after a submittal has been reviewed and accepted, shall be borne by the Contractor.

D. Costs of any testing which is required solely for the convenience of the Contractor in its scheduling and performance of the Work shall be borne by the Contractor.

E. Costs for verification testing and inspection of Work done without timely notice, with improper supervision, or contrary to construction practice, shall be borne by the Contractor.

F. Costs for testing of materials for which fabrication and mill reports are required, but not furnished, shall be borne by the Contractor.

G. Costs of any testing which is the responsibility of the Contractor as specified in the Contract Documents shall be borne by the Contractor.

1.6 TESTS AND INSPECTION REPORTS

A. Copies of Test and Inspection Reports: Electronic copies of Owner’s Testing Agency (or other special inspection services) reports and Contractor’s test and inspection reports shall be
exchanged between Owner and Contractor at weekly intervals and shall be provided to AHJ as required. All reports will be signed by a registered engineer. Such reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested and records of special sampling operations that are required shall also be reported.

1. Submit copies of inspection reports, certifications, notices, correspondence, and similar documents and records established in conjunction with building industry standards bearing upon the Work.

1.7 CONTRACTOR’S RESPONSIBILITIES

A. General: Inspection of the Work by the Owner’s special inspectors and/or Testing Agency shall not relieve the Contractor from responsibility for compliance with Contract Documents requirements. Owner’s special inspectors and/or Testing Agency and Owner’s Representative shall have authority to reject Work whenever the provisions of the Contract Documents are not being complied with, and the Contractor shall instruct his employees accordingly.

B. Coordination: The Contractor’s shall initiate, coordinate, and conform to the required tests and inspections of AHJ.

C. Access for the Purpose of Inspection: The Contractor shall ensure the Owner’s special inspectors and/or Testing Agency have free access to all parts of the Work and to the shops where the Work is in preparation; are provided proper facilities for safe access for such inspection; and are reasonably furnished equipment, tools, samples, certifications, test reports, design mixes, storage, and assistance as requested by the Owner’s Inspector.

D. Storage Facilities: The Contractor shall furnish adequate facilities for the sole use of the Owner’s Testing Agency to provide safe storage and curing space for test specimens that must remain on-site prior to transport to the laboratory.

E. Data: The Contractor shall furnish accepted submittals and approved Change Orders, certificates, and similar data as may be required by Owner’s inspectors to perform their work to assure compliance with the Contract Documents.

F. Notice: Furnish notice to Owner's Representative and coordinate with Owner’s inspectors. Provide a minimum of five (5) working days notice in advance of all required tests and a minimum of forty eight (48) hours in advance of all required inspections, unless otherwise specified.

G. Cancellations: Contractor shall give sufficient advance notice to Owner’s Representative and Inspectors to allow rescheduling of their work load in the event of cancellation or time extension of any scheduled test or inspection.

1. Any charges from an Inspector due to insufficient advance notice of cancellations or time extensions shall be borne by the Contractor, at the Owner's sole discretion.

1.8 TEST FAILURES

A. General: The Owner's Representative may require a re-test of a sampled material when a sample or procedure has failed to pass the required tests. In such cases, two samples shall be tested and the material shall be rejected if either sample fails.

1. In the event any test or inspection indicates failure of a material or procedure to meet the requirements of the Contract Documents, all costs for re-testing or re-inspection shall be borne by the Contractor.
1.9 REPORTING TEST FAILURES

A. General: Immediately upon determination of a test failure, the Owner’s inspector shall telephone the test results to the Owner’s Representative and Contractor. By the end of the following day, the Owner’s inspector shall send written test results to those named on the distribution list.

B. Contractor shall similarly report test failures to Owner’s Representative resulting from work of testing agencies provided by the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Minimum temporary facilities and controls requirements are specified in this Section. Nothing in this Section is intended to limit the types and amounts of necessary temporary facilities required to perform the Work, and no omission from this Section will be recognized as an indication that a necessary temporary facility is not required for successful completion of the Project, and compliance with the requirements of the Contract Documents and all applicable codes.

B. Included in this Section are the following headings:
   1. Product Delivery, Storage and Handling
   2. Project Site - Work Area
   3. Protection of Existing Utilities
   4. Shutdowns of Existing Equipment and Utility Services
   5. Temporary Support Facilities
   6. Temporary Enclosures and Miscellaneous Construction
   7. Noise and Vibration Control
   8. Construction Parking and Staging
   9. Construction Traffic

C. Owner's forms referenced in this Section include (see Appendix A):
   1. UW or HMC Utility Shutdown Request form, as appropriate.

D. Behavior:
   1. The Owner will not tolerate inappropriate behavior by any worker on a jobsite toward a student, staff, patient, visitor, neighbor or employee.
   2. The Contractor shall not allow obscene, offensive or otherwise inappropriate material to be displayed at the Project site, or at remote construction staging and parking areas, including job offices and trailers. If such material is displayed, it shall be immediately removed by the Contractor and/or when requested by the Owner's Representative.
   3. Gratuities to Owner's employees by a Contractor are not allowed per Washington Administrative Code, Chapter 42.52 RCW.

E. Conservation: The Contractor shall install and operate temporary facilities and perform construction activities in a manner which reasonably will be conservative and avoids waste of energy and materials, including water.

F. Pest Control: The Contractor shall rid the Project site of rodents, birds, insects, and other pests which may have entered buildings under construction as a result of the work.

G. Pollution Control: The Contractor shall perform the Work so as to prevent water, soil, and air pollution.
   1. The Contractor shall not discharge volatile, harmful, or dangerous materials into the Owner's sanitary sewer and storm water drainage systems.
      a. Non-storm water discharge into the Owner's storm water system is prohibited, including the following types of discharge, unless the stated conditions are met:
         1) Discharges of potable water for, but not limited to, water line flushing, hyper-chlorinated water line flushing, fire hydrant system flushing, and hydrostatic test water must be de-chlorinated to a concentration of 0.1 parts per million or less, pH-adjusted if necessary, and volumetrically and velocity controlled to prevent re-suspension of sediments in the storm water system.
      b. Street sweeping must be performed prior to washing the street at construction sites.
2. The Contractor shall not cause or allow visible emissions of fugitive dust from the construction site, unless reasonable precautions are employed to minimize the emissions. Reasonable precautions include, but are not limited to, the following:
   a. During high winds, the use of control equipment and/or enclosures, the reduction of construction vehicle speeds, and the curtailment of all dust creating construction procedures shall be implemented.
   b. When demolition, excavation, and construction activities generate dust, the construction site shall be sprinkled with water or chemical stabilizers to minimize dispersion.
   c. Truck under-carriages shall be brushed to minimize the transporting of dirt off construction sites.
   d. Truckloads shall be covered, wetted, or allowed adequate freeboard to prevent the escape of dust-bearing materials.

H. Silica Dust Control: The Contractor shall use best engineering and work practice controls to reduce exposure to silica dust at or below the Washington State Permissible Exposure Limit defined in the latest regulations from the Washington State Department of Labor and Industries (L&I), Puget Sound Clean Air Agency (PSCAA) and any other applicable federal, state, and local government regulations.
   1. The Contractor shall assume that silica is present in all concrete, mortar, terrazzo flooring, plaster, sheetrock, fireproofing and other related building products.
   2. The Contractor shall implement controls to contain and clean-up silica dust generated by cutting and demolition work and shall provide worker and equipment decontamination provisions. At no time is silica dust from the construction permitted beyond the “work area.”
      a. The Contractor shall conduct air sampling for respirable crystalline silica in accordance with the National Institute for Occupational Safety and Health (NIOSH) method 7500.

1.2 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle specified products in accordance with the manufacturer’s recommendations and use means and methods that will prevent damage, including, but not limited to, moisture damage of materials, deterioration, and loss or theft.
   1. Store materials and products off the ground and protect from weather.

B. Furnish products in the manufacturer’s original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

C. Include a waste reduction provision in purchasing agreements requiring that materials and equipment be delivered in packaging made of recyclable material, that the amount of packaging be minimized, and that packaging be taken back for reuse or recycling.
   1. The Contractor shall require the same provisions in its Subcontractor’s purchasing agreements.

D. Inspect products upon delivery to ensure compliance with Contract Documents, and to ensure that products are dry and mold free, undamaged, and properly protected.

E. Store products at the Project site in a manner that will facilitate inspection and measurement of quantity or counting of units.
F. Store heavy products away from the Project structure in a manner that will not endanger the supporting construction.

G. Protect building products subject to damage, under cover in a clean and weather-tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer’s instructions.

H. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
   1. Ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

1.3 PROJECT SITE - WORK AREA

A. Confine operations, equipment, and storage to the designated work area.
   1. Maintain the Project site, including adjacent areas and properties, in a clean and orderly manner free from accumulations of combustible materials and construction waste, including rubbish and debris resulting from construction operations. Clean indoor work areas daily of construction waste, dirt, and dust. Do not store construction materials and equipment in Owner-occupied areas unless approved by the Owner. Immediately clean up any spilled material and/or fugitive construction spoils or debris from adjacent properties and vehicle travel ways. Keep streets, fire lanes, and walks clean and free from obstructions.
   2. Mechanical rooms shall not be used for construction storage, unless approved by Owner.
   3. All masonry cutting is to be done outdoors. Cut stations for all other work shall be located outdoors or within well ventilated dustproof enclosures or other approved containment.

B. Security:
   1. General:
      a. Protect work and stored products from theft and vandalism and protect premises from entry by unauthorized persons. At the end of workday, close temporary enclosures and lock exterior doors and/or gate. Secure all openings at any time the Project site is left unoccupied.
      b. Owner’s Keys: Owner’s Representative will issue keys, as required, for the Contractor to perform the Work. Prior to Substantial Completion, the Contractor will return all issued keys. Contractor’s responsibility shall include, but not be limited to, the following:
         1) Arrange for the issuance of access keys on a daily basis, or as mutually agreed with Owner.
            a) Owner’s costs associated with re-keying a system, including an entire tunnel system, due to lost keys shall be the responsibility of the Contractor.
         2) Lock all access doors when not attended and at the end of each shift.
         3) Provide security barriers, acceptable to Owner, at all utility openings which are created by the removal of gratings and/or the opening of utility tunnels or shafts.
         4) Coordinate Work to minimize need for access to restricted areas.
      c. Many buildings and spaces on Campus are high security areas, such as building mechanical and electrical equipment rooms, certain lab spaces, and computer facilities. Contractor shall use due care to maintain an equivalent level of security of Owner’s property, where appropriate, and as it normally exists (i.e., secure areas when not actively working). Normally locked or closed doors shall not be propped open.
d. Contractor is advised to lock its gang boxes and secure them to the construction. Owner will not reimburse Contractor for any lost or stolen tools, material or equipment.

2. Tunnel System: Owner maintains rigid controls for persons entering the Owner’s tunnel systems. All tunnel doors and certain utility access gratings are equipped with special security locks. The remaining utility access gratings are secured by tack welding.

3. Criminal Background Checks: All construction personnel working in medical centers shall be subject to criminal background checks in accordance with Washington Administrative Code, RCW 43.43.830, et seq.
   a. On the first day of work, each worker shall fill out a Washington State Patrol Request for Criminal History Information form and a Request for Criminal History Record form and submit them to the Contractor’s superintendent who shall submit the collected forms to the Owner’s Representative.
   b. The Owner will request the background check from the Washington State Patrol.
   c. A worker may be conditionally employed on the Project pending results of the criminal background inquiry.
   d. Any worker who does not pass the criminal background check will not be permitted to work on the Project and the Contractor shall immediately remove, or cause the worker to be removed, from the Project.

4. Photo Identification Badges: The Owner requires that all construction personnel working within the Owner’s existing facilities obtain photo identification badges. The badge shall be worn above the waist with the photo visible at all times that the worker is on-site within the Owner’s existing facilities.
   a. On the first day of work, the worker shall complete and submit to the Owner a badge application form(s) provided by the Owner’s Representative, and schedule a time and location with the Owner’s Representative to obtain a badge.
   b. The Contractor shall return the badge to the Owner’s Representative at completion of each worker’s on-site work as a requirement of Final Completion.

C. Construction Waste: Remove construction collected materials from the Project site at a frequency acceptable to the Owner and dispose of in a lawful manner. Do not burn waste material, stockpile waste material, or bury waste material on Owner’s property. Do not use Owner’s waste containers for construction waste of any kind, unless approved by Owner. Dispose of all refuse and waste material, including excess earth from excavation, off of Owner's property.
   1. See Section 01 74 00 “Construction Waste Management” and, when specified, Section 01 11 01 “Summary of Work – Regulated Materials” for additional requirements.

D. Odor Control:
   1. General: Adjacent Owner areas and/or neighboring buildings may be occupied during construction. The use of solvents and materials producing noxious fumes or any product or equipment that adversely impacts air quality shall be subject to the approval of Owner. Isolate odor-causing work away from building air intakes, private properties and pedestrian traffic areas. Where solvents are used within enclosed structures, vent to outside areas.
   2. Emissions Control Plan: The Contractor shall submit a written procedure for control of emissions prior to any use.
      a. The plan shall at a minimum consist of the following items:
         1) Products to be used/Material Safety Data Sheets
         2) Location of Work
         3) Application
         4) Ventilation plan
         5) Hours of operation
         6) Materials handling/storage
      b. Considerations shall include, but are not limited to:
1. Concrete curing
2. Roofing and waterproofing
3. Welding
4. Exterior painting
5. Adhesive and/or stripping or paint removal
6. Asbestos abatement
7. Soil remediation

3. Equipment and trucks producing fumes shall not be parked or located in the vicinity of building air intakes, entrances, and operable windows, unless approved by the Owner.
   a. Trucks that are idling for more than a few minutes shall shut off their engines. If trucks are queued and idling, there must be at least 20 feet between each truck or the exhaust shall be piped to have a 20-foot separation between each exhaust.
   b. All diesel-powered construction equipment shall utilize ultra-low sulfur diesel fuel.
   c. All diesel-powered construction equipment and trucks must be: 2007 model year or later (for vehicles); or Tier II heavy duty (for stationary engines); or equipped with 3-CARB verified oxidation catalyst-based particulate emissions control devices, operating at 600 degrees F or above.

E. Smoking: The University of Washington and Harborview Medical Center have restricted smoking policies. The Contractor shall not permit its employees or the employees of its Subcontractors of any tier to smoke on the Owner’s property, except in the areas indicated below:
   1. Smoking is permitted on University of Washington campuses where shown on maps: [http://www.ehs.washington.edu/psosmoking/index.shtm](http://www.ehs.washington.edu/psosmoking/index.shtm)
   2. For the Harborview Medical Center: Contact Owner’s Representative for information.
   3. If the Project site includes a fenced construction area, the Contractor shall establish an outside area, within the fenced area, where its employees and the employees of its Subcontractors may smoke, provided that the area is in compliance with the requirements of Chapter 70.160 RCW. The Contractor shall communicate the location of the permitted smoking area to its employees and Subcontractors, and shall require Subcontractors (of any tier) to communicate the location of the smoking area to its employees.

1.4 PROTECTION OF EXISTING UTILITIES

A. The existing concealed utilities shown on the Drawings are not necessarily exact with respect to location or completeness. Therefore, the Contractor shall take the following steps:
   1. Notify Owner in writing, with a minimum two (2) week notice for each occasion, of the intent to work near existing known underground utility services or structures or when a new excavation operation is about to begin. Submit procedure for approval to assure safe and continuous operation of the services.
   2. Proceed with sufficient caution to preclude damaging any known utilities (i.e., hand digging or probing). In the event unidentified utilities are encountered, notify Owner’s Representative immediately.
   3. In the event utilities are damaged during construction, temporary services and/or repairs must be made immediately to maintain continuity of services.
      a. Utilities installed by the Contractor, and damaged by the Contractor, shall be repaired at the Contractor’s sole expense.

1.5 SHUTDOWNs OF EXISTING EQUIPMENT AND UTILITY SERVICES

A. It is generally critical that all building systems remain operational within occupied buildings, except for brief shutdowns that might be required to integrate or connect new Work. Similarly, continuity of equipment and utility services to adjacent buildings and Owner’s site infrastructure shall also be reasonably maintained at all times.
B. Equipment or utility shutdowns required to facilitate the Work shall be accomplished in accordance with the following requirements:
   1. Submit a schedule of equipment and utility shutdowns (see Section 01 32 16 "Construction Progress Schedule").
   2. Submit a Utility Shutdown Request form to schedule all equipment and utility shutdowns not less than fourteen (14) days prior to the proposed date. Include, as a minimum, the following information:
      a. Equipment or utility services affected
      b. Reason shutdown is required
      c. Work to be accomplished during the shutdown
      d. Proposed date and time
      e. Duration of the shutdown
      f. Proposed method of providing back-up service during shut down
   3. The actual time and date of all shutdowns will be subject to approval of Owner. Shutdowns normally will be scheduled for nights, weekends, school vacations or other low intensity use periods.
   4. The duration of all shutdowns shall be held to a reasonable minimum as determined by Owner.
   5. Materials and equipment required for the Work to be accomplished during shutdown shall be complete and available on the job for review by Owner three days prior to the shutdown, if requested. If Contractor is not adequately prepared, the shutdown will be canceled and rescheduled.
   6. ONLY OWNER'S PERSONNEL WILL SHUT DOWN AND RESTART OWNER'S EQUIPMENT AND UTILITIES. Owner will inspect the installation prior to restarting and will not restart if an unsafe condition exists. In the event Contractor's Work is not completed during the time scheduled for the shutdown, Owner may elect to restart the equipment or utility service. In that event, additional shutdown requirements shall be rescheduled in accordance with the preceding requirements. Restarting shall not be construed as acceptance of the Work as complete.
   7. Include in the bid all costs associated with equipment and utility shutdowns. Owner will make no extra payment for overtime work, schedule changes or failure to complete utility connections within authorized shutdown periods.

C. For building electrical shutdowns involving de-energization of equipment on the campus high-voltage distribution system, including main breakers for a given building, the following enhancements to the requirements listed above apply. The Owner's Representative will determine which shutdowns proposed by the Contractor require such enhancement.
   1. A minimum of 6 weeks before the proposed shutdown, the Contractor shall submit a Proposed Shutdown Plan to the Owner's Representative. This Shutdown Plan shall include the following information:
      a. A description of Contractor tasks and safety measures (such as lock-out/tag-out), necessary to install or otherwise create the project improvements. Include specific names of devices to be switched and a complete list of equipment to be de-energized.
      b. Inspections by the engineer of record, the high voltage shop, and/or the authority having jurisdiction, as applicable. Indicate what inspections are requested and where in the sequence of work they occur.
      c. Proposed dates(s) and time(s) with duration(s) of the shutdown. Alternate dates may be proposed but the earliest of the proposed dates shall be no sooner than 6 weeks from the date of submittal of the Shutdown Plan.
      d. A draft “UTILITY SHUTDOWN REQUEST” on the standard form in Appendix A.
   2. At the Owner’s request, participate in a meeting with the Owner’s Representative and the University’s High Voltage Shop to explain and discuss the Proposed Shutdown Plan. This meeting shall occur at the time of plan submittal or within 2 business days of plan submittal. Insofar as the Shutdown Plan would necessitate tasks to be performed by the
High Voltage Shop, the University’s high voltage electricians will use the information as an aid in formulating their approach to the actual switching, and in determining the level of effort and feasibility of the schedule and shutdown in general.

3. At the Owner’s request, check/verify that plans by the University’s zone electricians and others to mitigate building impacts are coordinated with, and safely support, the proposed construction activities.

4. If the Proposed Shutdown Plan is approved or approved with conditions, proceed as follows in paragraph 5. If rejected, work with the Owner’s Representative to reschedule the shutdown.

5. A minimum of 2 weeks before the proposed shutdown, review status with the Owner’s Representative and submit the final UTILITY SHUTDOWN REQUEST. If deemed necessary by the Owner’s Representative, also submit a final Shutdown Plan. These documents shall include, at a minimum, the following information:
   a. The final proposed date, time and duration of the shutdown.
   b. Responses to any conditions imposed on the shutdown by the University’s review and approval process.
   c. Any Contractor-proposed changes to the original (draft) plan.

1.6 TEMPORARY SUPPORT FACILITIES

A. Temporary support facilities include: construction power and lighting and heating and water, toilet and hand washing facilities, mobile communications, cranes and hoists, field offices, and field office communications; and similar miscellaneous facilities (i.e., storage sheds, first aid facilities, clean-up facilities, fire protection, waste disposal) as may be reasonably required for proficient performance of the Work and accommodation of personnel at the Project site, including Owner’s and A/E’s personnel. Locate temporary support facilities for convenience of users, and for minimum interference with construction activities. Placement of all temporary support facilities shall be subject to review and approval by the Owner’s Representative.

1. Do not block Owner's access to adjoining buildings and occupied spaces through the use of temporary support facilities.

2. Keep temporary support facilities clean and neat in appearance and do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on the site. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload temporary facilities or permit them to interfere with progress.

3. Erection and dismantling of cranes shall occur only on weekends, unless otherwise approved in writing by the Owner.

B. Remove all temporary support facilities including, but not limited to, power and water infrastructure, hoist foundations, and communications cabling and pathway, unless indicated otherwise in the Contract Documents. Restore the Project site to original or new conditions, patching and filling as required to match adjacent surfaces.

C. All connections to Owner utilities must be made in accordance with 1.5 of this Section, “Shutdowns of Existing Equipment and Utility Services.”

1. Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of the permanent service.

D. Electrical Power and Service: Contractor shall pay for, provide, and install all necessary Owner-approved temporary equipment required for use of the Owner’s electrical power for minor renovations and/or alterations construction work within the Project site of an Owner-occupied facility. Temporary equipment shall be installed and maintained in accordance with all applicable safety regulations and the Owner’s requirements.
1. Electrical power for the operation of small tools and equipment required for work outside of the Project site will be provided by the Owner as reasonably available from approved existing sources.

E. Lighting: Provide and maintain LED (light-emitting diode) type construction lighting to provide adequate general illumination of the work area and trade task lighting. Shield construction lighting from adjacent residential areas.

F. Heating and Ventilation: Provide temporary heat as required to protect materials and equipment from dampness, cold, and mold growth. Method of heating is subject to approval of Owner’s Representative. Fuel fired “salamander type” heaters are not permitted, unless approved by Owner.

1. Owner’s HVAC system shall not be utilized for construction in the UW Medical Center. Supply and return–air grills shall be completely sealed-off within the Project site.

2. New building HVAC systems shall not be operated or used for construction until such time the Contractor has submitted the Contractor’s final punch list report, unless otherwise approved by Owner.

3. Renovations of Owner’s facilities may utilize existing ducted ventilation supply diffusers but shall not utilize exhaust systems, including return-air grills or fans. Un-ducted plenums over a construction work area must have all ceiling tiles in place, unless otherwise indicated in the Contract Documents or approved by the Owner.

   a. If Owner’s HVAC system is utilized for construction, the Contractor shall:

      1) Protect the HVAC system from construction dust contamination and provide cleaning of the components exposed to contamination prior to Owner’s occupancy.

      2) Install filter media having a minimum efficiency reporting value of 8 (MERV 8) according to the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 52.2-1999 at each supply and return-air grill used during construction.

      3) Replace Owner’s filtration on any return air fan system with a minimum 85% filtration media (as determined by ASHRAE 52.1-1992) prior to Substantial Completion.

G. Water: For construction purposes, will be furnished by Owner.

1. Contractor shall pay all costs of temporary piping, including pressure reducing station, double backflow preventer, removal of piping and restoration of Owner’s utilities at the completion of the Work. Piping of temporary water service shall not exceed the capacity of the Owner’s system and shall be limited to 1-1/2” pipe size.

2. Contractor shall provide drinking water from a proven safe source for all those connected with the Work.

   a. The Owner’s “potable” water drinking facilities may be used, if available and approved by Owner.

H. Toilet and Hand Washing Facilities:

1. The Owner’s toilet facilities may be used provided they remain in a clean condition, as approved by Owner.

2. Contractor shall provide alcohol hand sanitizers or hand gel dispensers for workers in medical centers, if restrooms and/or similar hand washing facilities are not available within the Project site.

I. Elevators: Use of Owner’s elevators is subject to approval of the Owner, unless indicated for construction use in the Contract Documents.

1. Use requires temporary protection and, if indicated in the Contract Documents, restricted hours of use apply.
J. Mobile Communications: The Contractor shall provide cellular phones with e-mail capability for its key on-site personnel.

1.7 TEMPORARY ENCLOSURES AND MISCELLANEOUS CONSTRUCTION

A. Temporary enclosures include, but not by way of limitation, fire-rated barriers, dustproof enclosures, and site fences to protect the Work and to provide for public protection as required by law and ordinance.

1. Provide one-hour fire-rated barriers of gypsum sheetrock and metal studs with taped joints where shown on the Drawings or when removing and/or compromising existing fire safety partitions indicated on the Drawings, such as corridor walls and/or occupancy separations, to completely isolate the construction area from other occupied building areas. Remove and repair finishes to match existing at completion of Work.
   a. Fire Safety during construction, alteration, or demolition must be provided as indicated by the current edition of the International Fire Code with local amendments and applicable rules. Combustible materials are not permitted to be used as barriers.

2. Provide dustproof enclosures within occupied buildings to enclose the entire work area and completely isolate it from surrounding areas, unless otherwise approved by Owner. At a minimum, construct dustproof enclosures on metal studs from one layer of: 5/8 inch gypsum sheetrock; 1/4 inch fire retardant low VOC (volatile organic compounds) shiny surface materials (such as melamine); 6-mil fire retardant plastic sheathing; or 4-mil fire retardant polypropylene. Tape all joints smoke tight and continuously seal all connection points to existing construction utilizing painters tape for existing surfaces to be retained, melamine tape for melamine enclosures, and duct tape for existing surfaces not to be retained. Enclosures must extend above ceilings to the structure above except when the entire work area ceiling is completely sealed from the above ceiling space, in which case, the seal may occur at the ceiling. If the Contractor employs a combination of temporary enclosures and existing construction to enclose the work area, the Contractor shall seal any penetrations found in the existing construction, including supply and exhaust HVAC duct grills that shall be blocked off and sealed shut.
   a. All existing finishes damaged by construction are to be repaired to their original condition and ceiling tiles damaged by the Contractor are to be replaced with equivalent undamaged tiles at completion of the Work.
   b. An Owner-approved portable mini-enclosure shall be utilized outside the containment area for ceiling work: that will be completed within one shift; with limited dust disturbance/creation; with little anticipated noise; and with no "hot work."
      1) Portable mini-enclosures shall be constructed of 6-mil fire-retardant plastic sheathing with zipper openings. Completely seal all joints and connection points with smooth vinyl tape. All ceiling tiles removed by Contractor must be placed back into position before the mini-enclosure is removed.

3. Fire barrier and/or dustproof enclosure doors are to be installed in rigid frames and be self-closing and fitted with a gasket or other material to restrict closing noise and inhibit airflow, except for plastic sheathing enclosures which shall have zipper wall doors for personnel access. The door and its frame shall be painted in medical centers.
   a. All interior Project site entrances and exits shall have dust containment walk-off mats (sticky mats) present at all times. Provide 24” x 36” minimum size with layers to be peeled off when fully loaded. Secure mats to floor and install snug to enclosure entrances.
      1) Mats must be clean, intact and maintained on a constant basis. Avoid locating adhesive walk-off mats in public walking areas and patient transport areas in medical centers.

4. All elevator openings within the work area of occupied buildings, except working construction elevators, shall be sealed airtight from the work area.

5. Site Fences: Provide temporary six (6) foot high chain link fence panels with top rail fastened to tubular metal posts set in heavy concrete bases to prevent ready relocation,
unless otherwise indicated, to enclose exterior areas of the Project site and off-site laydown and Contractor parking areas provided by the Owner. Panels are to be anchored together to prevent entry between panels. Provide gates or equal to facilitate access to fire hydrants, pumper connections and standpipes. No barbwire is permitted.

B. Provide miscellaneous construction to protect the Work. Furnish, install, and maintain for the duration of construction all required tarpaulins, barricades, security barriers, canopies, warning signs, steps, bridges, platforms and other temporary construction necessary for the safe and proper completion of the Work. Maintain the temporary construction in compliance with all pertinent safety and other regulations. Temporary barricades that obstruct exit paths from occupied areas shall not be installed unless approved by Owner.

1. Egress Signage: Provide and install temporary exit signs, as needed, to insure a clear direction or emergency exit travel in occupied areas adjacent to the construction project. Review the temporary exiting routes and signage design and location with Owner’s Representative.

2. Other Signage: Provide informational signs, warning signs, and any other sign required by AHJ for the Project.

1.8 NOISE AND VIBRATION CONTROL

A. Construction shall not exceed the maximum permissible sound levels defined by the local AHJ and shall meet the special conditions of the Project.

B. Exterior Construction Noise: Maintain the sound pressure level of exterior construction noise from exceeding decibels with a frequency rating function A (60 dBA) inside adjacent facilities with windows closed between the hours of 8:00 a.m. and 5:00 p.m. weekdays.

1. If required, the Contractor shall meet this criterion by erecting barriers between work equipment and adjacent facilities.

C. Limited Hours of Use Within Buildings: Noise-producing equipment exceeding 60 DB(A) and/or vibration-producing equipment is subject to approval of Owner and in general will be allowed only before 7 a.m. and after 6 p.m. except within medical centers where use will be allowed from 8 a.m. - 7 p.m., unless otherwise approved by the Owner.

1. When possible, combine noisy and vibration-producing operations into one time period.

2. Specific scheduling is required for Work within the UWMC, HMC and the UW Health Sciences Center. Contractor shall provide its work schedule to Owner for approval no later than three (3) weeks prior to commencing any noisy and/or vibration-producing work.

D. Noise and Vibration Control Plan: Contractor shall submit a written procedure to minimize construction vibration and noise prior to performing physical impacts to, or demolitions of, existing structural components.

E. Machinery & Equipment: Equipment shall be as quiet as feasible for the work being performed. Electric-driven or hydraulically drawn is preferred to gas, diesel, or pneumatic powered machinery. If noise levels on any gear cannot meet the criteria of this Section, either that gear will not be allowed on the job or use times will have to be scheduled subject to approval of the Owner. Conformance to this requirement shall be included in the Contract price and no compensation will be allowed for special equipment or overtime that may be required.

1. Construction personnel shall limit the extent of unnecessary equipment idling.

F. Outdoor Vehicle and Internal Combustion Engine Noise: In addition to the requirements applicable to exterior construction noise in this Section, the sound pressure level of each piece of equipment shall not be greater than 85 dBA when measured at the property line of adjacent
real property of another person, and when measured at a distance of 50 feet from the emission source under noisiest operating conditions.

1. Rubber-tired equipment shall be used whenever possible instead of equipment with metal tracks.
2. When required, mufflers for stationary engines shall be “hospital-area” quality of silencing.
   a. Contractor is to routinely verify equipment mufflers and/or noise barriers are intact and operational.

G. Air Compressors: Equip air compressors with silencing packages—electric-driven preferred.

H. Arc Welders: No arc welders are to be connected to Owner’s utilities, unless approved by the Owner. Provide separate gas generators for arc welders.

I. Jack Hammers and Rotary Hammer Drills: May be used where no other alternative is available, if permitted by the Owner. The use of core-drilling and saw cutting equipment, or electric driven drills is preferred. Time of use is subject to approval by Owner.

1.9 CONSTRUCTION PARKING AND STAGING:

A. Parking permits are required for all vehicles parking on campus. Parking without a valid parking permit will result in citation and possible impound of vehicle.
   1. Parking on or near University of Washington and Harborview Medical Center campuses is congested. To minimize disruptions to campus operations and the impact on the adjacent neighborhoods, Contractor shall limit the number of vehicle trips to the Project site and encourage carpooling. In addition, the Contractor shall advise construction workers not to park on city streets and in neighboring residential areas.
      a. Parking on the University of Washington campus, outside a fenced Project site, is not available or permitted for Contractor and Subcontractor vehicles on the dates of graduation, convocation, and on Husky football game days.
      b. This information shall be posted at the Project site along with bus pass/ticket information.
   2. The Contractor is responsible for advising all parties on the Project of their designated parking area and ensuring that all workers park there. If parking needs change for any reason, Contractor shall advise the Owner’s Representative so, to the extent possible, necessary accommodations can be made.
   3. A designated parking area, outside the Project site, is for workers’ personal vehicles only and not for the storage of construction equipment or materials.

1.10 CONSTRUCTION TRAFFIC

A. The Contractor and the Contractor’s Subcontractors and suppliers shall minimize negative traffic impacts on city streets for construction. Scheduled truck traffic shall avoid the peak hours of 7:00 – 9:00 AM and 3:00 – 6:00 PM, Monday through Friday.

B. Deliveries on the Seattle campus: If a Contractor, Subcontractor, or supplier needs to make a delivery, the driver must stop at a Campus gatehouse upon entry during the posted hours of operation for UW Parking Services and obtain a commercial delivery permit.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies the administrative and procedural requirements for field engineering, in addition to requirements specified elsewhere in the Contract Documents, requiring the Contractor to employ a registered “Structural Engineer” and/or “Land Surveyor.”

B. Related Sections:
   1. Section 01 73 29 “Cutting and Patching”

1.2 QUALITY ASSURANCE

A. Contractor shall employ a registered Structural Engineer (Contractor’s Structural Engineer) experienced in construction techniques and sequences, and temporary structural support systems, who is licensed in the State of Washington.

B. The Contractor shall employ a registered Land Surveyor (Contractor's Surveyor) who is registered in the State of Washington, and acceptable to Owner, to perform survey work of this Section.

C. Submit the name, address, and telephone numbers of the Contractor’s Structural Engineer and Land Surveyor for Owner’s records, prior to their performance of Work.

1.3 CONTRACTOR’S STRUCTURAL ENGINEER

A. The Contractor’s Structural Engineer shall advise the Contractor as to the safety and adequacy of all temporary structural provisions necessary for cranes and hoisting, erection and/or alteration of the building structure and shall assume the responsibilities and duties as it relates to means and methods for these items (e.g., erection sequence, temporary bracing, cutting).
   1. Temporary bracing shall be coordinated with other trades to permit continuous operation of construction.
   2. Should it be necessary to modify the structural design to accommodate construction means and methods, the Structural Engineer shall advise the Contractor who shall immediately notify the A/E and await his/her direction.
   3. Proposed changes or modifications to the structural design shall be submitted to the A/E for approval prior to the Contractor incorporating changes or modifications into the Work.

1.4 OWNER’S PROPERTY SURVEY

A. Owner’s property survey for the Project is included in the Contract Documents.

B. The Owner will provide the services of a public land surveyor to locate the property corners noted on the Contract Documents and establish benchmarks for use by the Contractor.

1.5 PROJECT SURVEY REQUIREMENTS

A. Before proceeding with layout of actual work, the Contractor, working through the Contractor’s Surveyor, shall verify the layout information shown on Contract Documents and the Owner’s property survey.
B. As work proceeds, the Contractor shall check every major element for line, level and plumb, and shall require the Contractor's Surveyor to maintain a complete and accurate record book log of control of such checks and upon request shall make this log of control available for the Owner's and A/E's reference.

1. Record deviations from required lines and levels and promptly advise the Owner’s Representative upon detection of any discrepancies including, but not limited to, conflicts, errors, inconsistencies, or deviations that exceed the Contract specified or indicated or industry recognized tolerances.

2. If discrepancies are found, no work shall be done until the Owner’s Representative has been so notified and has provided the Contractor with written direction and/or drawings which correct and clarify the discrepancy.

3. All work which is determined to be incorrectly located will be rejected by the Owner. Any additional corrective work caused by discrepancies that should reasonably have been known to the Contractor and were not called to the attention of the Owner’s Representative, shall be borne at the Contractor’s expense.

C. Protect Owner’s benchmarks and survey control points prior to starting site work and preserve during construction. Do not change or relocate benchmarks or control points without Owner’s written approval. Promptly report lost or destroyed benchmarks or control points.

1.6 PROJECT RECORD SURVEY

A. Contractor working through the Contractor's Surveyor shall perform the following:

1. Upon completion of new foundation walls, prepare and submit a certified survey showing that dimensions, elevations, angles, and location of the building are in accordance with the Contract Documents.

2. Upon completion of the below grade site work, certify that the Project Record site survey represents the actual dimensions, elevations, lines, grades, and levels, including invert elevations, constructed in the field for all below grade installations and existing services located during the Work referenced to Owner’s benchmarks. This shall include the locations of all below grade site improvements including, but not be limited to, civil, electrical and mechanical services, utility tunnels, duct banks and vaults, and irrigation system.

3. The above documentation shall be submitted to the Owner under provisions of Section 01 77 00 for CAD As-built Shop Drawings.

1.7 PROJECT LAYOUT REQUIREMENTS

A. The Contractor shall be responsible for laying out the Work utilizing recognized engineering survey practices. Establish elevations, grades, lines and levels for:

1. Site improvements, including pavements, walks and retaining walls, stakes for grading, fill and topsoil placement, utility locations including slopes and invert elevations, and irrigation system.

2. Grid and axis of building structures.

3. Building foundations, column locations, ground floor elevations, elevations and levelness for floors and roofs.

4. Other elevations, grades, lines and levels, as needed to properly locate each element of the Project.

B. Calculate and measure required dimensions as shown within recognized tolerances. Do not scale drawings to determine dimensions.

C. Advise entities performing work of marked elevations, grades, lines and levels, provided for their use.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the administrative and procedural requirements for cutting and patching and general alterations of the Project including, but not limited to, preparations, products, transitions and adjustments, and repairs and disposal.

B. Related Sections:
   1. 01 11 01 “Summary of Work – Regulated Materials”
   2. 01 35 23 “Owner’s Safety Requirements”
   3. 01 71 23 “Field Engineering”

1.2 CONTRACTOR RESPONSIBILITY

A. The Contractor shall bear all cost of correcting damaged or destroyed work, indicated to remain on the Contract Documents, which is caused from failure to comply with the requirements of the Contract Documents or failure to exercise reasonable care by the Contractor and/or the Subcontractors’ work.

1.3 SUBMITTALS

A. Notice:
   1. Submit written request two (2) weeks in advance of cutting or alteration which affects:
      a. Structural integrity of any element of the Project;
      b. Integrity of weather-exposed or moisture-resistant elements;
      c. Efficiency, maintenance, or safety of any operational element;
      d. Visual qualities of sight exposed elements; and
      e. Work of Owner or separate contractor.
   2. Include in request:
      a. Project name
      b. Location and description of affected work
      c. Description of proposed work
      d. Reason for cutting or alteration
      e. Alternatives to cutting and patching
      f. Effect on work of Owner or separate contractor
      g. Written permission to affect separate contractor
      h. Date and time work will be executed, including duration of work
      i. Utility Shutdown Request form, as appropriate
   3. Owner will respond in writing to the submitted request.

B. Visual Matching: When indicated to “match existing,” submit products and/or finishes to match existing adjacent finishes for Owner’s review and approval or, for patching new work, use the specified materials and finishes in the Contract Documents.

PART 2 - PRODUCTS

2.1 PATCHING AND EXTENDING WORK

A. The Contractor shall provide products specified in the Contract Documents and/or match existing products with an alternate product of the most suitable grade for the intended purpose.
B. The Contractor shall determine the type and quality of existing products and finishes by inspection and/or testing, where necessary.
   1. Remove samples of existing installed work for testing only when approved by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to commencing work:
   1. The Contractor shall inspect existing conditions to ascertain elements subject to damage or movement and to determine the need for temporary bracing during cutting and patching work; and
   2. Verify that materials to be worked-on or removed have been evaluated in the Owner’s Regulated Materials “Good Faith” Survey report.

B. Beginning of cutting or patching means acceptance of existing conditions.

C. After cutting and/or removing existing work:
   1. The Contractor shall inspect conditions affecting performance of new work and notify Owner of any unforeseen physical conditions; and
   2. Verify that demolition is complete and areas are ready for installation of new work.

3.2 PREPARATION

A. Move, or remove, items as necessary for access to cutting and patching work.

B. For Owner occupied facilities, prepare a noise and vibration control plan in accordance with Section 01 50 00 “Temporary Facilities and Controls.”

C. Schedule shut-downs and obtain permits required for performance of the Work.

D. Provide temporary supports to ensure structural integrity of the Work.

E. Provide temporary enclosures, shielding devices and/or other methods to protect the following from damage:
   1. Existing conditions that are to remain
   2. Owner occupied areas
   3. Owner’s building systems, including HVAC systems

F. Establish “hot-works” fire safety precautions required for performance of the Work.

3.3 PERFORMANCE

A. Execute cutting and patching work in a manner to:
   1. Avoid damage to other work;
   2. Provide proper surfaces for installation of new work; and
   3. Provide a neat transition from existing finishes to new work.
      a. Fit new work to existing pipes, sleeves, ducts, conduit and other penetrations through surface

B. For all new work made to existing work under warranty, employ original installer or fabricator to perform cutting and patching unless otherwise approved by the Owner.
C. For additional cutting and patching requirements in medical centers, see Section 01 35 33 “Infection Control.”

D. Prepare surfaces to provide for the specified installation of new work and finishes.
   1. Remove and replace or repair unsuitable substrate materials (e.g., rotted wood, water damaged materials, corroded metals and deteriorated concrete) for new applications.

E. Restore existing building systems that are impacted by cutting and patching work to original operating conditions.

F. For penetrations cut in existing fire-rated separations, completely seal new work with fire-stopping materials to full thickness of the penetrated element.
   1. Replace existing fire-stopping materials when disturbed by new work.

G. Unless otherwise indicated in the Contract Documents, cut concrete and masonry materials using a diamond saw in accurately located straight lines. Pneumatic tools are not allowed without Owner’s prior approval.
   1. Concrete walls: Core drill pipe penetrations. Saw both sides of wall and break out remainder. Minimize overcuts.
   2. Concrete floors: Provide temporary support of elevated floor areas requiring removal and saw-cut. Core-drill pipe penetrations.
   3. Masonry walls: Saw-cut along mortar joints. Remove all mortar adhering to edges. Overcuts are not allowed.
   4. Wood and/or metal frames walls: Cut wall finish materials in straight uniform lines and remove wall framing as required.

H. Remove debris and abandoned items from the work area, including from concealed spaces.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This section includes administrative and procedural requirements for construction waste management activities.

B. Related Sections:
   1. 01 50 00 “Temporary Facilities and Controls”

1.2 GOALS AND PROCEDURES

A. The Owner has established waste management goals for this Project with the minimum requirement of diverting 50% of non-hazardous and non-regulated construction and demolition waste, including recycled or donated materials, by weight in tons, from landfill disposal and/or incinerator.
   1. For materials which contain lead or have lead-containing coatings, see Section 01 11 01 “Summary of Work – Regulated Materials.”

B. Waste classified as hazardous materials or dangerous waste will be disposed of by the Owner (see Section 01 11 01 “Summary of Work – Regulated Materials,” if applicable).
   1. If the Contractor suspects that an unidentified hazardous or dangerous material may exist in the Project area, the Contractor shall inform the Owner of this possibility. Owner will investigate and test the material to determine the extent and nature of the material and to decide on appropriate procedures.

1.3 CONTRACTOR RESPONSIBILITY

A. To the maximum extent possible, the Contractor shall separate recyclable materials from construction, demolition, and land clearing waste to be disposed of as garbage.

B. The Contractor shall designate an on-site construction “waste management coordinator” responsible for instructing the Contractor's workers and Subcontractors in the requirements of the construction waste management plan and for overseeing and documenting results.
   1. When on-site dumpsters and recycling bins are required by the Contract Documents, the waste management coordinator shall conduct regular visual inspections of dumpsters and recycling bins to ensure materials are being separated properly and to remove contaminants.

1.4 DEFINITIONS

A. Construction, Demolition, and Land Clearing (CDL) Waste: Includes all non-hazardous solid wastes including material that is recycled, reused, salvaged, and/or disposed of as garbage.

B. Salvage: Recovery of materials for reuse.

C. Reuse: Making use of a material without altering its form for reuse on-site or reuse on other projects off-site (e.g., grinding of concrete for use as sub-base material and chipping of land clearing debris for use as mulch).

D. Recycling: The process of sorting, cleaning, treating, and reconstituting materials for use in the manufacture of a new product.
E. Source-Separated CDL Recycling: The process of providing on-site separation of recyclable materials into separate containers as they are generated. The separated materials are hauled directly to a recycling facility or a transfer station.

F. Co-mingled CDL Recycling: The collection of mixed recyclable materials in one on-site container. The container is taken to a material recovery facility where materials are separated for recycling.

G. Material Recovery Facility (MRF): A facility used to sort and recover CDL waste materials for recycling.

H. Transfer Station: A facility where waste is moved from collection vehicles to larger trucks for longer distance transport to a landfill, source-separated recycling facilities, or MRF.

I. Approved Recycling Facility: A facility that can legally accept CDL waste materials for the purpose of recycling into a new product where the method of recording and calculating the recycling rate is regulated by local or state government.

1.5 PERFORMANCE REQUIREMENTS

A. General: Divert CDL waste from landfills by one, or by a combination, of the following activities:
   1. Salvage
   2. Reuse
   3. Source-separated CDL recycling
   4. Co-mingled CDL recycling

B. CDL waste materials to be salvaged, reused, or recycled include, but are not limited to, the following:
   1. Acoustical ceiling tiles
   2. Asphalt
   3. Asphalt shingles
   4. Brick
   5. Cardboard
   6. Carpet and pad
   7. Concrete
   8. Drywall
   9. Insulation
   10. Metals
   11. Paint
   12. Porcelain
   13. Wood
   14. Plastic film such as sheeting, shrink wrap, and packaging
   15. Window glass
   16. Field office waste such as paper, aluminum cans, glass, plastic, and office cardboard

1.6 CONSTRUCTION WASTE MANAGEMENT (CWM) PLAN

A. Prior to performing any on-site work, the Contractor shall develop and submit a CWM plan for Owner’s review and comment. The CWM plan shall include a reuse and salvage plan, identification of waste types by quantity and weight in tons, methods of disposal, and handling and transportation procedures. Include separate sections in plan for construction demolition, land clearing debris and construction waste.

B. The reuse and salvage plan shall include:
1. A list of items being reused in place or elsewhere on the Project;
2. A list of items for reuse off-site through salvage, resale or donation; and
3. A plan for protecting, dismantling, handling, storing and transporting the reused items.

C. The Contractor shall organize the CWM plan to include the following information:
   1. Types and estimated quantities, by weight in tons, of CDL waste expected to be generated during demolition and construction.
   2. Proposed methods for CDL waste salvage or reuse during demolition including, but not limited to, one or more of the following:
      a. Contracting with a deconstruction specialist to salvage materials
      b. Selective salvage as part of the demolition Subcontractor’s work
      c. Reuse of materials on-site, or sale or donation to a third party for reuse
   3. For this Project, there is no on-site space available for source-separated CDL recycling and waste collection. The Contractor shall contract with a recycling hauler, who accepts commingled construction and demolition debris, for hauling to an approved MRF.
   4. Name of recycling facility or MRF receiving the CDL wastes.
   5. On-site Handling Plan: Proposed locations for collecting CDL waste and/or separating recyclable waste into containers including, but not limited to, types and sizes of containers, and frequency of removal.
   6. CWM Communication Procedures: Describe how the CWM plan will be communicated to the Contractor’s workers and the Contractor’s Subcontractor’s workers (of any tier).

1.7 CONSTRUCTION WASTE MANAGEMENT (CWM) REPORT

A. CWM Report: The Contractor shall submit a cumulative CWM report on an Owner-approved form as a requirement of Final Completion with the following attachments:
   1. A record of the type and quantity, by weight in tons, of each material salvaged, reused, recycled or disposed of
      a. Dirt and land debris must be documented separately
   2. Total quantity of waste recycled as a percentage of total waste
   3. Disposal Receipts: Copy of receipts issued by a disposal facility for CDL waste that is disposed in a landfill
   4. Recycling Receipts: Copy of receipts issued by an approved recycling facility
      a. For co-mingled materials, include weight tickets from the recycling hauler or MRF and verification of the recycling rate for co-mingled loads at the facility.
   5. Salvaged Materials Documentation: Types and quantities, by weight, for materials salvaged for reuse on-site, or sold or donated to a third party

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT MEETING

A. The Contractor shall schedule and administer a construction waste management meeting prior to construction activities and shall record and distribute copies of meeting minutes to all attendees (The Contractor may conduct this meeting as part of the first pre-installation meeting).
   1. Attendees:
      a. Owner’s Representative
      b. A/E
      c. Contractor’s superintendent and waste management coordinator
      d. Major Subcontractors
      e. Business and Industry Resource Venture representation, as appropriate
2. Agenda Items: Review methods and procedures related to waste management including, but not limited to the following:
   a. Review and discuss CWM plan, including identification of and responsibilities of the Contractor’s waste management coordinator
   b. Review requirements for documenting quantities of each type of waste and its disposition.
   c. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays
   d. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   e. Review waste management requirements for each trade.

3.2 SOURCE-SEPARATED CDL RECYCLING

   A. Provide containers for separating CDL waste that is to be recycled, clearly labeled with a list of acceptable and unacceptable materials.

   B. For managing on-site stockpiled recyclable materials until removed, stockpile without intermixing with other materials, place and shape to drain surface water, and cover to prevent windblown dust.
      1. Stockpile materials away from demolition areas. Do not store within drip line of existing trees.

3.3 CO-MINGLED CDL RECYCLING

   A. Do not put CDL waste that will be disposed of in a landfill into a co-mingled CDL waste recycling container.

3.4 LANDFILL AND/OR INCINERATOR WASTE

   A. Provide containers for CDL waste that is to be disposed of in a landfill or by incineration, clearly labeled as such.

3.5 REMOVAL OF CONSTRUCTION WASTE MATERIALS

   A. Transport CDL waste materials off Owner’s property and legally dispose of them.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies minimum administrative and procedural requirements for mechanical and electrical systems functional performance testing required by the Contract Documents.

B. Related Sections:
   1. 01 91 00 “General Commissioning Requirements”

1.2 SERVICES

A. Test Engineer - provided by Contractor.

B. Commissioning Authority - provided by Owner.

C. Electrical Testing Contractor (ETC) - provided by Electrical Subcontractor (working through the Contractor’s Test Engineer).

D. Testing, Adjusting and Balancing (TAB) - provided by Contractor.

1.3 REQUIREMENTS FOR TEST ENGINEER

A. The Contractor shall provide the services of a “Test Engineer” experienced in commissioning including the troubleshooting of equipment and systems. The Test Engineer shall be qualified to develop and write, coordinate and schedule, and manage and document mechanical systems functional performance tests (FPT). The Test Engineer shall also coordinate the work of the ETC and assemble the required electrical commissioning documentation.

1. Qualified personnel experienced in the technical aspects of each system to be commissioned shall be provided, if necessary, to augment the expertise of the Test Engineer.

1.4 TEST ENGINEER DUTIES

A. The Test Engineer shall prepare and submit all FPT and commissioning documentation required by the Contract Documents for the actual equipment and systems installed, including but not limited to, start-up plans, installation verification audit reports, start-up and FPT deficiency report forms, test equipment identification lists, FPT procedures, FPT data forms, and one-line system and riser diagrams.

1. Maintain separate mechanical and electrical (M&E) systems “Commissioning Binders,” indexed and tabbed according to the equipment or systems requiring commissioning, to compile the start-up and FPT documentation. Blank start-up forms, approved by the Commissioning Authority, shall populate the initial binders and be replaced with completed forms that shall be submitted in final M&E systems Commissioning Binders, as a requirement of Final Completion. The binders shall be on-site during the work (see Section 01 91 00 for the Commissioning Binders documentation requirements).

2. Prior to testing, the Test Engineer shall have applicable Subcontractor’s and manufacturer’s representatives review the test and commissioning documentation to identify personnel safety issues, equipment protection issues, and to validate relevance to the actual equipment provided.
B. Prepare and submit a “Commissioning Plan” for Owner’s review and comment before developing the FPT procedures and prior to any equipment or systems testing and/or start-up required by the Contract Documents.

C. Develop a commissioning schedule for all FPT and commissioning activities required by the Contract Documents and integrate into the construction Progress Schedule. Identify:
1. Commissioning Plan preparation, submittal, and review;
2. Each required functional performance test;
3. Sequence of testing, including commissioning activity start-up prerequisites, point-to-point testing, and balancing activities; and
4. Submission and approval of test results.

D. Develop and write FPT procedures for all equipment tests, and systems and cross-systems tests required by the Contract Documents. Test procedures shall be in accordance with equipment manufacturer's recommendations, where applicable. Test procedures shall fully describe the equipment or system configuration and steps required for each test. The procedures shall be appropriately documented so that another party can repeat the identical test.
1. Maintain a set of drawings for recording the sign-off of each component of the plumbing and piping system pressure testing, heating, ventilation, and air conditioning (HVAC) system duct work pressure testing, and the completed flushing/cleaning and treatment activities.

E. Coordinate the participation of each Subcontractor, including the ETC, specific to their start-up and testing responsibilities. Inform each Subcontractor as to what their test and expected results will be prior to commissioning.

F. Observe the progress of the work to assure that all installations requiring commissioning are being made in accordance with the Contract Documents. Prepare and submit installation verification audit reports prior to the start-up of equipment or systems for which a formal start-up is specified in the Contract Documents.

G. Coordinate all cross-systems testing such as HVAC, environmental controls, fire alarm, emergency power, life safety, elevators, and chiller controls.

H. Manage and observe the start-up testing and all final tests of equipment and systems required by the commissioning plan and document test results.

I. Report any deficiency in equipment or systems and either enforce compliance with the Contract Documents or provide Owner with technical expertise to recommend modifications to the equipment or systems to correct the deficiency. Oversee and direct the correction of deficiencies found during commissioning.

J. Coordinate the required Commissioning Authority, A/E or other Owner-witness participant for all test/approval procedures, after verifying that pretests have been satisfactorily conducted and final tests are ready to be performed.
1. Notify the Owner’s Representative in writing of the date, time, location, and anticipated duration of start-up and test activities, with a minimum of five (5) working days advance notice.
2. Obtain the signature of the designated witness on all data forms. If the witness is unavailable at the scheduled time and location of the activity, so note, and proceed per schedule without the witness.
K. Compare operation and maintenance information provided by the various Subcontractors and vendors with the Project Record documents and report any discrepancies to the Owner's Representative.

L. Oversee and provide Owner with operating instruction and training for the mechanical and electrical equipment and systems specified in the Contract Documents, with coordination by the M&E Subcontractors.

M. Provide as-built information to update the commissioning basis-of-design criteria.

1.5 TEST FAILURES

A. In the event that a functional test fails, the Contractor shall determine the cause of failure, rectify the failure as soon as possible, and then retest. If more than two (2) functional tests of the same system are required, all costs for additional testing shall be borne by the Contractor, at the Owner's sole discretion.

1.6 CANCELLATIONS

A. The Test Engineer shall give at least 48 hours advance notice to the Owner's Representative of cancellation of any scheduled test.
   1. Any costs incurred by Owner due to insufficient advance notice of cancellations shall be borne by the Contractor, at the Owner's sole discretion.

1.7 WARRANTY TESTS

A. In the event a product fails during the warranty period, the Contractor shall determine the cause of failure, rectify the failure as soon as possible, and then retest. All warranty testing shall be borne by the Contractor.

1.8 TEST ENGINEER QUALIFICATIONS

A. The Contractor shall propose a Test Engineer, who is competent in the Project’s M&E systems design and intent, for the Owner to evaluate and approve or reject in writing, based upon the following criteria which shall be documented in the Test Engineer resume.
   1. The Test Engineer shall have extensive experience in start-up and troubleshooting of HVAC, hot water heating, chilled water, steam, plumbing, electrical, emergency power, fire alarm, lighting controls, life safety systems and other systems of similar complexity to those contained in the Contract Documents that are required to be commissioned.
   2. The Test Engineer shall:
      a. Be familiar with the Project’s control operating system(s);
      b. Be capable of troubleshooting control code and recommending necessary modifications;
      c. Be knowledgeable in testing and balancing of both air and hydronic systems;
      d. Have an excellent working knowledge of complex fire alarm, environmental and electric power control systems;
      e. Have excellent communication and writing skills, be highly organized, and be able to work well with the Project's Subcontractors; and
      f. Have a Bachelor's degree in mechanical engineering, PE certifications, and related field experience.
      1) However, in lieu of a Bachelor's degree and PE certifications, other technical training with extensive practical field experience may be considered.

B. Test Engineer Resume - The Contractor shall submit the Test Engineer’s resume, including the following documentation:
1. Present or most recent employment:
   a. Company name and address
   b. Present title and job description
   c. Dates of employment

2. Other relevant work experience:
   a. Company name and address
   b. Job title and description
   c. Dates of employment

3. For a minimum of three (3) similar projects, description of commissioning experience and roles performed in commissioning activities that demonstrate working knowledge of complex systems.

4. Samples of a commissioning plan, a start-up plan, and a FPT with data forms written by the Test Engineer.

5. References from a minimum of three (3) project owners and/or commissioning authorities.

6. Description of education, certifications, and other technical training or field experience.

1.9 COMMISSIONING AUTHORITY

A. The Owner will provide a “Commissioning Authority,” or appoint an Owner-designated witness, to act as the commissioning authority.
   1. The Commissioning Authority will provide no labor or equipment in the commissioning process.

B. The duties of the Commissioning Authority are to:
   1. Provide commissioning basis-of-design criteria, for Contractor’s information;
   2. Ascertain that the Project commissioning processes and information provided is in accordance with the requirements of the Contract Documents;
   3. Review the Contractor's Commissioning Plan, start-up plans, installation verification audit reports, start-up and FPT deficiency report forms, and FPT data forms;
   4. Review the Contractor's equipment, systems and cross-systems FPT procedures;
   5. Witness, verify, and approve satisfactory completion of equipment, systems and cross-systems FPT, based upon the Contract Documents requirements;
   6. Review for accuracy, comment on, and approve specified close-out documentation;
   7. Recommend Substantial Completion when commissioning and training has been successfully completed; and
   8. Provide final commissioning reports to the Owner.

C. The Commissioning Authority will communicate as follows:
   1. The Commissioning Authority will formally communicate with the Contractor via approved project channels. It is expected, however, that informal communication and coordination will be conducted directly with the Test Engineer. As the Owner's commissioning representative, it is expected that the Commissioning Authority will communicate directly with A/E, as may be appropriate.
   2. The Commissioning Authority will keep the Owner's Representative advised regarding commissioning activities and progress, equipment and systems performance, and any problems and solutions thereto.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for Contract closeout including, but not limited to:
   1. Project Record
   2. Operation and Maintenance Manuals
   3. Warranties and Bonds Manual
   4. Operating Instructions and Training
   5. Cleaning
   6. Owner’s Final Inspection
   7. Substantial Completion
   8. Final Completion, and
   9. Final Acceptance

B. For additional specific construction Work, closeout requirements are described in Divisions 02 thru 49 of the Specifications.

1.2 PROJECT RECORD

A. General: Project Record documents include the Contractor’s as-built Drawings, as-built Specifications, and as-built Shop Drawings required by the Contract Documents. Project Record documents must be protected from deterioration and stored in a secure fire-resistant location.

B. As-built Drawings: Maintain black line prints of the bid set Contract Drawings and approved Shop Drawings. Mark the drawings to show new information that was not shown on the bid set Drawings, and on the approved Shop Drawings, including the actual installation where the installation varies substantively from the work as originally shown. Mark drawings to show conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
   1. Organize as-built Drawings in manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on the cover of each set.
   2. Mark with reproducible pencil and distinguish between variations in separate categories of the Work. Text size is to be 1/8” minimum. Good basic drafting practice must be applied.
   3. Show bid addenda items, Change Orders, and Request for Information (RFI) responses by their number, and date the revisions with a “cloud” around the revision.
   4. Keep accurate measurements of below-grade site work, including permanent shoring, in accordance with Section 01 71 23 “Field Engineering.”
   5. Show mechanical dampers, valves, reheat boxes, cleanouts, and other equipment and items that require maintenance.
   6. Show location of construction-concealed mechanical, electrical and plumbing (MEP) riser installations including, but not limited to, piping, ductwork, and conduits referenced to visible and accessible features.
   7. Show field changes of dimensions and details.
   8. X-out conditions not constructed and appropriately annotate "not constructed" to convey the actual as constructed condition.

C. As-built Specifications: Maintain one (1) copy of the bid set Contract Specifications showing all addenda, substitutions, Change Orders, and RFIs. Give particular attention to the selection of options, changes in product data, and information on elements engineered by the Contractor.
and note related as-built Drawing information, as appropriate. Clear, legible documentation must be applied.

D. As-built Shop Drawings: The Contractor shall comply with the following CAD (Computer-Aided Drafting) standards and requirements when preparing as-built record Shop Drawings required by the Contract Documents.
1. Cover sheets shall contain a complete index of all sheets.
2. Symbols shown must be symbols used in the Contract Documents.
3. Standard drafting practice shall be:
   a. Title block
      1) All sheets shall have a title block.
      2) Title block information is to be on the right side of the sheet.
      3) Title blocks shall include the following information:
         a) Date
         b) University Project Name
         c) University Project Number
         d) University Facility Number (FACNUM)
         e) Sheet name
         f) Sheet number
         g) Contractor or Subcontractor company name
         h) A/E’s Seal (whoever prepared the document)
         i) A Key Plan
   b. Layering format: Use Army Corps of Engineers A/E/C CAD standard found at: cadbimcenter.erdc.dren.mil/CAD.
   c. Scale and Units:
      1) All objects are to be drawn at full scale for the assigned unit of measure.
      2) All drawings are to have a unit of measure assigned and not set to “unitless.”
   d. External references usage in CAD Documents: External references are not allowed for submittals. All external references are to be bound using the “bind” option, instead of the “insert” option.
   e. Area of Work: CAD drawings shall include a boundary that defines the area of work, showing only the area where work is performed.
4. CAD Compliance Submittal Review Requirements: CAD Shop Drawings shall be electronically submitted for Owner’s CAD compliance review and approval prior to submitting as-built record Shop Drawings. The Contractor may request a compliance review at any time during the work prior to Substantial Completion.
5. Project Record submittal: Provide all record as-built Shop Drawings required by the Contract Documents in CAD and PDF format (per the requirements of Section 01 33 00 “Submittal Procedures”).
   a. CAD files shall be submitted in latest release of AutoCAD .dwg format.
      1) Custom menus or arx applications are not allowed if they create a requirement for the drawing to be used. No menus, custom user interface files or arx applications are to be submitted.
      2) Each CAD drawing shall represent a single printed sheet where the file name conspicuously identifies the sheet number (e.g. sheet A2.1 CAD file name might be A2-1.dwg).
      3) For all disciplines in a submittal, the CAD drawings shall be in a single folder. All supporting files (font files, line types, plot configurations, plot style tables, etc.) are to be in a subfolder.

1.3 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. Separate manuals shall be provided by the Mechanical and Electrical (M&E) Subcontractors titled MECHANICAL or ELECTRICAL and an additional manual provided by the General
Contractor titled ARCHITECTURAL for all other information. The preliminary manuals shall be labeled “Preliminary” and comply with all requirements.

B. The O&M Manuals shall contain all the information needed to operate, maintain and repair all systems, equipment, and product finishes provided in the Project. They shall be presented and arranged logically for efficient use by Owner's operation personnel. As a minimum, the information provided shall include, but not be limited to, the following: (see Architectural, Mechanical and Electrical Divisions for additional requirements)

1. Product description including, but not limited to, manufacturer, product name or equipment make and model number (and other nameplate data), size and dimensions, color, Material Safety Data Sheets (and related product information), and other pertinent information
2. Supplier's name, address, e-mail address, phone, and reference order numbers
3. Product finishes maintenance and cleaning instructions
4. Performance and calibration data for specific product provided (extraneous catalog data must be eliminated)
5. Descriptions and diagrams of system assembly and configuration (including components and interrelations)
6. Manufacturer's recommended equipment operating and maintenance instructions, including routine lubrication and servicing data, start-up and shutdown procedures, and any seasonal or emergency procedures
7. Manufacturer’s checklists and methods for troubleshooting
8. Complete parts list with parts numbers indicating common replacement parts and anticipated useful life
9. Copies of: digitally signed warranties; any certificates from respective manufacturers, suppliers, and Subcontractors; permits and/or licenses, and; equipment maintenance and service contracts.

C. The O&M Manuals shall contain the following information for specified items, when the item is specified elsewhere in the Contract Documents:

1. As-built door hardware schedule and submittal documentation
2. Elevator systems documentation
   a. Wiring/equipment locations diagrams
3. Refrigeration controls schematics/sequence of operation documentation
4. Motors data and variable frequency drives (VFDs) documentation
   a. Final settings programmed into the VFDs
5. Fan and pump curves documentation
6. HVAC filters schedule
7. Environmental controls systems (ECS) documentation including hardware and software manuals
8. Electrical—Short Circuit Coordination and Arc Flash Study Report
9. Pull calculations documentation for MV wire, cable, and terminations
10. Electrical transformer factory test reports documentation

D. Drawings included in the manual shall not exceed 11” x 17.”

E. Hard copy manuals shall be bound in a slant-D, 3-ring, view binder with a clear overlay insert on the front cover and spine.

1. Provide a cover slip sheet and a spine sheet typed with ARCHITECTURAL, MECHANICAL, and (or) ELECTRICAL OPERATIONS AND MAINTENANCE MANUAL, University Project name, University Project number, University Facility number, A/E name, and Contractor name. Label manuals consecutively (ex., Mechanical 1 of 3).
2. Each manual shall have a typed index and tabbed dividers between specification divisions and sections or, when presented in a logical format by Contractor and approved by Owner, between systems/equipment categories.
3. Contents of the manual shall be printed on 8-1/2” x 11” acid free, recycled copy paper.

F. ARCHITECTURAL, MECHANICAL, and ELECTRICAL manuals may be combined into one manual, with approval of Owner.

1.4 WARRANTIES AND BONDS MANUAL

A. Assemble executed warranties and bonds, and any certificates from the respective manufacturers, suppliers, and Subcontractors. Provide preliminary review copies of all warranties and bonds and a final manual with the original documents, titled “Warranties and Bonds Manual.” Manuals shall be assembled in the same format as the O&M Manuals and include a table of contents in complete and orderly sequence.

1.5 OPERATING INSTRUCTIONS AND TRAINING

A. The Contractor shall provide on-site instruction and training for Owner's personnel in all aspects of the philosophy, operation and maintenance of equipment and systems. Instruction and training shall be provided by a qualified trainer from the Contractor or Subcontractor who supplied and installed the equipment and systems and/or a manufacturer’s training representative who is familiar with all aspects of the design, operation, maintenance, and troubleshooting of the specified equipment and systems. Training shall be conducted in a classroom setting with appropriate schematics, handouts, and audio/visual aids. All training shall also be digitally recorded in video, cataloged, and provided to Owner in a DVD/container labeled with session identification and date. Attendance shall be recorded. For work requiring commissioning, see Section 01 91 00 “General Commissioning Requirements” for further training session agenda requirements.

1. Prepare and submit a training plan for Owner’s information and coordination. For each training session, the training plan shall include the following:
   a. Dates, start and finish times, and locations
   b. Outline of the information to be presented
   c. Names and qualifications of the presenters
   d. List of texts and other materials required to support training

1.6 CLEANING

A. Contractor clean up during construction is specified in the Contract Documents.
   1. If Contractor fails to clean as specified in the Contract Documents, and after reasonable notification from Owner, Owner may do so and the cost thereof shall be charged to the Contractor.
   2. For work in medical centers, reference housekeeping in Section 01 35 33 “Infection Control.”
   3. Contractor shall employ continuous housekeeping cleaning during construction to minimize interior construction dust and particulates during the Work.

B. Preliminary Cleaning: Perform the following preliminary cleaning operations as a prerequisite for Owner’s Final Inspection. The following are examples, without limitation, of minimum cleaning requirements:
   1. Remove labels that are not permanent.
   2. Remove temporary protective coatings and wrappings from all products.
   3. Remove glazing compounds and other vision obscuring substances from transparent and reflective materials provided by the Contractor including, but not limited to, mirrors, glass in doors and interior construction, glass canopies and skylights, and windows inside and out.
   4. Clean all exposed building interior surfaces, including cabinet interiors, and new exterior surfaces to be free of foreign substances including, but not limited to, stains and films.
5. Leave floors broom-clean. Vacuum carpeted surfaces and clean consistent with manufacturer’s recommendations for installation.

6. Remove and clean all construction debris and refuse from:
   a. Roofs, mechanical and electrical rooms, tunnels and equipment vaults
   b. Limited access spaces, including above ceiling areas and shafts
   c. Physically inaccessible components of the Work including wall and chase cavities, gutters and downspouts, floor drains and other drainage systems

7. Wipe surfaces of M&E equipment, including elevator equipment and similar Architectural equipment. Remove excess lubrication and other substances.

8. Clean the Project site of construction waste, rubbish, and litter. Sweep paved areas broom clean and remove stains, spills, and other foreign deposits.

C. Final Cleaning: Prior to Substantial Completion, employ experienced workers or professional cleaners for final cleaning of the Work. Clean to a condition expected of a normal commercial building cleaning and maintenance program. Comply with manufacturer’s instructions.

1. Leave entire Project clean and ready for occupancy. All new interior, including cabinet interiors, and exterior building surfaces, fixtures and equipment shall be turned over to the Owner in a new condition, free of all damage, dust, dirt, spots, stains, encrustations, and other blemishes.

2. Clean transparent materials including mirrors, glass in doors and interior construction, glass canopies and skylights, and windows inside and out.

3. Clean plumbing fixtures to a sanitary condition.

4. Clean light fixtures and lamps.

5. Owner will wax and apply sealers to vinyl composition tile and sheet vinyl floors.

D. Compliance: The Contractor shall:

1. Use non-toxic Green Seal Certified cleaning products, or products with low-volatile organic compounds (VOC), and cleaning paper with a post-consumer recycled content;

2. Employ equipment with high efficiency particulate filtration and sweep compound to keep dust down; and

3. Comply with current regulations and standards of authorities having jurisdiction and the safety standards for cleaning specified in the manufacturer’s instructions.

1.7 OWNER’S FINAL INSPECTION

A. Prior to Final Inspection: The Contractor shall satisfactorily complete the following actions prior to the Owner’s final inspection of the Project.

1. Submit written notice that the Project is ready for final inspection. Include a copy of the Contractor’s final punch list report (see Section 01 45 00 “Contractor Quality Control”) and list all incomplete work items that have been reviewed with the Owner, and which the Owner has agreed are not necessary prior to Substantial Completion.
   a. Include: a written plan/schedule outlining all actions necessary to achieve Substantial Completion, without requiring extra ordinary participation by Owner and A/E.

2. Complete preliminary cleaning operations.

3. Submit a list of all equipment and systems requiring instruction and training with a proposed schedule of times and locations for the instruction, for Owner’s review and comment.

4. Replace all ventilation systems air filters specified for construction with final filters.

5. Complete start up and functional performance testing of all systems required by the Contract Documents and AHJ including, but not limited to: electrical testing; environmental control systems point-to-point testing; emergency eyewash and safety shower testing; fume hood face velocity testing; and HVAC air balancing (if included in the scope of the Work).
6. Submit an electronic copy each of the current air balancing report and the M&E Commissioning Binders labeled “Preliminary,” listing all deficiencies, for Owner’s review and comment.

7. Submit the final mechanical pressure test and flushing forms, signed-off by Owner’s Representative.

8. Submit the final copper and fiber optic communications cabling test results in PDF format, on Owner’s CMS.

9. Submit the final audio/visual equipment documentation including, but not limited to, manufacturer/model information and an itemized summary list with equipment serial numbers in PDF format, on Owner’s CMS.

B. Owner’s Final Inspection: Upon satisfactory completion of the actions in 1.7A, Owner will determine if the Project is complete and ready for final inspection and, at Owner’s sole discretion, commence final inspection, or provide a written deficiency list of items to the Contractor of work that must be completed to the satisfaction of the Owner prior to the Owner’s final inspection. Final inspection is performed by the A/E and Owner’s representatives.

1. After the Owner has issued the final inspection list of corrective work items, the Contractor shall make the required corrections and/or identify items that the Contractor feels are not required by the Contract Documents, and resolve these items with the Owner.

C. Re-inspection: Contractor shall request, in writing, re-inspection after completing the Owner’s final inspection list of corrective work items and providing the Owner the final inspection report notated with a signed-off approval for each of the corrected items. Those items whose completion is delayed due to circumstances acceptable to the Owner will be exceptions. The Owner’s Representative will back check the items or have the A/E perform a re-inspection.

1. If the A/E is required to perform more than one re-inspection, the costs for additional inspections may be borne by the Contractor, at the Owner’s sole discretion.

1.8 SUBSTANTIAL COMPLETION

A. Substantial Completion: Substantial Completion (for either the entire Work or portions thereof) shall be achieved when all Work, other than incidental corrective and incidental punch list work, is complete including, but not limited to, the following actions:

1. Complete final cleaning operations.

2. Submit the “Preliminary” Operations and Maintenance Manual for Owner’s review and comment in one (1) hard copy and in PDF format, on Owner’s CMS.

3. Submit all sign-offs, releases, jurisdictional settlements, judgments, and other records from AHJ allowing the Owner’s full and unrestricted use and benefit of the facilities including, but not limited to, a temporary or permanent certificate of occupancy permit, operating permits and/or licenses for the use of building equipment such as elevators, boilers, paint booths, etc. and similar necessary certificates and releases.
   a. Provide a list of any outstanding work required by AHJ.

4. Submit the current Project Record as-built Drawings and Specifications identified “Preliminary” Project Record (marked with the date of submission) in PDF format, on Owner’s CMS.

5. Submit the Project Record as-built Shop Drawings required by the Contract Documents in accordance with this Section 1.2D.5, on Owner’s CMS.

6. Remove all construction tools and temporary facilities not required for Final Completion work from the Project site including, but not limited to, storage sheds, samples and mock-ups, Project identification signage, site fences, crane and hoist base foundation construction, temporary enclosures, and construction electrical power and service.

7. Complete Owner’s personnel operating instructions and training and submit training DVD’s.
8. Deliver specified maintenance equipment and tools to Owner, with itemized summary list.
9. Complete final change-over of locks, transmit new keys to Owner, and return Owner's loaned construction keys.
10. Complete all air balancing, testing and commissioning work required by the Contract Documents, allowing the Owner to fully occupy the Work for the use for which it is intended. Incidental Work, that is not life safety or occupational safety commissioning work, whose completion is delayed due to circumstances excused by the Owner, will be the exception.
   a. Submit one (1) hard copy each of the current environmental control systems point-to-point testing documentation and (when specified as work of the Contractor) the current Testing, Adjusting and Balancing (TAB) report (marked with the date of submission).
11. Submit all controls systems software files required by the Contract Documents including, but not limited to, lighting and environmental controls.

B. Substantial Completion: Upon a satisfactory completion of the actions in 1.8A above and the General Conditions requirements for Substantial Completion, the Owner will prepare a letter of Substantial Completion and forward to Contractor. The letter will identify the date of Substantial Completion and include the final punch list report and the commissioning deficiencies list, listing all remaining incomplete work. Contract warranties will begin as of the date of Substantial Completion, as specified in Section 01 78 36 “Warranties,” or as otherwise indicated in the Contract Documents.
1. Substantial Completion and the start of warranties for incomplete items will be established in writing by the Owner when the item is determined complete.

1.9 FINAL COMPLETION

A. Prior to Final Completion: Final Completion shall be achieved when the Work is fully and finally complete, to the Owner's satisfaction in accordance with the Contract Documents including, but not limited to, the following:
1. All Work, including incidental corrective or punch list work, and air balancing and commissioning work (if included in the scope of the Work) is complete and correct to the satisfaction of the Owner.
2. All remaining temporary facilities are removed from the Project site and the site (including landscape) is restored to original conditions or Contract Documents requirements.
3. All final permits, originally issued as temporary permits, have been submitted.
4. The final marked-up Project Record as-built Drawings and Specifications identified Final Project Record (marked with the date of submission) have been submitted in hard copy; and in PDF format, on Owner's CMS.
5. The complete Operations and Maintenance Manual and Warranties and Bonds Manuals have been submitted in PDF format, on Owner's CMS, and a hard copy of the Warranties and Bonds Manual with original documents has been submitted.
6. The Contractor's final 3-ring binder of all MSDS used for construction, marked with the date of submission, has been submitted in PDF format, on Owner's CMS.
7. The Contractor's final cumulative Construction Waste Management Report (marked with the date of submission) has been submitted in PDF format, on Owner's CMS.
8. All Change Orders are approved and signed by both parties.
9. A draft of the Final Application for Payment has been submitted to Owner for review and approval.
10. The final Schedule of Values and the Building Componentization Report in hard and electronic copies (see Section 01 29 76 “Progress Payment Procedures”) have been submitted.
11. The final environmental control systems point-to-point testing documentation and (when specified as work of the Contractor) the final air balancing report marked with the date of submission, has been submitted in PDF format, on Owner's CMS.
12. Specified spare parts, extra stock of materials, and extra materials of value to the Owner, with itemized summary list, have been submitted.

13. The "Regulated Materials – Waste Manifests" (marked with date of submission) have been submitted in PDF format, on Owner’s CMS.

14. For Projects at the UW Warren G. Magnuson Health Sciences Center, UW Medical Center, and Harborview Medical Center; all personnel identification badges have been returned.

B. Final Completion: Upon satisfactory completion of the requirements in 1.9A above to achieve Final Completion, the Owner will approve and process the final Application for Payment and establish the date of Final Completion thereon.

1.10 FINAL ACCEPTANCE

A. Final Application for Payment has been approved by Owner and payment made to the Contractor.

B. The Owner will establish the date of Final Acceptance and issue the letter of Final Acceptance after the Contractor has completed the requirements of the Contract Documents.

1. The Contractor shall follow the requirements outlined in the General Conditions and Section 01 29 76 “Progress Payment Procedures” for release of retainage.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies general administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer’s standard warranties on products and special warranties.

1. Refer to the following General Conditions for terms of the Contractor’s warranty of Work:
   a. Part 5.16 "Correction of Non-conforming Work"
   b. Part 5.21 “Warranty of Construction”

   1) If there is any discrepancy in the Contract Documents regarding the warranty period or its date of commencement, the specified passage granting the Owner the longest warranty period ending on the latest date shall govern.

2. General closeout requirements are included in Section 01 77 00 “Closeout Procedures.”

3. Specific requirements for warranties for the Work and products and installation that are specified to be warranted are included in the individual sections of the Specifications.

4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

B. Disclaimers and Limitations: Manufacturer’s disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and Subcontractors that are required to countersign special warranties with the Contractor.

1.2 DEFINITIONS

A. “Standard Product Warranties” are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. “Special Warranties” are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.3 WARRANTY REQUIREMENTS

A. General: Upon determination that Work covered by a warranty has failed, correct or replace the Work to an acceptable condition complying with requirements of Contract Documents.

B. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

C. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected or replaced and restested and/or re-commissioned reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

D. Costs: The Contractor is responsible for the cost of correcting or replacing including the cost for retesting and/or re-commissioning defective Work, regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
E. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

2. Right to Refuse Work: The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

A. Submit written warranties to the Owner's Representative. Provide a draft for Owner's review and comment prior to final execution. Warranties shall identify:

1. Scope description of what is covered (indicate labor and/or materials requirements);
2. The Specification reference stating the warranty;
3. The date of the warranty's start and finish (indicate the specified warranty duration);
4. Service and maintenance contracts, when specified in the Contract Documents;
5. Supplier's name, address, e-mail address, and telephone number;
6. Proper procedure in case of failure; and
7. Instances which might affect validity of warranty.

B. When a special warranty is required to be executed by the Contractor, or the Contractor and a Subcontractor, supplier, or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties.

1. Refer to individual sections of the Specifications for specific content requirements, and particular requirements for submittal of special warranties.

C. Include warranties in the Operations and Maintenance Manual (see Section 01 77 00 “Closeout Procedures”).

D. Review and acceptance, by the A/E or Owner's Representative, of submitted warranties does not relieve the Contractor of the warranty requirements of the Contract Documents.

E. The Owner may generate and keep electronic copies of original executed warranties, certifications, and other similar commitments and such copies shall be considered as originals.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Comply with the commissioning provisions specified in this Section and elsewhere in the Contract Documents.

B. General:
   1. Unless noted otherwise, functional performance tests (FPT) apply to all equipment and systems identified to be tested in the Contract Documents.
   2. Submittals shall be in accordance with Section 01 33 00 “Submittal Procedures” and for CAD (Computer Aided Drafting) Record Drawings, in accordance with Section 01 77 00 “Closeout Procedures.”
   3. The duties of the Contractor’s “Test Engineer” and Owner’s “Commissioning Authority” are described in Section 01 75 00 “Test Engineer Services.”
   4. The Contractor shall ensure that the Commissioning Authority, or other Owner-designated witness, is provided safe access to witness the performance of the equipment or systems being commissioned and is reasonably furnished ladders, scaffolding, and staging, if required, for witnessing.

1.2 COMMISSIONING DOCUMENTATION

A. Commissioning Plan: The Contractor shall prepare and submit a “Commissioning Plan” that identifies how commissioning activities will be integrated into the construction Progress Schedule and how commissioning responsibilities are distributed. Include, as a minimum, the following:
   1. An organizational chart showing lines of communication and authority of the Test Engineer relative to key Contractor positions and to key Subcontractors
   2. Who will be responsible for producing the various procedures, reports, Owner notifications, and forms required by the Contract Documents
   3. list of all control systems software required by the Contract Documents
   4. The commissioning schedule
   5. Commissioning forms and other documentation
   6. Description of start-up and test procedures
   7. list of Subcontractors who will participate in each of the tests
   8. The instrumentation required for each test and who will provide the instrumentation
   9. Operational description for each test (This shall include, for example, the commissioning basis-of-design criteria provided by the commissioning authority, code requirements, the specifics of the equipment to be provided, sequences of operation, operating priorities, and other necessary information.)
   10. One-line system and riser diagrams

B. Mechanical and Electrical Commissioning Binders (M&E): The M&E “Commissioning Binders” shall include the submittals, test equipment, commissioning procedures, installation verification audits, and FPT procedures documentation described in this Section.

1.3 SUBMITTALS

A. Start-up plans: Submit start-up plans, with start-up test procedures and documentation forms, for the equipment and systems for which a start-up is specified in the Contract Documents.
   Start-up plans shall include the following:
   1. Start-up schedule
   2. Names of firms/individuals required to participate
   3. Detailed start-up procedures
4. Start-up forms
5. Operations and maintenance product data

B. Start-up installation verification audit report: Submit installation verification audit reports prior to start-up of equipment and systems for which a start-up is specified in the Contract Documents. Identify:
1. Equipment and/or systems, to be started-up;
2. Prestart-up tests performed, including manufacturer’s factory tests;
3. Deficiencies noted;
4. Corrective action taken; and
5. Dates and initials of persons making the entries.

C. Start-up deficiency report form: Submit start-up deficiency report forms within five (5) days following the start-up of each equipment or system to report any deficiencies discovered in conjunction with start-up. Identify:
1. Equipment and/or systems started-up;
2. Location and identification of the deficient equipment and/or materials;
3. Date of observation and initials of observer;
4. Deficiencies noted;
5. Corrective action taken; and
6. Date of correction and initials of the person making the correction.

D. Test equipment identification list: Submit a list of all test equipment used in commissioning, sorted according to intended use. Provide an updated list, if any equipment is added to the commissioning, while testing is in progress. The list shall include the following information:
1. Manufacturer
2. Model number
3. Serial number
4. Date of most recent calibration
5. Range
6. Accuracy
7. Resolution
8. Intended use

E. Testing, Adjusting and Balancing (TAB) progress reports: Submit weekly TAB progress reports after TAB activities have begun. Identify the following:
1. Systems or subsystems for which preliminary balancing is complete
2. Systems or subsystems for which final balancing is complete
3. Status of deficiencies and balancing problems encountered, including corrective actions taken
4. Updated schedule of remaining TAB activities

F. FPT procedure documentation: Submit FPT procedure documentation for FPT specified in the Contract Documents. The documentation shall include the following:
1. FPT procedure description
2. Procedures that are based upon the actual equipment and/or systems configuration
3. The value for all set points and inputs, positions of adjustable devices, valves, dampers and switches
4. The acceptable test range for each FPT
5. Updated one-line system and riser diagrams
6. An alphanumeric designator for each procedure
7. Reference to the applicable Specifications section upon which the procedure is based

G. FPT data forms: Submit FPT data forms to document the equipment or systems FPT specified in the Contract Documents.
1. Identify each FPT data form by a unique designator, consisting of an applicable FPT procedure designator followed by a dash and digit suffix to distinguish multiple repetitions of the same procedure.

2. The FPT data form shall identify:
   a. Who needs to be in attendance for the tests, including but not limited to, Subcontractors, Commissioning Authority or other Owner-designated witness, regulatory agencies, and others as appropriate; and
   b. The sequence of the tests to be performed.

3. Include space to record the following:
   a. Description of the procedure
   b. Whether the form is for a retest of a failed procedure
   c. Identification and location of the equipment being tested
   d. Identification of instrumentation used, by type and serial number
   e. Observed conditions at each step of the procedure
   f. Acceptable results, as specified
   g. Date of the test
   h. Names of technicians performing the procedure
   i. Name and signature of the Contractor’s Test Engineer
   j. Name and signature of the Commissioning Authority or Owner-designated witness

   1) Signature of witness shall only indicate concurrence with reported results and observations. Acceptance of the results will be reported separately by the Commissioning Authority after review of the FPT data forms.

H. FPT deficiency report forms: Submit FPT deficiency report forms at the end of each day for all tests in which acceptable results were not achieved during the day. When corrections have been completed, update the FPT deficiency report form. FPT deficiency report forms shall record the following:
   1. Associated FPT data form number and description
   2. Equipment identification and location
   3. Date of test
   4. Name of person reporting the deficiency
   5. Description of the observations associated with the failure of the test
   6. Cause of the failure, if apparent at the time of the test
   7. Date and description of corrective action taken
   8. Name and signature of person taking corrective action
   9. Schedule for retest

I. One-line system and riser diagrams: Submit one-line system and riser diagrams with the Commissioning Plan, updated one-line system and riser diagrams with the FPT procedure documentation, and as-built one-line system and riser diagrams with the final M&E Commissioning Binders. One-line system and riser diagrams shall be submitted for the following, when included in the work of the Contract Documents:
   1. Owner-provided one-line system and riser diagrams in CAD format for Contractor’s use:
      a. Hot water heating
      b. Domestic water
      c. Steam and condensate
      d. Chilled water
      e. Condenser water
      f. Supply air
      g. Return air
      h. Exhaust air
      i. Electrical normal and emergency power
   2. Subcontractor-provided one-line system and riser diagrams CAD Shop Drawings, for Contractor’s use:
      a. Environmental control systems (ECS)
b. Fire alarm/smoke evacuation/life safety graphics and riser diagrams  
c. Lighting control system diagrams  
d. Electrical distribution equipment and spot or network substations schematic diagrams

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Provide industry standard test equipment required for performing the tests specified in the Contract Documents.

B. Instrumentation shall meet the following standards:
   1. Be of sufficient quality and accuracy to test and measure system performance within the tolerances required to determine adequate performance
   2. Be calibrated on the manufacturer’s recommended intervals with calibration tags permanently affixed to the instrument being used
   3. Be maintained in good repair and operational condition throughout the duration of use on this Project
   4. Be recalibrated/repaired if dropped or damaged in any way since last calibrated

C. For all temperature measurements, including air, liquids, and surfaces of pipes and components, use appropriate probes that meet the following requirements:
   1. Range: Minimum +14°F to 248°F  
   2. Type: Thermometer, digital electronic  
   3. Minimum accuracy: +/- 0.5°F  
   4. Calibration Interval: Per manufacturer instruction, not to exceed every twelve (12) months.

D. For hydronic systems pressure and differential pressure measurement instruments, the test equipment shall meet the following requirements:
   1. Range: 0 to 30 psi (1 pound per square inch), 0 to 60 psi, and 0 to 200 psi  
   2. Type: Calibrated test gauges, 3 inch, or electronic digital device (TSI Performance Measurement Tools or similar) meeting accuracy and calibration interval requirements.  
   3. Minimum accuracy: 2% with a gauged scale; 3% with an electronic reading  
   4. Calibration interval: Per manufacturer’s recommendation, not to exceed every twelve (12) months.  
   5. Note: Use lowest range instrument or scale

E. For air pressure measurement instruments, the test equipment shall meet the following requirements:
   1. Range: 0 to 1 inch WC (water column), 0 to 4 inch WC, 0 to 10 inch WC  
   2. Type: Use properly leveled and zeroed manometer, magnehelic or electronic instrument meeting accuracy requirements  
   3. Minimum accuracy for electronic devices: 2% with a magnehelic reading; 3% with an electronic reading  
   4. Calibration interval for electronic devices: Per manufacturer’s recommendation, not to exceed every twelve (12) months  
   5. Note: Use lowest range instrument or scale

F. Refer to electrical inspection, calibration, and testing requirements for instrumentation related to electrical systems and equipment.
PART 3 - EXECUTION

3.1 COMMISSIONING PROCEDURE

A. Sequence of testing: Commissioning shall proceed from lower to higher levels of complexity. For each system, testing at the lower level shall be completed prior to starting the next higher level of tests. In general, the order of testing, from lowest to highest is as follows:
   1. Static tests (e.g., duct leakage tests)
   2. Motors, actuators, sensors, and other system components requiring start-up and FPT
   3. Point-to-point (PTP) testing
   4. Balancing
   5. System functional performance tests
   6. Cross-systems functional performance tests

B. Retesting: Repeat, at no additional cost to the Owner, the complete functional test procedure for each test in which acceptable results are not achieved. Repeat tests until acceptable results are achieved. Fill out a new FPT data form for each retest.

C. Correction of deficiencies:
   1. Correct FPT deficiencies promptly and schedule retest.
      a. Corrections during FPT are generally prohibited to avoid consuming the time of personnel waiting for the test, but not involved in making the correction. Exceptions will be allowed if the cause of the failure is obvious and corrective action can be completed in less than five (5) minutes. If corrections are made under this exception, the failure shall be noted on the FPT data form. A new FPT data form, marked “retest”, shall be submitted after the correction has been made. The entire FPT procedure shall be repeated.

3.2 INSTALLATION VERIFICATION AUDIT

A. Conduct an installation verification audit before equipment or system start-up begins. The audit shall include, but not be limited to, a check of the following equipment or systems:
   1. Piping specialties, including balance, control, and isolation valves
   2. Ductwork specialty items, including turning devices; balance, fire, smoke and control dampers; and access doors
   3. Control sensors by type and locations
   4. Piping, valves, starters, gauges, thermometers, and other components of the Work specified for formal start-up in the Contract Documents
   5. Accessibility to equipment in 1 - 4 above
   6. Verification of final programmed variable frequency drives (VFD) settings

B. If any part of the Work is found to be incomplete, inaccessible, incorrect, or non-functional, the Contractor shall make note of deficiencies, and correct deficiencies before system start-up work proceeds.

C. Coordinate with the electrical testing contractor (ETC) for the audit of electrical systems required by the Contract Documents.

3.3 TESTING, ADJUSTING, AND BALANCING (TAB)

A. Complete all PTP testing prior to start of TAB.

B. Coordinate and perform air and hydronic balancing. Advise the TAB firm when systems are complete and ready for balancing. Start TAB as early as possible following system start-ups
and component FPT, in order to be essentially complete prior to system FPT. Coordinate TAB activities with other construction schedule activities.

C. Verify completion of PTP testing and the accuracy of the TAB work prior to commencing any FPT activities which may be adversely affected by incomplete PTP testing and improper balancing.

3.4 FUNCTIONAL PERFORMANCE TEST PROCEDURES

A. FPT procedures must confirm the performance of systems to the extent required by the Contract Documents.
   1. Emphasis shall be placed on testing procedures which will conclusively determine actual system performance and compliance with the design.

B. FPT procedures shall demonstrate the actual performance of specified safety shut-offs in a real or closely simulated condition of failure. Failure conditions shall include adequate oil pressure, proof-of-flow, non-freezing conditions, maximum head pressure, and other conditions common to the equipment.

C. Systems may include safety devices and components that control a variety of equipment operating as a system. Interlocks may be hard-wired or installed via software. FPT procedures shall demonstrate these interlocks.

3.5 ECS SOFTWARE REVIEW

A. Review ECS software and required ECS cross-systems software routines prior to the installation of control devices. The review shall include:
   1. Obtaining ECS program documentation
   2. Review of the programming approach
   3. Interface with other systems, including but not limited to:
      a. Lighting
      b. Fire alarm
      c. Security
      d. Clock
      e. Emergency generator monitoring
      f. Sump pumps
      g. Distributed and mechanical utility metering

B. Discrepancies in programming approaches shall be resolved with the Owner to provide the most appropriate, simple, and straightforward approach to software routines.

3.6 COMMISSIONING MEETINGS

A. The Contractor shall participate in the following meetings with the Commissioning Authority. Other Subcontractors may, at Owner’s sole discretion, be required to attend as necessary.
   1. Pre-commissioning kick-off meeting
   2. Commissioning meetings described in Section 01 31 19 “Project Meetings”
   3. ECS software review, and design intent clarification meeting
   4. Preliminary O&M Manual review meeting

3.7 EQUIPMENT OPERATING INSTRUCTIONS AND TRAINING AGENDA

A. Each training session shall include an agenda addressing the following:
   1. Introduction of presenters
2. Using the O&M information:
   a. What is the equipment
   b. Basic operating procedures (including start-up/shut-down)
   c. Preventative maintenance procedures
   d. Troubleshooting procedures
3. What does it do, or serve
4. Any special features
5. Safety precautions
6. Maintaining warranties, guarantees, and warranty periods
7. Instruction on how to use proprietary instrumentation or operating equipment
8. Recommended spares
9. Review of start-up reports and FPT results
10. Jobsite walk-through

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Removal of designated building equipment and fixtures.
B. Removal of designated construction.
C. Products and installation for patching and extending Work.
D. Disposal of materials.
E. Repair of damaged surfaces, finishes, and cleaning.

1.2 SUBMITTALS
A. Shop Drawings: Indicate demolition; location and construction of temporary facilities.

1.3 REGULATORY REQUIREMENTS
A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.
B. Obtain required permits from authorities.
C. Do not close or obstruct egress from any building exit or site exit.
D. Do not disable or disrupt building fire or life safety systems without 14 days prior written notice to Owner.
E. Conform to applicable regulatory procedures when hazardous or contaminated materials are discovered.

1.4 FIELD CONDITIONS
A. Conduct demolition to minimize interference with adjacent and occupied building areas.
B. Cease operations immediately if structure appears to be in danger and notify Owner. Do not resume operations until directed.

PART 2 PRODUCTS

2.1 PRODUCTS FOR PATCHING AND EXTENDING WORK
A. New Materials: As specified in product Sections; match existing Products and work for patching and extending work.
   1. Where new materials are indicated in Drawings and product Section for material is not included in Project Manual, provide new materials as specified in Drawings.
B. Type and Quality of Existing Products: Determine by inspection and testing Products where necessary, referring to existing Work as a standard.

PART 3 EXECUTION

3.1 PREPARATION
A. Provide, erect, and maintain temporary barriers at locations indicated.
B. Erect and maintain weatherproof closures for exterior openings.
C. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued building occupancy.
D. Protect existing materials that are not to be demolished.
E. Prevent movement of structure; provide bracing and shoring.
F. Notify affected utility companies before starting work and comply with their requirements.
3.2 DEMOLITION
A. Disconnect, remove, and identify designated utilities within demolition areas.
B. Demolish in an orderly and careful manner. Protect existing supporting structural members.
C. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete.
   1. Replace materials as specified for finished Work.
D. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.
E. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
F. Remove materials as demolition progresses. Upon completion of demolition, leave areas in clean condition.
G. Remove temporary facilities.

3.3 INSTALLATION
A. Coordinate work of alterations and renovations to expedite completion sequentially and to accommodate Owner occupancy.
B. Project Finishes: Complete in all respects including operational mechanical and electrical work.
C. Remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to specified condition.
D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
E. In addition to specified replacement of equipment and fixtures restore existing plumbing, heating, ventilation, air conditioning, and electrical systems to full operational condition.
F. Install Products as specified in individual technical specification sections.

3.4 TRANSITIONS
A. Where new Work abuts or aligns with existing, perform a smooth and even transition.
   1. Patched Work to match existing adjacent Work in texture and appearance.
B. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Owner.

3.5 ADJUSTMENTS
A. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
B. Where a change of plane of 1/4 inch or more occurs, submit to Owner a recommendation for providing a smooth transition.
C. Trim existing doors as necessary to clear new floor finish.
   1. Refinish trim as required.
D. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

3.6 FINISHES
A. Finish surfaces as specified in individual technical specification sections.
B. Finish patches to product uniform finish and texture over entire area.
   1. When finish cannot be matched, refinish entire surface to nearest intersections.

3.7 CLEANING
   A. Clean Owner occupied areas affected by Work of this Project.

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The Contractor shall perform all planning, notifications, administration and execution necessary to safely remove, dispose and/or handle the regulated materials listed within this Section in accordance with local, state and federal regulations.

1.2 RELATED WORK

A. Drawings, General Conditions, Modifications to the General Conditions, and Supplemental Conditions to the General Conditions, and other Divisions apply to this Section.

1.3 WORK INCLUDED

A. The Contractor shall supply all labor, equipment, notifications, services, insurance, special permits and equipment necessary for the following regulated materials:

1. Asbestos:

   a. Asbestos abatement is included in this Project and shall be completed per federal, state and local regulatory requirements. Refer to Section 01 35 33 for Infection Controls and requirements of enclosure under negative pressure.

   b. Contractor shall refer to the Hazardous Materials Survey Report (Attached in Appendix C and prepared by PBS Engineering and Environmental). This document lists suspect asbestos-containing materials (ACM) sampled and analyzed for asbestos content, or presumed to exist, at the areas of the building included in the Work. The Contractor shall ensure that copies of this information are made available to and retained at the project site by all subcontractors.

   c. Contractor shall be aware that suspect-ACMs may exist in inaccessible locations of the spaces included in the Work and in areas not included in the Work.

   d. Contractor is advised that, should additional ACMs not included in the Hazardous Materials Survey Report be encountered, the Owner may elect to include the abatement of such materials in the work at a mutually agreed upon price. Work impacting such materials is not to occur prior to the Contractor receiving explicit written authorization from the Owner, and any Work performed without such approval is performed at the Contractor’s own risk and expense.

   e. The disturbance or impact of ACMs may cause asbestos fibers to be released into the building’s atmosphere, thereby creating a potential health hazard to building and tunnel occupants. Contractor is to apprise all workers, supervisory personnel, subcontractors and consultants who will be at the jobsite of the seriousness of this potential hazard and of proper Work procedures that must be followed, should it occur.

   f. Where in the performance of the Work, workers, supervisory personnel, subcontractors, or consultants encounter, disturb, or otherwise function in the
immediate vicinity of any identified ACMs, Contractor shall take appropriate continuous measures, as necessary, to protect its employees, sub-contractors, building occupants from the potential hazard of exposure to airborne asbestos. Such measures shall include the procedures and methods described herein, and compliance with applicable local, state and federal regulations.

g. Damage of Asbestos by the Contractor: Damage to asbestos-containing materials to remain caused by the Contractor shall be repaired to the satisfaction of the Owner by the Contractor using certified asbestos workers according to these specifications, and at the sole expense of the Contractor.

h. Remove and dispose of the following asbestos-containing materials (ACM) according to Section 02 82 00 and review all project related construction documents and demolition drawings.

2. Metals/Lead:

a. Lead/metals-containing materials and associated health and safety compliance and controls are not in the scope of work.

b. The Owner’s consultant has conducted a survey of representative areas in the Building to be impacted by the Work for the presence of lead-containing components. Findings and related analytical data are included in the attached Appendix C Hazardous Materials Survey Report. The report did not identify lead-containing paint. However, all structural steel with primer coating shall be assumed to contained Lead.

c. Contractor shall comply with all applicable Metals regulations, laws and ordinances concerning the impact, removal, handling, storage, disposal, monitoring and protection against exposure or environmental pollution related to building components containing lead coatings or lead products. Impacts to lead that may be required by the Work include, but are not limited to: product installation, manual demolition, mechanical demolition, cutting, sawing, drilling, sanding, scraping, welding or torch-cutting. Confirm required impacts with other applicable specification sections and drawing sheets. In addition, provide all infection controls and engineering controls per contract requirements.

d. Work impacting lead-containing painted coatings and lead-containing items and products within this contract is the responsibility of the Contractor, and all affected Sub-Contractors, and shall be performed in accordance with all applicable local, state and federal regulations.

3. Polychlorinated Biphenyls (PCBs)

a. PCB-containing light ballast or leaking ballasts were not identified at the project site.

b. Representative light ballasts inspected were found to be labeled “No PCBs” or the electronic types without suspect potting compound. However, all magnetic ballasts not marked (unlabeled) or labeled with “No PCBs” must be segregated and recycled through the Owner as they may contain PCBs in low concentrations. As
part of the scope of the project, contractor is to inspect light fixtures and individual ballast (magnetic devices for suspect potting compound regardless of labeling) during demolition activities for proper handling and disposal/recycling.

c. Contractor is responsible for handling, removal, and proper storage of magnetic ballasts for Owner disposal in accordance with applicable local, state and federal regulations and these Specifications. Remove all magnetic ballasts (labeled or unlabeled with “No PCB”) as part of the scope for proper disposal by Owner.

d. Provide U.S. Department of Transportation approved 55-gallon drums (with approved lid) and deposit all removed ballast into containers.

e. Drummed ballast will be disposed-off or recycled by Owner through the UW Environmental Program Office (EPO) as a state regulated waste.

f. Prevent damage to any unlabeled ballasts and immediately report any leaking ballasts to the Owner’s Representative.

g. Submit for review a work plan to address handling and removal of PCB-containing light ballast (labeled and non-labeled) including all appropriate worker protection, environmental controls, and cleanup procedures.

4. Mercury

a. Fluorescent Lighting Tubes/Bulbs and Thermostats.

i. Work includes handling and removing of light tubes, compact bulbs, high-intensity discharge lamps and thermostats for Owner to properly dispose. Fluorescent lighting tubes/bulbs and thermostats may not be disposed of as construction debris because they contain mercury. Thermostats and whole/intact fluorescent and shall remain intact during handling, removal, storage, and transportation.

ii. Thermostats, whole fluorescent light tubes/bulbs and light ballast from the project on the Seattle campus are recycled through UW Recycling Program. Coordinate with the Owner’s representative for the recycling program. To initiate this process, the Owner will contact UW Recycling by calling the Recycle Information Line at 206.685.2811 or sending an email to recycle@u.washington.edu at a minimum one week prior to the scheduled removal of lamps.

iii. The Owner’s fluorescent tube recycling vendor will drop off and subsequently pick up the appropriate number of fiber drums at the project location on specified dates – coordinate with Owner for logistics. The project will be billed directly for tube recycling. Fluorescent tubes must be managed under the state Universal Waste rules. This means that all fluorescent tube drums must be labeled as Universal Waste (usually the recycling contractor does this, but it is the ultimate responsibility of the Owner to label them). The drums must also be under the generator’s control at all times and must be stored at a covered or indoor site.
iv. Damaged and broken tubes/bulbs are disposed of as hazardous waste through the UW Environmental Program Office (EPO) as well. Contractor to provide to Owner for review their work plan to address handling and removal of light tubes and light ballast including all appropriate worker protection and environmental controls.

5. Refrigerants – Not Used – Not in the Scope


8. Contaminated Ductwork - Not Used – Not in the Scope

   a. The purpose of the site specific safety plan (SSSP) is to inform workers of the unique characteristics of SARS-CoV-2 including common reference to the virus Covid 19 and to provide general guidelines for protecting the workers, HMC staff patients, visitors and the job site. As part of the scope the Contractor shall incorporate the best management work practice to prevent the spread of Covid 19 virus for this project.
   b. The plan and work practice submitted should incorporate by reference and not limited (to all amendments) of the University of Washington’s Project Delivery Group Covid-19 prevention guidance document, UW PDG Covid-19 construction project site guidance, April 9, 2020 and the Department of Labor and Industries, Division of Occupational Safety and Health (DOSH), General Coronavirus Prevention Under Stay Home - Stay Healthy Order Updated. And subsequent amendments, extensions, and clarifications, including the Implementation of Phase 1 Construction Restart – Proclamation 20-25 Addendum (4/23/2020) and associated guidance (e.g. DOSH F414-164 and F414-162).
   c. Submit SSSP Covid 19 for Owner review: Such plans should have the minimum guidelines such as a Covid 19 site supervisor, Covid 19 symptoms, worker Covid 19 safety training, infection prevention measure, social distancing, worker screening, engineering controls to prevent spread of virus, PPE, sanitation and cleaning, employee health symptoms, reporting system for confirmed cases and corrective action such as contact tracing and decontamination and enhanced sanitizing of work areas, job hazard analysis if work task is within the 6 feet distancing and project documentation.

10. Silica and Fugitive Dust
   d. Presumed silica-containing building materials such as in structural and finish assemblies of concrete slab (exterior walls, interior walls, floor, columns and ceiling assemblies), plaster wall finish, and wallboard assemblies are present in the areas of work. Silica controls and risk assessment shall apply during concrete floor grinding or preparation of new floor finish.
   e. Contractor is responsible for proper handling, removal, storage, and proper recycling of silica-containing materials according to all applicable regulation, employee and environment protection. Refer other section for engineering
requirements for dust and particulate controls during all work including demolition activities.

f. Construction activities including but not limited to floor preparation, grinding, chipping, drilling, sawing, cutting and jack hammering and other general construction or demolition require control of potentially airborne silica dust from contaminating the environment within the facility. Impact of these building materials with detectable concentrations of silica shall be performed according to Washington Labor and Industries regulations for Silica in Construction (WAC 296-840 and -841 Airborne Contaminants) including all applicable employee exposure assessment.

g. All employers of personnel performing work related to the above are to address the following information related to all tasks to be performed by their personnel. Provide for Owner review Work Safety Plan or Job Hazard Plan to address Silica in building materials to be impacted, including: worker training, personal protective equipment and engineering controls (to limit and control dust) to be implemented during the work, decontamination procedures, access restriction procedures and controlled/restricted areas, enclosures, debris clean-up procedures, worker exposure assessments and any related air monitoring.

11. Contaminated Soil Remediation – Not Used – Not in the Scope


PART 2 - PRODUCTS

2.1 MATERIALS

A. Not Used

2.2 EQUIPMENT

A. Not Used

PART 3 - EXECUTION

3.01 WORK PERFORMED BY ENVIRONMENTAL CONSULTANT

A. In addition to contractor’s ambient and personnel monitoring other necessary sampling such as post-remediation clearance, determination of hazardous and regulated materials or dangerous waste profiling for disposal may be performed by the Owner’s Environmental Consultant.
PART 1 - GENERAL

1.01 SCOPE

A. This section covers the removal and disposal, or other impact, of asbestos-containing materials (ACM) at the areas included in the Work as defined by these Contract Documents. See Sections 01 11 01 (Summary of Work - Regulated Materials) and 02 80 00 (Facility Remediation).

B. Provide all labor, materials, equipment, services, permits and insurance required to complete asbestos-related procedures as indicated in the Contract Documents. Removal and disposal of ACMs shall be in compliance per federal, state and local regulations.

C. Provide all required Infection Controls (per other Section) under negative pressure enclosure (separate from abatement enclosure). Field identify the location and amount of all asbestos-containing materials to be impacted as indicated in this section.

D. The Contractor shall refer to the Hazardous Materials Survey Report that lists suspect materials sampled in areas included in the Work and analysis for asbestos content. Contractor shall ensure that a copy of this information is made available to and retained at the project site by all subcontractors.

E. The Contractor shall be responsible for all air sampling including worker/personnel and area monitoring (pre-abatement and contractors post abatement clearance sampling).

F. Abatement/Removal: Provide all labor, coordination, materials, equipment, services, permits and insurance required to complete ACM removal/abatement, disposal as indicated in the Contract Document, Demolition scope and the following scope:

   1. Remove ACM black mastic associated with 12” floor tile and under carpet (no chemicals to be used, and mechanical means allowed for mastic removal under full enclosure).
      a. Concealed under finish flooring, carpet and wall assemblies in 8EH-34, 8EH-36 and 8EH-01 and as needed in surrounding corridors/vestibules (approx. 900 square feet).
      b. Concealed under non-ACM floor finish in corridors (approximately 500 SF).
      c. Based on previous completed projects at the HMC, PBS assumes that residual ACM back mastic may be present in the other rooms where non-ACM flooring is to be removed (assumed 500 SF).

   2. All accessible mudded fittings tested were found not to contain asbestos. In ceiling and wall cavities mudded pipe fittings were not sampled and are assumed to contain asbestos (includes work areas on the 8th and 7th floor). Remove ACM mudded pipe joints and fitting insulation associated with fiberglass straight runs (approximately 20 liner feet).

   3. Remove sinks ACM undercoat (approximately 5 sinks).

   4. Owner will conduct confirmation bulk sampling to determine asbestos content in any assumed asbestos-containing material or suspect material found during construction.
1.02 RELATED SECTIONS

A. Drawings, General Conditions, Modifications to the General Conditions, and Supplemental Conditions to the General Conditions, and other Divisions apply to this Section.

1.03 DEFINITIONS

A. Wherever the terms below occur in this contract document, they will have the meanings which follow:

1. Abatement: Procedures to control fiber release from asbestos-containing building materials. Includes encapsulation, enclosure, removal, repair and related activities.
2. Adequately wet: sufficiently mixed, saturated, or coated with water or an aqueous solution to prevent emissions.
4. Amended Water: Water containing a surfactant additive.
5. Asbestos: Asbestiform varieties of actinolite, amosite, (Cummingtonite - grunerite, tremolite, chrysotile, crocidolite and anthophyllite.)
6. Asbestos-containing Material (ACM): Any material containing more than one percent (1%) asbestos as defined under NESHAPS CFR 40 Part 61, and OSHA 29 CFR Part 1926.1101, or at least one percent (1%) asbestos as defined under Regulation III of the Puget Sound Clean Air Agency.
7. Asbestos-containing Waste Material: Asbestos-containing materials, materials used to control the work area during the asbestos project, debris, containers, bags, protective clothing and HEPA filters.
8. Authorized Visitor: The Owner or designated representative, or a representative of any regulatory or other agency having jurisdiction over the project, and having required training, medical, fit test, etc.
10. Certified Asbestos Supervisor: person certified by WAC Chapter 296-65-012, whose duties include at least: establishing negative pressure, mini-enclosure, glove bag or other engineering controls, ensure integrity of those controls, supervise employee monitoring, protective equipment, training, hygiene and decontamination procedures.
11. Certified Industrial Hygienist (CIH): An industrial hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene.
12. Class I Asbestos Work: Activities involving the removal of TSI, surfacing ACM and presumed asbestos-containing materials as defined by OSHA. Materials include those otherwise regulated by WISHA including, but not limited to, pipe insulation.
13. Class II Asbestos Work: Activities involving the removal of ACM which is not thermal system insulation or surfacing material as defined by OSHA. This also includes, but is not limited to, the removal of asbestos-containing floor tile, cement asbestos board, roofing and siding.
14. Critical Barrier: Barrier constructed of two layers of six-mil plastic sheeting and sealed at the edges with duct tape and, as appropriate, spray adhesive. Critical barriers constructed in exterior areas shall utilize reinforced plastic sheeting.
15. Decontamination Area: Enclosed area adjacent and connected to regulated area and consisting of equipment room, shower area, and clean room, which is used to decontaminate workers, materials, and equipment.
16. Disposal: Procedures necessary to transport and deposit the asbestos-contaminated material in an approved waste disposal site in compliance with EPA and other applicable regulations.
17. Disposal Site: EPA and UW approved landfill for asbestos-containing waste.
18. EPA: U. S. Environmental Protection Agency.
19. Encapsulant (Sealant): A liquid material which can be applied to asbestos-containing material and which controls the possible release of asbestos fibers from the material.
either by creating a membrane over the surface (bridging encapsulant), or by penetrating into the material and binding its components together (penetrating encapsulant).

20. Environmental Consultant: Environmental consultant specializing in asbestos abatement and retained by the Owner.

21. Fiber: A particulate form five micrometers or longer, with a length to diameter ratio of at least 3:1.

22. Fibers/cc: Fibers per cubic centimeter of air.

23. Fixed Object: Fixtures which are attached to the building or are too heavy or bulky to remove from the work area.

24. Glove bag: A manufactured device consisting of a transparent plastic bag with inward projecting sleeves, an internal tool pouch, provisions for fastening and sealing at the top and sides, and a receptacle in the bottom to hold asbestos waste. The glove bag is installed so as to surround the material to be removed and contain all fibers released during the process. Gloves are used to remove insulation from small sections of pipe and fittings.

25. HEPA Filter: A High Efficiency Particulate Air (absolute) filter capable of trapping and retaining 99.97% of asbestos fibers greater than 0.3 microns in length.

26. HEPA Vacuum Equipment: High Efficiency Particulate Air (absolute) filtered vacuuming equipment with a filter system capable of collecting and retaining asbestos fibers. Filters of 99.97% efficiency for retaining fibers of 0.3 microns in length or larger shall be installed for filtering discharge air.


28. Independent Testing Laboratory: A laboratory financially independent from and hired by the Owner or Contractor which is either AIHA-accredited for asbestos with demonstrated proficiency via the AIHA PAT program, or has analysts proficient in the AIHA AAR program for air sample analysis.

29. Industrial Hygienist: An employee of the Independent Testing Laboratory who is experienced and trained in asbestos sampling and analysis as specified.


31. Mini-enclosure: An enclosure fabricated to effectively contain a small work area conforming to EPA, AHERA, 40 CFR 763 Subpart E, Appendix B.

32. Movable Object: Furnishings which are not attached to the building structure and can be removed from the work area.

33. Non-Isolated, Regulated Area: Work area where Class II asbestos abatement work is performed as defined by OSHA 29 CFR 1910.

34. NVLAP: National Voluntary Laboratory Assurance Program.

35. PACM: Presumed asbestos-containing materials.

36. PAT: Proficiency Analytical Testing program performed for NIOSH method 7400.

37. PCM: Phase Contrast Microscopy analytic method applied to air samples to determine airborne fiber concentrations, NIOSH method 7400.

38. PLM: Phase Light Microscopy analytic method applied to bulk material samples to determine asbestos content, EPA method 40 CFR 763, Subpart F, Appendix A.

39. Public Area: Any area outside the isolated work area. When work area isolation measures are removed, the work area becomes a public area.

40. Regulated Area: Area which only certified asbestos workers and other persons authorized by Regulation I of the Washington Industrial Health Act have access, where asbestos materials to be removed exist, or where airborne fiber concentrations are expected to exceed 0.01 f/cc.

41. Removal: All operations where ACM and/or PACM are taken out or stripped from structures or substrates, and include demolition activities.

42. Surfactant: A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.
43. Thermal System Insulation (TSI): ACM applied to pipes, fittings, boilers, breaching, tanks, ducts or other structural components to prevent heat loss or gain.

44. Transport: Hauling of asbestos-containing waste from a work site to a disposal site and deposit of the waste by a firm in compliance with the EPA, Washington State and PSCAA.

45. Waste Load-out Area: A two chamber system adjacent to the negative pressure enclosure used for the final preparation and external decontamination of waste containers, and short term storage waste containers prior to transport from the jobsite.

46. Waste Shipment Records: Form similar to that shown in EPA NESHAP 40 CFR 61.150(d)(1), or an EPA approved state or local form.

47. Worksite Entry Logbook: A logbook kept in the clean room which must be signed by everyone entering or leaving the work area.

1.04 DOCUMENTS INCORPORATED BY REFERENCE

A. The current issue of each document shall govern. Where conflict among requirements or with these Specifications exists, the most stringent requirements shall apply.


3. U.S. Department of Labor Occupational Safety and Health Administration (OSHA):


6. Title 29 Code of Federal Regulations Section 1910 et al.--Occupational Exposure to Asbestos; Final Rule.


8. Title 29 Code of Federal Regulations Section 1910.2--Access to Employee Exposure and Medical Records.


13. CERCLA, Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 et seq.)


17. Washington Industrial Safeties and Health Act (WISHA).


19. Electrical work shall be performed in accordance with the National Electrical Code.

20. All local ordinances, regulations, or rules pertaining to asbestos, including its storage, transportation, and disposal.

1.05 SUBMITTALS AND NOTICES

A. Contractor shall provide electronic documents of the "Pre-Job Submittals" as indicated below for review by the Environmental Consultant and Owner. No asbestos-related work will be permitted prior to submittals being approved by the Environmental Consultant. Allow ten (10) days for review.

B. Additional requirements for submittals are also described in other sections of these specifications. The requirements in this section pertain to asbestos-containing materials removal.

C. Submit the "Contractor Acknowledgment of Asbestos Hazard Training, Respirator Training and Agreement to Undertake All Required Precautions", Form 028200-1. (attached to this Section) completed and signed by the Abatement Contractor in conjunction with pre-job submittals.

D. Contractor shall submit to the Environmental Consultant the following information prior to beginning work on the project:

1. Work Plan: Include a detailed plan of the procedures proposed for use in complying with the requirements, including the following:

   a. A description of all special equipment, techniques, and methods to be used on the Project, including description of work area layout(s) citing entries/exits, HEPA exhausts through open windows, decon units, waste load-outs, emergency spill controls SOP, etc.

   b. A detailed project schedule, including proposed clearance monitoring schedule and progression of abatement through the work areas.

   c. Specific information relating to handling, transport and disposal of asbestos-containing waste. Identify any disposal site (must be Owner approved site) at which
any waste material generated during the project will be disposed and furnish evidence of all necessary government approvals to dispose of the waste.

2. Laboratory Qualification Information: Submit information pertaining to the proposed Air Monitoring Program for this project. Air monitoring shall include employee exposure monitoring, area air sampling and post abatement air sampling. This information shall include the name(s) of the on-site Industrial Hygiene Technician working under the foreman's supervision, types of equipment, sampling schedule, sampling procedures, calibration record keeping, name and address of proposed Independent Testing Laboratory, and evidence of analyst's NIOSH 582 course completion and AIHA PAT program participation.

3. Notifications and Permits: Submit copy of all required notifications and permits obtained by the contractor (Washington State Department of Labor and Industries, and PSCAA) and copies of all types of specified bonds and insurance. Submit upon receipt any approved amendments to notifications or re-notifications for multi-phase activities. See Permits and Notifications for additional requirements.

4. Asbestos Supervisor: Submit the name, Asbestos Supervisor Certification, Certificate of Worker Acknowledgment and resume of experience of the assigned on-site foreman. At a minimum, the foreman shall have successfully completed a supervisor training course in compliance with WAC Chapter 296-65-007. References and work on similar projects will also be reviewed. The Owner reserves the right to reject the foreman from the work at any time during the project. The Contractor shall then submit another on-site foreman for approval as described above.

5. Emergency Cleanup and Control Plan: Contractor shall submit for review a comprehensive plan detailing procedures to be implemented in the event of an asbestos spill. Information shall include the name of the Contractor's supervisory personnel responsible for identifying spills, detailed procedures of cleanup of spills, communication procedures, and methods to expedite response time.

E. Periodic Job Submittals:

1. Personal/worker Air Monitoring: Submit copies of all personal air monitoring data sheets, chain-of-custody and analytical results to the Owner and Environmental Consultant on a daily basis prior to the start of the next work shift following sample collection.

2. Daily Logs: Submit daily logs to the Owner and Environmental Consultant daily prior to the start of the next work shift. Daily logs shall indicate the ACM quantity removed, date, time, identity, company or agency represented, and reason for entry of all persons entering the work area, and the type, amount and location(s) of all ACMs removed.

3. Provide documentation of training (and current certification identification numbers), medical monitoring and fit test records of employees as required by applicable regulations. Such documentation will be maintained on the project site as required by applicable regulations.

F. Post-Job Submittals shall be delivered to the Owner within 15-days of completion of work and shall include the following:
1. Certification: Provide the completed Certification of Clearance that Contractor has fully inspected the work area and completed work in strict accordance with the Specifications.

2. Air Monitoring: Submit documentation of all employee personal air monitoring results relative to OSHA and WISHA respiratory protection level compliance. Include copies of all air monitoring data sheets, chain-of-custody documentation and analysis reports for sampling conducted at the site.

3. Project Record Documents: Provide project records including documentation of all contract changes, and copies of worksite entry log books, safety logs, sign-in sheets, and supervisor's daily field reports.

4. Disposal Manifests: Submit copies of all asbestos waste disposal transportation and disposal manifests including signed receipts from the landfill (shall be Owner approved landfill), and chain-of-custody.

1.06 PERSONNEL PROTECTION

A. Training: All personnel accomplishing removal of asbestos-containing materials shall have received the minimum training as required by the Washington State Department of Labor and Industries for the work to be performed. At a minimum, the supervisor shall be the bearer of a current "Certified Asbestos Supervisor Certificate" issued by the Washington State Department of Labor and Industries. Prior to commencement of work, Contractor shall ensure all workers have been trained as specified in WAC Chapter 296-65.

1. The Contractor shall provide and post decontamination, respirator, and work procedures for abatement crew.

2. The Contractor shall ensure that all employees have been trained as to emergency evacuation procedures specific to each work area.

B. Personnel Protective Equipment for Asbestos Removal: Provide protective clothing and equipment per WAC 296-62 and Protective Clothing and Equipment.

1.07 AIR MONITORING BY CONTRACTOR (PERSONNEL AND CLEARANCE)

A. Laboratory Analysis: An Independent Testing Laboratory shall be retained by the Contractor for PCM sample analysis. All analysis shall be performed by an analyst experienced and trained in asbestos sampling and analysis. At a minimum, documentation of prior asbestos sampling and analysis experience, plus satisfactory completion of the NIOSH 582 course or equivalent will be required. Air sample collection may be performed by an Industrial Hygienist or the Contractor's foreman at the Contractor's option. The Contractor shall perform sampling and analysis of air samples for asbestos in compliance with WAC Chapter 296-62-07735, Appendix A-WISHA reference method.

B. Sample Documentation: Documentation shall be kept for each filter sample procured as to worker sampled, activity, work area location, date and time taken, volume of air drawn through filter, pump identification number and calibration. Documentation shall indicate in what areas tests were taken and shall clearly indicate the specified maximum allowable fiber levels for each area tested. Report all data on copies of the Asbestos Air Sample Data Sheet bound in these Specifications or similar approved form within 48 hours. Fill in all information on every form. Submit chain-of-custody records along with all samples.
C. Analysis Procedures: The samples shall be collected on 25 mm filters and analyzed within 12 hours using the membrane filter method at 400-500x magnification with phase contrast illumination--NIOSH Analytical Method No. 7400--for laboratory and field analysis. The analyst shall sign and submit permanent records of all samples analyzed directly to the Environmental Consultant. The Independent Testing Laboratory shall seal the unused portion of all filters in airtight containers so that individual samples can be re-analyzed at a later date if necessary. The containers shall be clearly labeled with Project Name and Sample Number and shall become property of the Owner at work completion at the Owner's request.

D. Controls: The Contractor's testing laboratory shall submit sample analysis results, chain-of-custody and equipment calibration records to the Owner prior to the start of the next work shift following collection.

E. Contractor's Sampling During Abatement.
   1. Sample Collection: Air monitoring shall be performed to determine worker exposure during the period of asbestos abatement in each work area. Begin sampling when asbestos removal commences. Contractor shall determine which worker(s) in each work area is probably experiencing the most severe exposure. This is the "Most Contaminated Worker(s)". 8-hour TWA and 30-minute excursion samples shall be collected on this worker(s). This worker shall wear a personal sampling pump and the sample shall be drawn from the breathing zone of this worker.

   2. The number of air samples collected shall be in accordance with the Contractor's approved work plan, however, a minimum of one sample per work area must be collected daily.

F. Quality Assurance: See Quality Assurance for additional requirements related to air monitoring.

1.08 AIR MONITORING BY OWNER

A. Industrial Hygienist: The Environmental Consultant may collect and analyze asbestos air samples prior to abatement, inside the work area, outside the work area, at HEPA exhaust, and work area clearance/post abatement, and conduct visual inspection at the Owner's discretion and expense. See Section 1.14, Quality Assurance, for additional requirements related to air monitoring.

B. Sampling and analysis of asbestos samples shall be performed in compliance with WAC Chapter 296-62-07735, Appendix A--WISHA reference method.

C. The Owner reserves the right to monitor Contractor's performance via air samples on abatement workers in addition to the Contractor's air monitoring responsibility.

1.09 OWNER OCCUPANCY

A. The area of abatement shall be occupied only by properly trained and protected personnel during abatement activities. Construct the abatement control areas and perform the work so as not to interfere with the Owner's site and facility operations. Owner will temporary vacate the Work Areas during abatement. All existing furnishing, equipment, medical devices, computers etc. remaining at the work areas shall be protected and covered with 6-mil plastic sheeting during asbestos abatement.
1.10 WORKING HOURS

A. No asbestos abatement shall occur when University staff or building users have access to the work area(s). Refer to other Section for work hours and all restriction.

1.11 PERMITS AND NOTIFICATIONS

A. The Contractor is responsible for obtaining and maintaining all permits and notifications as required for the completion of the work by the Washington State Department of Labor and Industries, the U.S. E.P.A., the Puget Sound Clean Air Agency and any other permitting agency involved with the completion of the work included herein.

B. Puget Sound Clean Air Agency (PSCAA)

1. At least 15 days before undertaking an Asbestos Project, the Contractor shall submit to the Owner a copy of the Notice of Intent to Remove Asbestos that the Contractor has filed with PSCAA. Prior to the start of any abatement work, the Contractor shall post the Notice of Intent to Remove Asbestos with PSCAA's case number and signature of reviewing officer to prove that the Notification has been processed by PSCAA.

2. The Contractor shall participate in PSCAA's Contractor Job Scheduling program whereby a daily fax is sent to PSCAA informing them of the Contractor's work schedule. A copy of this document shall be faxed to the Owner at the same time it is faxed or emailed to PSCAA. This PSCAA notification shall remain open until the entire general contract work has been completed, in case additional asbestos should be encountered.

1.12 LIABILITY

A. The Contractor is an independent contractor and not an employee of the Owner, Architect or Environmental Consultant. The Owner, Architect and the Environmental Consultant shall have no liability to the Contractor or any third persons for Contractor's failure to faithfully perform and follow the provisions of these Specifications and the requirements of the governing agencies. Notwithstanding the failure of the Owner, Architect or the Environmental Consultant to discover a violation by the Contractor of any of the provisions of these Specifications, or to require the Contractor to fully perform and follow any of them, such failure shall not constitute a waiver of any of the requirements of these Specifications which shall remain fully binding upon the Contractor.

1.13 SUBCONTRACTORS

A. Contractor performing work of this section shall be bound to all the work and safety standards specified and contractor's personnel shall meet requirements as specified.

1.14 QUALITY ASSURANCE

A. Qualifications for Performance of Work

1. Contractor performing the work of this section shall have a record of successful experience in asbestos removal and related Work similar in scope and magnitude to this Project. Contractor shall have valid licenses and certifications as a Contractor and an Asbestos Abatement Contractor in the State of Washington.

2. Maintain on site a full-time Certified Asbestos Supervisor approved by the Owner per pre-job submittals.
3. Provide one experienced Foreman for every ten asbestos workers, or portion thereof, utilized on the Project.

B. On-Site Observation

1. Pre-Removal: Contractor and Environmental Consultant shall perform observations regarding: demarcation of regulated area, installation of critical barriers, integrity of negative pressure enclosures, waste load-out facilities, and other conditions affecting abatement work. Contractor shall request pre-removal observations a minimum of two hours prior to desired removal commencing. No abatement work shall be performed prior to pre-removal observation by the Environmental Consultant.

2. Observation: Contractor and Environmental Consultant shall perform observations regarding: integrity of isolation barriers, decontamination facilities, worker protection, Contractor's air monitoring program, performance of abatement operations, and conformance to the Specification, EPA, OSHA, WISHA and PSCAA regulations.

3. Post Removal: Contractor and Environmental Consultant shall perform visual inspections after the removal of asbestos-containing materials and cleaning of work area(s) is complete.

   a. Following abatement and cleaning of work area(s), the abatement superintendent shall inspect the work area(s), and notify the Environmental Consultant that the scheduled post-abatement inspection may commence.

   b. Visual Inspections will be considered acceptable when no dust, debris or other refuse of any kind exists within the work area(s).

   c. Upon completion of the post-abatement inspection, the Environmental Consultant shall indicate acceptance of the work area for compliance, as appropriate.

   d. Should additional cleaning of the work area be required to meet the standards set forth in paragraph b of this section, the Environmental Consultant shall indicate deficiencies on the "Daily Log" report and notify the Contractor of such deficiencies.

   e. The Contractor shall not proceed with post-abatement sampling until post-removal visual inspection by the Environmental Consultant has determined work area(s) acceptable and completes the “Certificate of Clearance Form” found in the end of this Section. Both contractor and Environmental Consultant shall sign this form for submittal to the Owner.

4. Daily Work Area Inspection/Cleaning: Inspect all work areas prior to the end of each work shift. Personnel performing such inspections shall have proper training per (minimum of Class III asbestos training). Daily work area inspections shall identify any dust, debris or other refuse existing in areas to be occupied by building staff or users subsequent to the Contractor’s work shift.

   a. Any suspect asbestos debris (<1 SF) is to be cleaned using HEPA vacuums, wet-wiping and appropriately trained personnel;

   b. Any other debris identified is to be cleaned using wet-wiping and/or HEPA vacuuming;
c. Document location(s) and type(s) of debris identified, cleaning procedures, and the time of completion of cleanup in each area.

d. Any identified suspect asbestos spills in excess of 1 localized SF are to be reported immediately to the Owner and Environmental Consultant, and the affected area is to be restricted pending cleanup in compliance with the Contractor’s emergency cleanup and control plan required under Item below.

5. Stop Work: Owner shall notify the Contractor in writing to stop abatement work if the Owner determines that work practices are in violation of regulations, these Specifications or that work is endangering workers or occupants of the building. The Contractor shall continue work when conditions and actions are corrected and when written authorization is received from the Owner.

6. Schedule of Inspections: The Contractor shall schedule pre-removal and post-removal visual inspections with the Environmental Consultant a minimum of forty-eight (48) hours in advance of the desired inspection occurring.

a. Any delay in the completion of the Work caused by a lack of proper scheduling of inspections shall not be sufficient cause for any extension of time or extension of the project completion date.

C. Air Monitoring

1. Notification: If, at any time during the work, analysis of an air sample taken by the Contractor, Owner, or Environmental Consultant, indicates a fiber concentration in excess of the applicable Maximum Allowable Fiber Concentration, the laboratory that analyzed the air sample shall immediately notify the Contractor, Owner and Environmental Consultant.

2. Maximum Allowable Fiber Concentrations:
   a. Outside all Regulated Work Areas: 0.01 f/cc (fibers per cubic centimeter by PCM) or below pre-abatement.
   b. Inside Non-Isolated Regulated Work Area: 0.01 f/cc or below pre-abatement levels.
   c. Post-Abatement/Clearance: 0.01 f/cc or below pre-abatement levels.

3. Procedures: Immediately upon being notified of fiber concentration in excess of the Maximum Allowable Fiber Concentration, the Contractor shall perform the following steps in the order presented, at no additional cost to the Owner:
   a. Stop abatement work and identify source of high fiber counts.
   b. Corrective Actions: Immediately correct containment breaches, pressure differential changes and potential cause of high fiber counts. The Environmental Consultant will determine the affected area considered to be contaminated and the proper cleaning to be performed by the Contractor at no additional cost to the Owner.
   c. Clean the affected area. Cleaning will include wet methods and HEPA vacuuming.
   d. Re-sample air until fiber counts are determined to be below the specified maximum levels.
e. Secure and repair containment barriers, repair or add equipment, modify work procedures, and make other changes to reduce fiber counts.

g. Resume work and air monitoring.

4. **Post-Abatement Sampling**: The Contractor is responsible for all post abatement and/or clearance sampling using PCM sample collection and analysis. Provide to Owner and Environmental Consultant all air clearance sampling data. Analysis of PCM air clearance samples shall be posted by the contractor within four hours upon completion of clearance sampling. Upon review and found to be acceptable (and as compared to Environmental Consultant's QA/QC clearance sampling data), the work area can be considered “cleared for re-occupancy”. If there are conflicts with PCM sampling results, the best air quality results shall be used and applied in the field.

D. Performance: Work shall be performed in a skillful manner representing industry standards. Environmental Consultant shall require Contractor to remove from the work site employees and subcontractors the Environmental Consultant deems incompetent, careless or objectionable.

E. Additional Costs: The Contractor shall be responsible for costs of any testing, cleanup, repair, down time loss, etc. that is a result of the Contractor's negligence, poor maintenance of isolated areas, improper procedures or airborne fiber concentrations above the Maximum Allowable Fiber Concentrations.

**PART 2 - PRODUCTS**

2.01 **PROTECTIVE CLOTHING AND EQUIPMENT**

A. Provide approved clothing per WAC 296-62 for all workers and all official representatives of the Owner, State or other governmental entity, and the Environmental Consultant who may inspect or visit the project. Work clothes shall consist of disposable full-body coveralls and head and foot covers ("Tyvek" or approved equal), boots, or sneakers. Eye, hearing, fall protection, gloves and hard hats shall be available, as required by job site conditions.

B. Respirators: At a minimum, respiratory protection shall be approved by NIOSH/MSHA (National Institute for Occupational Safety and Health/Mine Safety and Health Administration), United States Department of Labor, and U.S. Department of Health, Education and Welfare, Centers for Disease Control, in accordance with WAC Chapter 296-62-071 and WAC 298-841/842. Respiratory protection shall provide workers with a maximum calculated fiber level inside the mask of 0.01 f/cc.

1. Selection: As part of the Contractor's Respiratory Protection Program, all workers shall be provided with a selection of brands and sizes of respirators to choose from. At a minimum, all workers shall be quantitatively or qualitatively fit-tested at the time of respirator selection per WAC Chapter 296-62-07715 and WAC 298-841/842. Respiratory protection shall provide workers with a maximum calculated fiber level inside the mask of 0.01 f/cc.

2. Contractor shall supply replacement filter cartridges as required. Cartridges which have become wet or clogged shall be replaced immediately.

3. Contractor shall provide personal protective equipment and supplies to the Environmental Consultant and authorized visitors for use on the site.

C. Air-purifying Equipment: Air-purifying equipment shall consist of High-efficiency Particulate Air (HEPA) filtration systems. No air movement system or air equipment shall discharge
asbestos fibers outside the work area. Each unit shall be capable of variable volume from a
minimum of 500 CFM to at least 1700 CFM under load and shall have at least 2 stages of
prefiltration ahead of the HEPA final filter. Each unit shall be equipped with an elapsed time
indicator (hour meter), static pressure gauge with low flow alarm, and be overload protected.
At the Contractor's option, each unit shall be equipped with heat and smoke sensors which
will visually and audibly warn workers and shut unit fan down within 30 seconds. The units
shall be: Micro-Trap Portable Air Filtration System manufactured by Asbestos Control
Technology, Inc. or Owner approved equal.

D. Water-purifying Equipment: Capable of removing all fibers longer than 5 microns or as
required by local regulations from water used in abatement work and decontamination
showers. Control Resource Systems, Inc. "AQUA-HOG" or Owner approved equal.

E. Vacuum Equipment: all vacuum equipment utilized in the work area shall be High-efficiency
Particulate Air (HEPA) equipment, and suitable for wet/dry usage.

F. Transportation Equipment: Transportation equipment, as required, shall be suitable for
loading, temporary storage, transit, and unloading of contaminated waste without exposure
to persons or property. Equipment shall have a hard bottom and sides. If equipment is
rented, notify rental agency in advance, in writing, of intended use of equipment.

G. Electrical: Electrical tools, equipment and lighting shall meet all applicable codes and
regulations, including WAC Chapter 296-155-426 to 462. Ground fault protection as required
by OSHA, shall be in effect at all times. Contractor shall take all additional precautions and
measures necessary to ensure a safe working environment during wet removal.

H. Remote Filter Housing: Stainless steel housing with pre-filters and HEPA filter sealed to
cabinet flanges by Century Equipment "Advance Guard II" or approved equal.

I. Other Tools and Equipment: Provide other suitable tools for the removal, glovebags,
enclosure, encapsulation, patching, and disposal activities including but not limited to: hand-
held scrapers, wire brushes, sponges, and rounded-edge shovels.

J. Lighting: Provide adequate lighting for safe execution of work and for Environmental
Consultant to perform visual inspections of work areas.

K. Pre-manufactured Remote Decontamination Facility: Remote decontamination facilities
shall be in compliance with all applicable state, federal and local codes and regulations and
function in accordance with these specifications.

2.02 MATERIALS

A. Plastic Sheet: Plastic sheet shall be flame-retardant polyethylene material, minimum
thickness of 6-mil, sized in lengths and widths to minimize the frequency of joints. Exterior
applications require reinforced plastic sheeting.

B. Plastic Bags: Plastic bags shall be 6-mil polyethylene printed with warning labels with
waterproof print and permanent adhesive in accordance with WAC Chapter 296-62-07721,
OSHA, DOT and EPA regulations. Permanently mark the label with the date the material was
collected for disposal, the name of the waste generator, the name and affiliation of the
certified asbestos supervisor, and the location at which the waste was generated.

C. Tape: Tape shall be capable of sealing joints of adjacent sheets of plastic and for attachment
of plastic sheet to finished or unfinished surfaces of dissimilar materials and capable of
adhering under dry and wet conditions, including use of amended water. Minimum of 2" wide tape must be used. Do not use polyethylene tape.

D. Disposal Containers: Disposal containers shall be suitable to receive and retain any asbestos-containing or contaminated materials until disposal at an approved site. The containers shall be labeled with waterproof print and permanent adhesive in accordance with WAC Chapter 296-62-07721, OSHA, DOT and EPA regulations. Permanently mark the label with the date the material was collected for disposal, the name of the waste generator, the name and affiliation of the certified asbestos supervisor, and the location at which the waste was generated. Containers must be both airtight and watertight, and have hard top, bottom and sides.

E. Warning Labels: Warning labels on plastic bags and disposal containers shall include the following information:

```
DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST
```

F. Warning Signs: Warning signs shall be provided and displayed at each regulated area in accordance with WAC Chapter 296-62-07721. Warning signs shall include the following information:

```
DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
AVOID BREATHING AIRBORNE ASBESTOS FIBERS
```

G. Amended Water: Clean potable water containing a surfactant additive. The surfactant additive shall be 50% polyoxyethylene ether and 50% polyethylene ester, or equivalent, and shall be mixed with water at a concentration of one ounce surfactant to 5 gallons of water, or as recommended by the manufacturer in the case of an equivalent.

H. Encapsulants (Sealants): Encapsulants shall be of the bridging or penetrating variety and shall be listed as "satisfactory" by the EPA. Penetrating Encapsulant: No. 207 Special Sealer #33775-27A as manufactured by Makus-Cincinnati, Inc.; "Asbestop 30B-2" as manufactured by Asbestos Corp.; "Cable Coating 22-P" as manufactured by American Coatings Corp., or approved. Bridging Encapsulant: Decadex Firecheck, manufacturer's standard color "Magnolia", as manufactured by Pentagon Plastics, Inc.; "Cable Coating 2-B", manufacturer's standard color gray, as manufactured by American Coatings Corp.; or Owner approved equal.

I. Other Materials: Provide materials such as lumber, nails and hardware, which may be required to construct and dismantle the decontamination area and barriers isolating the work area.

J. Spray Glue: Spray glue shall be a heavy duty adhesive in aerosol can, "CDC Spray Glue" as manufactured by AMREP, Inc., or Owner approved equal.
PART 3 - EXECUTION

3.01 WORK AREA PREPARATION

A. Worker Decontamination Facilities

1. Modified Worker Decontamination Enclosure System
   a. At entrances to non-isolated work areas the Contractor shall construct a personnel decontamination enclosure system or area consisting of plastic sheeting barriers with a HEPA vacuum and a water source. The system shall include a decontamination area where workers can remove contaminated protective clothing, decontaminate themselves and change into street clothing.
   b. Contractor shall not begin asbestos abatement work unless this system is functional, in good repair, and has been found acceptable for specification compliance by the Environmental Consultant.

B. Access to Work Area by Others

1. Except for emergency personnel, the Contractor shall limit access to the work area to authorized visitors.
2. The Contractor shall provide protective clothing, respirators and equipment for all authorized visitors, as specified.
3. All authorized visitors shall be subject to the personnel protection provisions specified above, and shall sign in and out on the Worksite Entry Logbook.

C. Personnel Protection During Work in Non-Isolated Work Areas

1. Work clothes per 2.01-A and respiratory protection per 2.01-B.
2. Clothing: Workers shall wear two layers of coveralls after removal of street clothes. Worker decontamination will consist of personal decontamination in a regulated area over drop plastic sheeting with HEPA vacuum and wet methods. The first layer of coveralls must be removed when exiting the work area.
3. Workers shall not eat, drink or chew gum at the worksite except in the established clean room. Smoking or using other tobacco products is prohibited.
4. Workers shall be fully protected with respirators and protective clothing immediately prior to the first disturbance of asbestos-containing or contaminated material and until final cleanup is completed.

D. Emergency Precautions

1. Emergency Exits: The Contractor shall establish emergency and fire exits from the work area. Contractor shall ensure these exits are well marked and remain unobstructed.
2. First Aid: The Contractor shall be prepared to administer first aid to injured personnel after decontamination. Seriously injured personnel shall be treated immediately or evacuated without delay for decontamination.
3. Fire Department: Contractor shall notify the local fire department of the asbestos abatement project prior to beginning work area preparation.

4. Contractor shall provide fire extinguishers at all abatement work areas.

5. Emergency Clean-up: Contractor to submit to the Environmental Consultant for review an emergency control and cleanup plan to be followed in the event of asbestos contamination during work in non-isolated work areas. Contractor shall ensure all workers are thoroughly familiar with approved plan.

E. Building Security and Protection

1. The Contractor shall post adequate warning signs at all potential entrances to work areas.

2. Building Protection: Contractor shall protect all existing fixed equipment, existing building finishes that are to remain, and existing systems and functions from damage during the abatement process. Extra precautions are to be taken in protecting existing electrical panels, light fixtures, etc. Any damage to existing building, services, and/or equipment shall be remedied by the Contractor at his expense.

3. Power Failure: Contractor shall notify Environmental Consultant and Owner immediately when a power failure occurs. Asbestos abatement work will stop and the work area will be misted with water. If power failure exceeds 15 minutes, workers shall use appropriate personnel decontamination procedures and shall seal the work area. Precautions to prevent visible emissions will be performed under the direction of the Environmental Consultant.

4. Contractor shall maintain access and use of existing fire lanes and maintain security measures to prevent unauthorized access, theft or vandalism.

3.02 NON-ISOLATED WORK AREA PREPARATION

A. Performance: Contractor shall perform the following procedures in the order in which they are presented for work in non-isolated work areas according to the approved work plan. Any alternative control measures considered for Class II asbestos abatement work involving the removal of ACM that is not TSI, surfacing or sheet flooring materials shall be reviewed by the Environmental Consultant and performed in accordance with 29 CFR 1926.1101.

1. Coordinate to ensure shut down and isolation of any HVAC equipment near work areas. Allow for fourteen (14) day notification period required for shut-downs. Coordinate regarding all electrical, safety and other service connections, requirements and equipment. Contractor is responsible to detect operation of systems intended to be shut down during abatement.

2. Completely pre-clean visible accumulation of any debris in work area using HEPA vacuum equipment and use wet cleaning methods.

3. Set up a modified worker decontamination enclosure system as described above. Once this system is installed and abatement commences, it shall be utilized in the specified manner for decontamination of only personnel. All personnel shall sign the Worksite Entry Logbook each time they enter or exit the work area. Work performed outdoors in excavated areas shall be performed wearing two disposable suits.
4. Have emergency cleanup equipment and supplies, including HEPA vacuum, amended water, disposal bags, buckets, towels and sponges, on hand prior to start of abatement work.

B. Compliance: No asbestos abatement work shall occur unless the work area has been found acceptable for Specification compliance by the Environmental Consultant. Notifications to perform asbestos abatement and the Hazardous Materials Inspection Summary shall be posted at the work site.

3.03 ISOLATED WORK AREA PREPARATION

A. Coordinate to ensure shut down and isolation of any HVAC equipment near work areas. Allow for fourteen (14) day notification period required for shut-downs. Coordinate all electrical, safety and other service connections, requirements and equipment. Contractor is responsible to detect operation of systems intended to be shut down during abatement.

B. Remove all uncontaminated removable equipment, fixtures, and supplies from the Work Area before commencing Work. If equipment and furnishing remain completely pre-clean and cover all unmovable furnishings or equipment with two layers of polyethylene sheeting, securely taped in place with duct tape. Such fixtures and equipment shall be considered outside the Work Area unless covering plastic or seal is breached. Contractor is responsible for any damage that these items incur while working in these areas.

C. Install critical barriers as follows:

1. Individually clean and seal all ventilation openings (supply and exhaust), doorways, lighting fixtures, floor drains and all other openings into the Work Area with two layers of reinforced polyethylene sheeting, taped securely in place with duct tape. Maintain seal until all Work is completed. Provide scaffolding and rigid post as necessary for proper structure integrity when negative pressure is applied.

2. Clean and seal all lighting fixtures and HVAC diffusers with duct tape, and plastic sheeting to provide an airtight and watertight seal. Take care to avoid wrapping plastic sheeting on light fixtures, which may generate heat. Ensure that all electrical conduit connections and other electrical devices inside the Work Area that are exposed to moisture are sealed.

3. Use duct tape to seal all seams of HVAC ductwork or other system components that extend through Work Area.

4. Completely pre-clean visible accumulation of any debris in work area using HEPA vacuum equipment or wet cleaning methods.

5. Seal all openings through the floor at columns and piping risers with a fire-stop sealant to provide an airtight and watertight separation between the Work Area and the floor below.

6. Seal all doorways and openings into work areas with hard rigid barriers and cover with a layer of reinforced plastic sheeting for dust controls.

D. Construct separate Decontamination Units in compliance with EPA, OSHA, and WISHA guidelines concerning number, size and placement of airlocks, etc. Shower in worker Decontamination Unit shall open into airlock on both contaminated and uncontaminated sides. Construct Decontamination Units of appropriate materials (including black plastic sheeting). Shower in personnel Decontamination Unit shall contain both hot and cold running water. Supply sufficient shower units to comply with OSHA regulations. Post OSHA decontamination
procedures in Change Room and Equipment Room for duration of Project. Water for the showers shall be plumbed from an Owner-designated source.

E. Trap shower waste water using filters having a maximum pore size of 5.0 microns, and drain into a sanitary sewer. Replace contaminated filters when they become clogged but not less than every third day. Dispose of filters as contaminated waste.

F. Submit the proposed route of exhaust of negative air pressure to Environmental Consultant prior to initiating its use. Coordinate with Owner for location to exhaust (to outside the building) all negative pressure air from work areas. Place Work Area under negative air pressure utilizing negative air equipment. Allow no air movement system or air filtering equipment to discharge unfiltered air outside the Work Area. Maintain a negative pressure in the Work Area continuously (24 hours per day) from the start of removal of asbestos-containing material until the area is decontaminated and certified as such by the required air testing. Ensure that the air within the Work Area is changed at least once every 15 minutes, and maintain a pressure differential of at least - 0.02 inches of water between the air within the Work Area and the air outside the Work Area. Provide manometer devise with paper read-out for all full enclosure/isolation Work Areas.

G. Notify Environmental Consultant for observation and acceptance of all critical barriers, HEPA filtration systems, and Decontamination Units before proceeding with installation of Primary Barrier.

H. Install Primary Barrier as follows:

1. Clean all surfaces in Work Area using a HEPA filtered vacuum and by wet wiping prior to the installation of the Primary Barrier.

2. Cover floor of Work Area with one layer of reinforced polyethylene sheeting, turned up walls at least 12 inches. Form a sharp right angle bend at junction of floor and wall so that there is no radius that could be stepped on causing the wall attachment to be pulled loose. Use spray cement and duct tape to seal all seams in floor covering.

3. Cover all walls in Work Area with one layer of polyethylene sheeting, mechanically supported and sealed with duct tape and spray cement. Seal all joints, including the joining with the floor, with duct tape.


I. Install Secondary Barrier as follows:

1. Cover floor of Work Area with a second layer of polyethylene sheeting, turned up walls at least 12 inches. Form a sharp right angle bend at junction of floor and wall so there is no radius of sheeting that could be stepped on causing the wall attachment to be pulled loose. Locate seams at least six feet from, or at right angles to, seams in Primary Barrier layer. Use spray cement and duct tape to seal entire length of all seams in floor covering.

2. Cover all walls in Work Area with a second layer of polyethylene sheeting. Support polyethylene sheeting on wall with duct tape; seal top of Secondary Barrier to Primary Barrier with duct tape so debris cannot get behind it.

3. Install sheeting so Secondary Barrier can be removed independently of the Primary Barrier.
4. Notify Environmental Consultant for visual review and acceptance of Secondary Barrier before proceeding with any abatement activities.

J. Maintain emergency and fire exits from the Work Areas, or establish alternative exits satisfactory to fire officials.

K. Ensure that all barriers remain effectively sealed and taped for the duration of abatement activities and subsequent cleaning. Repair damaged barriers and remedy defects immediately upon discovery. Visually inspect enclosure at the beginning of each Work period. Repair damaged barriers and remedy defects immediately upon discovery.

3.04 CEILING PLENUM CLEANING (NOT USED)

3.05 REMOVAL OF ASBESTOS-CONTAINING MATERIALS IN ISOLATED WORK AREAS

A. Contractor shall remove all asbestos-containing materials intact and non-aggressive measures as defined in these Contract Documents. Contractor shall apply spray coat of amended water to asbestos materials to be removed. Keep material damp during entire removal process. Immediately place asbestos-containing materials in properly labeled asbestos waste bags following removal.

B. Contractor shall maintain a safe and uncluttered work site including staging area, work area, worker decontamination system, and waste load-out area.

D. Contractor shall promptly remove waste bags to the waste load-out area.

E. All dust and debris remaining in the work areas must be cleaned-up following asbestos-related work using HEPA vacuuming and wet-wiping. Protect finishes and items remaining in work areas as necessary.

G. Ensure proper cleaning of boots and equipment is performed prior to exiting such work areas.

H. Contractor shall clean external surfaces of contaminated containers and equipment thoroughly by wet sponging and HEPA vacuum.

I. Encapsulate the work area upon visual observation by Consultant and prior to final air clearance sampling.

J. See requirements under 1.14-B-3 for procedures regarding post-abatement inspection.

3.06 REMOVAL/IMPACT OF ASBESTOS-CONTAINING MATERIALS IN NON-ISOLATED AREAS

A. Contractor shall remove all asbestos-containing materials as defined in these Contract Documents. Contractor shall apply spray coat of amended water to asbestos materials to be removed. Keep material damp during entire removal process. Immediately place asbestos-containing materials in properly labeled asbestos waste bags following removal.

B. Contractor shall maintain a safe and uncluttered work site including staging area, work area, worker decontamination system, and waste load-out area.

D. Contractor shall promptly remove waste bags to the waste load-out area.
E. All dust and debris remaining in the work areas must be cleaned-up following asbestos-related work using HEPA vacuuming and wet-wiping. Protect finishes and items remaining in work areas as necessary.

F. Ensure proper cleaning of boots and equipment is performed prior to exiting such work areas.

G. Contractor shall clean external surfaces of contaminated containers and equipment thoroughly by wet sponging and HEPA vacuum. Encapsulate the work area upon visual observation by Consultant and prior to final air clearance sampling.

H. See requirements under 1.14-B-3 for procedures regarding post-abatement inspection.

I. Not In Scope - Chemicals and solvents shall not be used to remove ACM floor mastic. ACM floor mastic shall be removed with mechanical means until the floor substrate (concrete slab) is smooth.

J. Glovebag Abatement: Glovebag work shall be completed within mini-enclosures in all areas. All removal using the glovebag method shall be performed strictly according to regulations, manufacturer's printed instructions, and as demonstrated by the manufacturer's representative or as further specified in this section. A minimum of two workers are required during glovebag operations. Workers are not to smoke or wear hand or wrist jewelry while using glove bags.

1. Contractor shall coordinate with the Owner to ensure the shutoff of all sources of heat to objects to be worked on. Do no work on objects above 150 °F.

2. Contractor shall install port for hose of HEPA vacuum to create reduced pressure inside glove bag. Installing of fresh air intake and/or bridging to prevent collapse of bag are acceptable. Contractor shall use the smoke test method to check for leaks in each glovebag.

3. During the removal phase, Contractor shall utilize amended water to reduce potential for airborne fibers.

4. After completion of insulation removal and cleaning, but prior to removal of glove bag, Contractor shall apply a single "tack" coat of penetrating encapsulant to surface of pipe and any remaining non-asbestos insulation, within the glove bag. In addition properly seal and cap all abated openings per regulatory requirements.

5. After the pipe has been encapsulated, but prior to removal of glove bag, Contractor shall thoroughly wash the upper chamber of the glove bag and seal the contents of the bag in the lower chamber.

6. Contractor shall remove all contaminated air in the glovebag using a HEPA vacuum.

7. Contractor shall promptly double-bag the glove bag after removal is complete, place into a sealed container and remove to the bag holding enclosure.

8. Contractor shall not reuse glovebag, slide glovebag or join multiple glovebags to perform additional removal.

9. Asbestos-containing material remaining in wall and floor penetrations shall be wetted and placed in asbestos waste bag. Area shall be HEPA vacuumed cleaned.

3.07 DISPOSAL

A. Regulations: The Contractor shall determine current waste handling, transportation, and disposal regulations for the work site and for each waste disposal landfill. The Contractor
must comply with these regulations and U.S. Department of Transportation, PSCAA Regulation III, Article 4 and EPA requirements.

B. Waste Load-Out:

1. Contractor shall coordinate activities to ensure that all asbestos-containing waste is properly containerized and removed from all work areas prior to the end of each work shift. Contractor shall prevent the accumulation of waste containers within work areas and shall ensure that all waste containers are stored in lockable, properly sealed storage container(s) at the end of each work shift.

2. Contractor shall perform waste load-out activities during pre-approved time periods via pre-approved routes through the building per Work Plan approved by Owner and Environmental Consultant.

C. Transport: Contractor shall remove all properly labeled asbestos waste from the site at the end of each work shift for disposal at Owner approved waste disposal site operated in accordance with the provisions of 40 CFR 61.156. Notify disposal site in advance of delivery to ensure immediate disposal. Maintain chain-of-custody until accepted by the landfill.

1. The University of Washington currently approves disposal of asbestos-containing waste at the following sites:
   a. Rabanco Regional Disposal Facility in Roosevelt, Washington
   b. Eastmont Transfer Station in Seattle, Washington
   c. Cedar Hills Landfill in Maple Valley, Washington
   d. Waste Management Columbia Ridge Landfill in Arlington, Oregon
   e. WCI Finley Butte Landfill, in Boardman, Oregon
   f. Waste Management, Greater Wenatchee Landfill, East Wenatchee, Washington

D. Submit disposal receipts and chain-of custody for waste as specified. Contractor shall make available all disposal manifests and receipts upon request from the Environmental Consultant or Owner.
CONTRACTOR ACKNOWLEDGMENT OF ASBESTOS HAZARD TRAINING, RESPIRATOR TRAINING AND AGREEMENT TO UNDERTAKE ALL REQUIRED PRECAUTIONS

Date: ________________

To: HMC and UNIVERSITY OF WASHINGTON
Re: HMC 8EH Burn Unit

CONTRACTOR’S FIRM NAME: ____________________________
Print

I am an asbestos contractor and hereby warrant that I have complied with the following requirements:

1. All workers employed in the above project understand that this project includes removal and disposal of asbestos. All workers are advised and they understand the dangers inherent in handling asbestos. All workers have been informed that breathing asbestos fibers can cause Asbestosis, Mesothelioma, lung cancer and other cancers.

2. All workers and I are familiar with all Local, State and Federal requirements relating to asbestos and agree faithfully to take all required precautions and comply with these regulations.

3. All asbestos workers have had a medical examination within the past twelve months, which was paid for by the employer. This examination included: health history, pulmonary function tests and may have included an evaluation of a chest x-ray. The results of the physician’s medical examination and any limitations workers may have regarding the wearing of respiratory protection, exposure to heat stress, or any other health risks discovered during this exam are being followed. All protective equipment required by regulations and as a result of the Worker’s medical examination has been supplied.

4. All workers requiring Personal Protective Equipment have been trained in the use of each type of respiratory protective equipment and all other equipment required on this project. This training included an explanation of dangers related to misuse of this equipment and instruction on fitting, testing, inspection, donning, wearing, cleaning and maintaining this respiratory equipment.

I certify that I am a principal of the above firm and, under penalty of perjury under the laws of the State of Washington that the “Asbestos Contractor Information Form” and the foregoing is true and correct.

Name: ____________________________
Print

Title: ____________________________
Print

________________________________
Signature

This form shall be completed and submitted with the Pre-Job Submittals
CERTIFICATE OF CLEARANCE FORM

CONTRACTOR’S CERTIFICATION OF VISUAL INSPECTION
In accordance with Section 02 82 00, the Contractor’s Supervisor hereby certifies that he/she has visually inspected all surfaces within the work area and has found no dust, debris or residue.

Work Area: ________________________________

ACM Removed: ________________________________

ACM Remaining: ________________________________

Signature of Supervisor: ______________________ Date: ______________

Print Name: __________________ Certificate #: __________ Expiration Date: __________

Company Name: ________________________________

THE OWNER’S REPRESENTATIVE CERTIFICATION OF VISUAL INSPECTION
In accordance with Section 02 82 00, the Owner’s Representative hereby certifies that he/she has visually inspected all surfaces within the work area and has found no dust, debris or residue. The Owner’s Representative certifies that final clearance air sampling has met the criteria established in the specifications. All clearance air sample data and supporting paperwork is to be submitted to Owner.

Signature: __________________________ Date: __________ Pass / Fail (see punch list)

Print Name: __________________ Certificate # & Expiration Date: ______________

Company: ________________________________

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Cleaning of existing concrete surfaces.
B. Resurfacing of concrete surfaces having spalled areas and other damage.
C. Repair of deteriorated concrete.
D. Scope of Work: As indicated on drawings.

1.2 REFERENCE STANDARDS
P. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.3 SUBMITTALS
A. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

1.4 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
B. Cleaner Qualifications: Company specializing in, and with minimum of 3 years of experience in, the type of cleaning specified.

C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum of 3 years of documented experience.

1.5 MOCK-UP(S)

A. Test each type of maintenance procedure required on each type of existing construction, to determine the most appropriate procedures to use and as a record of expected results.

B. Crack Injection: Prepare one sample of each type of injection.

C. Horizontal Surface Repair: Total of 10 foot square area, demonstrating each type of repair.

D. Vertical Surface Repair: Total of 10 foot square area, demonstrating each type of repair.

E. Where color or texture matching is required, first prepare a small size sample on cementitious board.

F. Locate mock-up(s) where directed.

G. Re-work mock-up(s) until satisfactory to Architect.

H. Re-work mock-up(s) until satisfactory to Owner.

I. Satisfactory mock-up(s) may remain as part of the work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturers’ instructions for storage, shelf life limitations, and handling of products.

PART 2 PRODUCTS

2.1 CLEANING MATERIALS

A. Degreaser:
   1. Manufacturers:
      a. Euclid Chemical Company; Euco Clean and Strip: www.euclidchemical.com/#sle.
      d. Or approved equal.

B. Detergent: Non-ionic detergent.

C. Blasting Medium: CSP-4 (medium shotblast) based on The International Concrete Repair Institute (ICRI) technical guideline #03732.

2.2 CEMENTITIOUS PATCHING AND REPAIR MATERIALS

A. Cementitious Resurfacing Mortar: One- or two-component, factory-mixed, polymer-modified cementitious mortar designed for continuous thin-coat application.
   1. In-place material resistant to freeze/thaw conditions.
   2. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
   3. Integral corrosion inhibitor.
   4. Recommended Thickness: Feather edge to 1/8 inch.
   5. Color: Gray.
   6. Manufacturers:
      d. Xypex Chemical Corporation; XYPEX Megamix II: www.xypex.com/#sle.
      e. Or approved equal.
B. Cementitious Repair Mortar, Trowel Grade: One- or two-component, factory-mixed, polymer-modified cementitious mortar.
   1. In-place material resistant to freeze/thaw conditions.
   2. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
   3. Dry Material: Complies with ASTM C928/C928M.
   4. Integral corrosion inhibitor.
   5. Products:
      c. The QUIKRETE Companies; QUIKRETE® FastSet Repair Mortar: www.quikrete.com/#sle.
      e. Or approved equal.

C. Cementitious Repair Mortar, Form and Pour/Pump Grade: Flowable, one- or two-component, factory-mixed, polymer-modified cementitious mortar; in-place material resistant to freeze/thaw conditions.
   1. Mixed with water in proportions as recommended by manufacturer.
   2. Integral corrosion inhibitor.
   3. Manufacturers:
      a. ARDEX Engineered Cements; ARDEX FDM: www.ardexamericas.com/#sle.
      b. Dayton Superior Corporation; Civil/Structural FPX: www.daytonsuperior.com/#sle.
      c. Euclid Chemical Company; EUCOCRETE: www.euclidchemical.com/#sle.
      d. Euclid Chemical Company; EUCOCRETE SUPREME: www.euclidchemical.com/#sle.
      e. Five Star Products, Inc; Five Star Structural Concrete: www.fivestarproducts.com/#sle.
      g. Or approved equal.

D. Pre-Blended Concrete Mix for Small Projects: Construction-grade Portland cement uniformly blended with aggregates and other approved concrete ingredients, requiring only the addition of water.
   1. Compressive Strength: 4000 pounds per square inch, minimum, at 28 days, when tested in accordance with ASTM C39/C39M.
   2. Manufacturers:
      a. The QUIKRETE Companies; QUIKRETE® Concrete Mix: www.quikrete.com/#sle.
      b. The QUIKRETE Companies; QUIKRETE® Crack Resistant Concrete Mix: www.quikrete.com/#sle.
      c. Or approved equal.

2.3 ACCESSORIES
A. Anchoring Adhesive: Self-leveling or non-sag as applicable.
   1. Self-Leveling Polyester-Based Products:
      b. Or approved equal.
   2. Self-Leveling Epoxy Products:
      d. Or approved equal.
   3. Non-Sag Epoxy Products:
      a. Dayton Superior Corporation; Sure Anchor J50, Sure Anchor I J51, All Weather J51
AW, Pro-Poxy 300, Pro-Poxy 300 FAST, Pro-Poxy 400, or Pro-Poxy 500:  
www.daytonsuperior.com/#sle.

b. Euclid Chemical Company; DURAL FAST SET GEL:  
www.euclidchemical.com/#sle.

c. SpecChem, LLC; SpecPoxy 3000 or SpecPoxy 3000 FS:  
www.specchemllc.com/#sle.

d. W. R. Meadows, Inc; Rezi-Weld Gel Paste or Rezi-Weld Gel Paste State:  
www.wrmeadows.com/#sle.

e. Or approved equal.


C. Sand: ASTM C33/C33M or ASTM C404; uniformly graded, clean.

D. Water: Clean and potable.

E. Reinforcing Steel: ASTM A615/A615M Grade 40 (40,000 psi) billet-steel deformed bars, 
unfinished.

F. Reinforcing Steel: Deformed bars, ASTM A996/A996M Grade 40 (280), Type A.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Prepare concrete surfaces to be repaired according to ICRI 310.2R.

3.3 CLEANING EXISTING CONCRETE

A. Clean concrete surfaces of dirt or other contamination using the gentlest method that is 
  effective.
  1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking 
  care to watch for impending damage.
  2. Clean out cracks and voids using same methods.

B. The following are acceptable cleaning methods, in order from gentlest to less gentle:
  1. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with 
  natural or synthetic bristles.
  2. Increasing the water washing pressure to maximum of 400 psi.
  3. Adding detergent to washing water; with final water rinse to remove residual detergent.
  4. Steam-generated low-pressure hot-water washing.
  5. Alkaline cleaning agent applied for the least amount of time that is effective, followed by 
  slight acid rinse and water rinse.
  6. Acidic cleaning agent applied for the least amount of time that is effective, followed by 
  water rinse. Test acidic cleaning agents on mock-up surfaces prior to use.
  7. Abrasive blasting: Use only abrasive media that have been proven not to damage 
  concrete by testing on mock-up.

C. Do not use any of the following cleaning methods, unless otherwise indicated:
  1. Brushes with wire bristles, grinding with abrasives, solvents, hydrochloric or muriatic acid, 
  sodium hydroxide, caustic soda, or lye.
  2. Soap or detergent that is not non-ionic.

3.4 CONCRETE SURFACE REPAIR USING CEMENTITIOUS MATERIALS

A. Clean concrete surfaces, cracks, and joints of dirt, laitance, corrosion, and other contamination 
  using method(s) specified above and allow to dry.

B. Apply coating of bonding agent to entire concrete surface to be repaired.

C. Fill voids with cementitious mortar flush with surface.

D. Apply repair mortar by steel trowel to a minimum thickness of 1/4 inch over entire surface,
terminating at a vertical change in plane on all sides.

E. Trowel finish to match adjacent concrete surfaces.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Structural steel framing members, support members.
B. Base plates, shear stud connectors.
C. Grouting under base plates.

1.2 REFERENCE STANDARDS
F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.
R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
1.3 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for submittals.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Steel Shapes, Plates, and Bars: ASTM A242/A242M high-strength, corrosion-resistant structural steel.

E. Steel Shapes, Plates, and Bars: ASTM A529/A529M high-strength, carbon-manganese structural steel, Grade 50.

F. Steel Plates and Bars: ASTM A572/A572M, Grade 50 (345) high-strength, columbium-vanadium steel.

G. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

H. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.

I. Steel Bars: ASTM A108.

J. Steel Plate: ASTM A514/A514M.

K. Steel Sheet: ASTM A1011/A1011M, Designation SS, Grade 30 hot-rolled, or ASTM A1008/A1008M, Designation SS, Grade 30 cold-rolled.


M. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

N. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.


P. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

Q. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
   2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

R. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

S. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
2.2 FABRICATION
A. Shop fabricate to greatest extent possible.
B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.
C. Fabricate connections for bolt, nut, and washer connectors.
D. Develop required camber for members.

2.3 FINISH
A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.
   1. Interior steel to have manufacturer standard primer.
   2. Exterior steel and interior steel with exterior exposed components to have high performance primer.
B. High Performance Prime Painting: One coat.
   1. Shop Primer for Exterior Steel
      a. Surface Preparation: SSPC-SP 6 with 1-3 mil surface profile and SSPC-SP 3 for touch up.
      b. Primer: Zinc-rich primer, Carboline Carbozinc 858 3-5mils DFT
   2. Touch up Primer, Intermediate and finish Coats per Section 09 91 13 Exterior Painting and 09 91 23 Interior Painting.

2.4 SOURCE QUALITY CONTROL
A. Provide shop testing and analysis of structural steel.
B. Welded Connections: Visually inspect all shop-welded connections.

PART 3 EXECUTION
3.1 EXAMINATION
A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.2 ERECTION
A. Erect structural steel in compliance with AISC S303.
B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
C. Field weld components and shear studs indicated on shop drawings.
D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".
E. Do not field cut or alter structural members without approval of Owner.
F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.3 TOLERANCES
A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
B. Maximum Offset From True Alignment: 1/4 inch.
3.4 CLEANING
   A. Remove site cuttings from finish surfaces.
   B. After completing installation, remove and recycle debris, excess materials and debris from project site per Section 01 74 00.

3.5 FIELD QUALITY CONTROL
   A. An independent testing agency will perform field quality control tests, as specified in Section 01 45 23 - Testing and Inspection Services.
   B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 25 percent of bolts at each connection.
   C. Welded Connections: Visually inspect all shop-welded connections.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Blocking in wall openings.
B. Concealed blocking for support of toilet and bath accessories, wall cabinets, and wood trim. Contractor’s option use metal stripping.

1.2 REFERENCE STANDARDS
C. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.3 SUBMITTALS
A. See Section 01 33 00 - Submittal Procedures for submittals.
B. Product Data: Provide technical data on wood preservative materials.

1.4 QUALITY ASSURANCE
A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
   1. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American Lumber Standards Committee.
   2. Lumber of other species or grades, or graded by other agencies, is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS
A. Lumber fabricated from old growth timber is not permitted.

2.2 DIMENSION LUMBER
A. Grading Agency: Western Wood Products Association (WWPA G-5).
B. Sizes: Nominal sizes as indicated on drawings, S4S.
C. Moisture Content: S-dry or MC19.
D. Miscellaneous Blocking, Furring, and Nailers:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.3 ACCESSORIES
A. Fasteners and Anchors:
   2. Anchors: Toggle bolt type for anchorage to hollow masonry.

PART 3 EXECUTION

3.1 FRAMING INSTALLATION
A. Set members level and plumb, in correct position.
B. Place horizontal members with crown side up.
C. Construct curb members of single pieces.
D. Space framing and furring members 16 inches o.c.
E. Coordinate curb installation with installation of decking and support of deck openings.
F. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.2 INSTALLATION OF CONSTRUCTION PANELS
A. Install telephone and electrical panel back boards made of plywood or other acceptable structural panels at locations indicated. Size back boards to be minimum 96 inches beyond size of telephone and electrical panels.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Specially fabricated cabinet units.
B. Countertops.
C. Hardware.
D. Factory finishing.
E. Preparation for installing utilities.

1.2 REFERENCE STANDARDS
B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.
D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.3 ADMINISTRATIVE REQUIREMENTS
A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.
B. Coordinate the Work with plumbing and electrical rough-in, and other finish work.
C. Coordinate with other trades for installation of concealed in-wall backing for support of cabinets.

1.4 SUBMITTALS
A. See Section 01 33 00 - Submittal Procedures for submittals.
B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, direction and patterning, fastening methods, accessory listings, hardware location and schedule of finishes.
C. Seaming diagrams: Provide Seaming and directional plans for fabric.
D. Product Data: Provide data for hardware accessories.
E. Samples: Submit samples illustrating component design, configurations, joinery, color, finish, and trim options.
   1. Submit three samples of each plastic laminate PLAM-5, 6 by 6 inches square
   2. Submit three samples of a section of each custom section, 6 by 6 inches square. Section for production to be coordinated with Owner.

1.5 QUALITY ASSURANCE
A. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Protect units from moisture damage.
1.7 FIELD CONDITIONS
   A. Do not deliver or install casework until building is enclosed, and heating and ventilating system is operating.
   B. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.
      1. Maintain 50 degrees F temperature in areas that casework is installed.
      2. Maintain Relative Humidity between 25% & 55% in areas that work is installed.

PART 2 PRODUCTS

2.1 CABINETS
   A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
   B. Wood Veneer Faced Cabinet:
   C. Plastic Laminate Faced Cabinets: Custom grade.
   D. Cabinets:
      2. Finish - Exposed Interior Surfaces: Decorative laminate.
      3. Finish - Concealed Surfaces: Manufacturer's option.
      4. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
      5. Door and Drawer Front Retention Profiles: Fixed panel.
      6. Casework Construction Type: Type A - Frameless.
      7. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
      8. Grained Face Layout for Cabinet and Door Fronts: Flush panel.
         a. Custom Grade: Doors, drawer fronts and false fronts grain to run and match vertically within each cabinet unit.
      10. Adjustable Shelf Loading: 50 lbs. per sq. ft.
      11. Drawer Side Construction: Multiple-dovetailed.

2.2 WOOD-BASED COMPONENTS
   A. Wood fabricated from old growth timber is not permitted.

2.3 LUMBER MATERIALS
   A. Softwood Lumber: NIST PS 20; Graded in accordance with, Grade II/Custom; average moisture content of 5-10 percent; species as recommended by manufacturer.
   B. Hardwood Lumber: NHLA; Graded in accordance with, Grade II/Custom; average moisture content of 5-10 percent; species as follows:

2.4 PANEL MATERIALS
   A. Veneer Faced Plywood Finish: HPVA HP-1; graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, core of medium density fiberboard; type of glue recommended for specific application; thickness as required; face veneer as selected by owner:

2.5 WOOD TREATMENT PROCESSES
   A. Fire Retardant Treatment: Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
2.6 LAMINATE MATERIALS
A. Manufacturers:
1. See A3.01 Materials and Finishes Schedule.
2. Substitutions: See Section 01 25 00 - Substitution Procedures.
B. Compact Laminate: High-performance solid composite, NEMA LD 3, Grade CGS.
2. Product Type: 568 and 575.
3. Thickness: 1/2 inch and 3/4 inch, See drawings for confirmation.
C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
D. Provide specific types as indicated.
1. Manufacturer, color, pattern, and surface texture as indicated for each designation on drawings Materials and Finishes Schedule.
2. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, colors as indicated, finish as indicated.
3. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, colors as indicated, finish as indicated.
4. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.
E. Thermoset Decorative Overlay: MDL Melamine Overlay as manufactured by one of the following, colors as selected from manufacturer’s standard:

2.7 STAINLESS STEEL
A. Stainless Steel: ASTM A167; 18 gauge, Type 302 or 304, No. 4 satin polished surface finish.

2.8 COUNTERTOP SUBSTRATE MATERIALS
A. Plywood: Exterior softwood plywood complying with PS 1, Grade C-C Plugged, touch sanded.

2.9 COUNTERTOPS
A. Countertops are specified in Section 12 36 00.

2.10 BANQUETTE SEATING-BUILT-IN BENCH SEATING
A. Type: Upholstered seat and Back cushions
   1. Foam: Flame Resistant
B. Fabric Types: As indicated on drawings Materials and Finishes Schedule.
C. Construction: As indicated on drawings.
D. Body:
   2. Drawers: Compact Laminate.

2.11 FABRIC TYPES:
A. As indicated in drawings Materials and Finishes Schedule.
B. Padding: LUX-HQ Foam.
   2. Density: 2.8 lb/Cu Ft
   3. Fire Retardant
   4. Thickness: 2 inch unless otherwise indicated.
   5. Fiberfill wrap at seat pads.
2.12 ACCESSORIES
   A. Adhesive: Type I (Waterproof).
   B. Joint Sealant: Clean translucent mildew-resistant silicone by Dow, General Electric, or approved equal.
   C. Screw Covers: Match adjacent surface in color and texture.
   D. Concealed Joint Fasteners: Threaded steel draw bolts.

2.13 HARDWARE
   A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
   B. Drawer and Door Pulls: "U" shaped wire pull, Stainless Steel.
   C. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.
      1. Coordinate with Owners Standards.
   D. Catches: Magnetic. BHMA A156.9, B03141
      2. Standard Cabinet Doors: Provide one per door.
   E. Drawer Slides:
      1. Type: Full extension.
      2. Static Load Capacity: Commercial grade.
      4. Stops: Integral type.
      5. Features: Provide self closing/stay closed type.
      6. Product Types:
         b. Light to Medium Duty Drawers: Accuride 3832, Steel ball bearings, full extension, load capacity up to 100 lbs. per pair; for drawers that are deeper than they are wide.
         c. Light to Medium Duty Drawers: Accuride 7432, Steel ball bearings, full extension, load capacity up to 100 lbs. per pair; for drawers 24 inches wide or less.
         d. Medium to Heavy Duty Drawers: Accuride 4034, Steel ball bearings, full extension with 1 inch overtravel, progressive movement, load capacity 150 lbs. per pair; for drawers 24 inches wide or less.
         e. Heavy Duty or Lateral File Drawers: Accuride 3640, Steel ball bearings, full extension with 1 inch overtravel, progressive movement, load capacity up to 200 lbs. per pair; for drawers 42 inches wide or less.
      7. Manufacturers:
   F. Hinges: European style concealed self-closing type, steel with polished finish.
      1. 110 degree opening
      2. Minimum three hinges for doors over 48 inches high.
      3. Manufacturers:
         f. Or approved equal.
   G. Silencers: Clear soft vinyl round bumpers, two per door.
H. Appliance Lift:
  1. Rev-A-Shelf, Heavy Duty, RAS-ML-HDCR
  2. Weight Limit: 60 lbs.

I. Casters:
  1. Description: 2" diameter, Bright Brass finish spherical ball caster with a 5/16-18 UNC x 1"
     threaded stem, a polyolefin wheel, a capacity of 80 pounds, and a mounting height of
     2-5/8".
  2. Manufacturer: Caster Specialists; Product:15RP20-T516; www.casterspecialists.com, or
     approved equal.

2.14 FABRICATION
A. Prior to fabrication, verify that field measurements are as indicated in Shop Drawings.
B. Cabinet Style: Flush overlay.
C. Cabinet Doors and Drawer Fronts: Flush style.
D. Drawer Construction Technique: Dovetail joints.
E. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit
   passage through building openings.
F. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than
   one piece for any single length.
G. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for
   cutting. Provide matching trim for scribing and site cutting.
H. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and
   as follows:
   1. Provide center matched panels at each elevation.
I. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions.
   Prime paint cut edges.

2.15 SHOP FINISHING
A. Sand work smooth and set exposed nails and screws.
B. On items to receive transparent finishes, use wood filler matching or blending with surrounding
   surfaces and of types recommended for applied finishes.
C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5-
   Finishing for grade specified and as follows:
   1. Transparent:
      a. Sheen: Flat.
   2. Opaque:
      a. Color: As selected by Owner.
      b. Sheen: Flat.

PART 3 EXECUTION
3.1 EXAMINATION
A. Verify adequacy of backing and support framing.
B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION
A. Set and secure cabinets in place, assuring that they are rigid, plumb, and level.
B. Use fixture attachments in concealed locations for wall mounted components.
C. Use concealed joint fasteners to align and secure adjoining cabinet units.
D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
E. Secure cabinets to floor using appropriate angles and anchorages.
F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
G. Seal joints between backsplash and countertop with clear sealant.

3.3 ADJUSTING
A. Adjust installed work.
B. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING
A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION
SECTION 07 05 53
FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.2 REFERENCE STANDARDS
A. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 SUBMITTALS
A. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.
B. Schedule: Completely define scope of proposed marking, and indicate location of affected walls and partitions, and number of markings.

1.4 FIELD CONDITIONS
A. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Partition Identification Labels:
   3. Or approved equal.

2.2 FIRE AND SMOKE ASSEMBLY IDENTIFICATION
B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl or paper sign with factory applied adhesive backing.
C. Languages: Provide sign markings in English.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION
A. Locate markings as required by ICC (IBC).
B. Install adhered markings in accordance with manufacturer's instructions.
C. Install neatly, with horizontal edges level.
D. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Delegated Design firestopping and smoke stopping systems at fire rated assemblies.
B. Firestopping of penetrations and interruptions to fire rated assemblies, whether indicated on drawings or not, and other openings indicated.
   1. Openings in fire rated walls, floors, and roofs, both empty and those containing penetrations such as cables, conduits, cable trays, pipes, ducts, and similar penetrating items.
   2. Gaps between fire rated floor slabs and exterior curtain walls.
   3. Gaps located within expansion joints.
   4. Openings at each floor level in fire rated shafts or stairwells.
   5. Gaps between tops of fire rated walls and underside of fire rated floor or roof assemblies.
C. Smokestopping of penetrations through non-fire-rated smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

1.2 REFERENCE STANDARDS
G. ITS (DIR) - Directory of Listed Products; current edition.
J. UL (DIR) - Online Certifications Directory; Current Edition.

1.3 ADMINISTRATIVE REQUIREMENTS
A. See Section 01 31 19 - Project Meetings for pre-installation meeting procedures.
B. Convene one week before starting work of this section.
C. Agenda:
   1. Review firestopping submittal.
   2. Review job site conditions.
   3. Outline schedule for installation.
   4. Outline reviewing process by building official.
1.4 DEFINITIONS

A. Construction Gap: An open joint between adjacent rated assemblies; may be a moving joint or static opening, without penetrating items.

B. Firestop System: Specific firestop material or materials, which when installed in openings in a specific rated assembly, achieve performance required.

C. Firestopping: Result of installation of firestop system.

D. Listing: Current, published listing of a system in a qualified listing agency's directory.

E. Listing Agency: Independent testing agency that has conducted tests and classified firestop systems for particular applications, which conducts routine in-plant follow-up inspections, and which lists tested systems in a published directory.

F. Penetrating Item: Any item (pipe, duct, conduit, cable, etc.) that passes completely through a rated assembly through an opening of any size.

G. Rated Assembly: Wall, floor, roof/ceiling, or other construction which is required to have an hourly fire rating or a smoke resistance rating.

H. Through Penetration: Hole through a rated assembly made to accommodate passage of a penetrating item or an empty hole made for another purpose and not repairable using the original materials of construction.

1.5 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for submittals.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
   1. Provide firestopping matrix as required by authority having jurisdiction.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Submit schedule of fireproofing and product data to authority having jurisdiction for approval.

E. Shop Drawings: Show typical installation details including reinforcement, anchorage, fastenings and method of installation for each type of firestopping condition.

F. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

G. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

H. Installer's Qualification Documentation.

I. Certificate from authority having jurisdiction indicating approval of materials used.

J. Installer Qualification: Submit qualification statements for installing mechanics.

K. Samples: Each type of firestopping systems, smoke seals and accessories, indicating installation locations.

1.6 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
   2. Current evaluation reports published by ICBO will be considered as constituting an acceptable test report.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Verification of minimum three years documented experience installing work of this type.
   2. Licensed by local authorities having jurisdiction (AHJ).

1.7 REGULATORY REQUIREMENTS
A. Conform to Building code for fire resistance ratings.
B. Provide certificate of compliance for firestopping materials to authority having jurisdiction, indicating approval for use on this project.
   1. Prohibited Materials:
      a. Pentabrominated Diphenyl Ether, CAS # 32534-81-9.
      b. Octabrominated Diphenyl Ether, CAS # 32536-52-0.
      c. Decabrominated Diphenyl Ether, CAS # 1163-19-5.

1.8 DELIVERY, STORAGE, AND HANDLING
A. Deliver materials in manufacturer's sealed and labeled containers. Handle and store materials in accordance with manufacturer's instructions.
B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.9 PROJECT CONDITIONS
A. Coordinate construction and cutting of openings so that each particular firestop system may be installed in accordance with its listing, including sizing, sleeves, and penetrating items.

1.10 FIELD CONDITIONS
A. Comply with firestopping manufacturer’s recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS
2.1 MANUFACTURERS
A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop.
   7. Or approved equal.

2.2 MATERIALS
A. Furnish products identical to those tested for classification by listing agency.
B. Firestopping Materials: Any materials meeting requirements.
C. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
E. Fire Ratings: Refer to drawings for required systems and ratings.
2.3 SINGLE SOURCE

A. All instances of a specific firestop system shall be made using products of the same manufacturer; where multiple installers (e.g. different subcontractors) are responsible for installation of firestopping, all installers shall use the same system made by the same manufacturer.
   1. Firestopping used within building shall be from one manufacturer.
   2. Contractor shall coordinate systems with subcontractors.

2.4 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Provide complete systems of asbestos-free firestopping capable of maintaining an effective barrier against flame, smoke and gases, listed by UL, WH, ULC, or FM, or other independent testing agency, and acceptable to authorities having jurisdiction.
   1. Fire Resistance Ratings: In accordance with applicable building code.
   2. Materials: Provide materials of type, thickness, width and density to provide and maintain fire resistance rating.
   3. Through Penetrations: Provide systems meeting UL 1479, ULC-S115 or ASTM E 814, completely filling annular spaces to prevent passage of flame, smoke and gases through opening in the separation in which it is installed.
   5. Compatibility: Provide materials which are compatible with materials used in systems including materials such as CPVC piping used in or on penetrants as well as construction materials used in conjunction or contiguous with firestopping system.

B. Firestopping materials shall be capable of maintaining an effective barrier against flame, smoke and gases, and suitable for firestopping of penetrations made by steel, glass, plastic, and insulated pipe.

C. Fire rating classification shall not require removal of insulation on insulated pipe.

D. Firestop rating shall not be less than rating of penetrated assembly.

E. Firestop systems do not re-establish structural integrity of load bearing partitions/ assemblies, or support live loads and traffic.

F. Installer shall consult Owner prior to penetrating any load bearing assembly.

G. For firestop applications that exist for which no UL tested system is available through any manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests shall be submitted to local authorities having jurisdiction for their review and approval prior to installation.

H. Compatibility: Provide products that are compatible with each other, with substrates forming openings, and with items, if any, penetrating firestopping, under conditions represented by this project, based on testing and field performance demonstrated by manufacturer.

I. Firestopping not to be water soluble where subject to moisture.

J. High traffic openings (i.e. cable tray openings) firestop with system allowing for repeated removal and reuse of firestop material such as pillows or putty.

K. Firestopping Exposed To View: Provide products with flame spread index of less than 25 and smoke developed index of less than 450, when tested in accordance with ASTM E 84.

L. Firestopping Exposed to View, Traffic, Moisture, or Physical Damage: Provide products that after curing do not deteriorate when exposed to those conditions during and after construction.

M. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.
   2. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
3. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.

N. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.

O. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.
   2. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

P. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
   2. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.5 FIRESTOPPING SYSTEMS

A. Firestopping:
   1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E 814 or ASTM E 119 that has F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and that meets other specified requirements.
   2. Fire Ratings: See Drawings for require ratings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive work of this section.
   1. Examine substrates, openings, voids, adjoining construction and project conditions.
   2. Confirm compatibility of surfaces scheduled to receive firestopping.

B. Verify that work within opening has been completed before installing firestopping.
   1. Correct conditions detrimental to timely and proper completion of work.
   2. Coordinate with work of other trades so that firestopping applications can be inspected prior to being covered by subsequent construction.
   3. Start of work will indicate acceptance of substrate.

C. Verify that penetrating elements are securely fixed and properly located with proper space allowance between penetrations and surfaces of openings.

D. Do not proceed until substrate and project conditions are satisfactory.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Prime substrates in accordance with manufacturer’s written instructions or recommendations.
   1. Confine primers to areas of bond; do not allow spillage or migration onto exposed surfaces.
D. Provide anchoring devices, back-up materials, clips, sleeves, supports and other related materials used in actual fire tests.

E. Install backing materials to prevent liquid material from leakage.

3.3 INSTALLATION

A. Install Work of this Section in accordance with:
   1. Construction Documents
   2. Reviewed Shop Drawings
   3. Requirements of governmental agencies having jurisdiction.
   4. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
      a. Obtain manufacturer's instructions for conditions not fully covered by printed instructions. Record in writing oral instructions received.
      b. Obtain approval and meet requirements of governmental agencies having jurisdiction.

B. Clean surfaces in contact with firestop materials of dirt, grease, oil, or other substance that may affect proper installation or fire resistance.

C. Consult with mechanical engineer prior to installation of any firestops around duct work that might hamper performance of fire dampers.

D. Install firestopping with sufficient pressure to properly fill and seal openings for effective smoke seal.

E. Install firestopping material promptly.

G. Fill, Void, and Cavity Materials: Use materials recommended by firestopping manufacturer to seal gaps created by non-combustible type damming boards and to seal around cables, conduits, pipes, and where void filler material becomes part of fire rated assembly.
   1. Floors and partitions sealed with masonry or concrete:
      a. Carefully fill and inspect for cracks or other imperfections.
   2. Floors:
      a. Filling voids in floors having openings of 4 inches or more in length or width, exclusive of penetrating items, provide firestopping materials which support same load as floor is designed to support, unless area is protected by a permanent barrier preventing loading or traffic on firestopped area.
      b. Protect firestopping materials from damage on surfaces subject to traffic.
   3. Pipe Insulation:
      a. Insulate pipes penetrating fire rated floors and walls with material which provides same performance as firestopping material.
      b. Extend this material at least 6 inches beyond both faces of opening. Maintain perm rating insulation’s vapor barrier.
   4. Rated Walls: Constructed with horizontally continuous air space, double wythe masonry, or double stud frame construction.
      a. Provide vertical, 12 inch wide fiber dams for full thickness and height of air cavity at 15 foot intervals maximum.

H. Sealant: Use non-sagging type where void cannot be dammed sufficiently to contain sealant until cured.
   1. Install damming material or mineral wool as recommended by manufacturer.
   2. Apply sealant to minimize air voids and to ensure sealant is in full contact with penetrating items and surrounding surfaces.
   3. Tool non-pourable sealant to ensure substrate contact if required.
4. Remove excess sealant in accordance with manufacturer's recommendations. Do not exceed minimum system or design thickness by more than 25 percent.

I. Mortar:
1. Install damming material as recommended by manufacturer for application.
2. Mix mortar in strict accordance with manufacturer's instructions.
3. Fill openings to minimum thickness as recommended by manufacturer and by tested system or selected design to achieve fire resistance rating.

J. Firestopping Mineral Wool:
1. Install by compressing material to minimum compression required tested system or selected design.
2. Apply firestopping in sufficient thickness, depth and density so as to achieve fire resistance rating.

K. Firestopping Devices, Collars, and Pillows:
1. Install in accordance with manufacturer's instructions, to achieve fire resistance rating.

L. Do not cover installed firestopping until inspected by authorities having jurisdiction.

M. Install labeling required by code.

3.4 FIELD QUALITY CONTROL
A. Inspect completed installations prior to concealing or enclosing an area containing firestopping materials.
   1. Area to remain accessible until inspection by governing authority
B. Notify Owner and authorities having jurisdiction prior to concealing or enclosing an area containing firestopping materials.
C. Owner to employ an independent inspection and testing agency.
D. Repair defective and damaged work as required to ensure compliance with Contract Documents.

3.5 CLEANING
A. Clean adjacent surfaces of firestopping materials.

3.6 PROTECTION
A. Repair damaged material.
B. Protect adjacent surfaces from damage by material installation.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
   A. Nonsag gunnable joint sealants.
   B. Joint backings and accessories.

1.2 REFERENCE STANDARDS

1.3 ADMINISTRATIVE REQUIREMENTS
   A. See Section 01 30 00 - Administrative Requirements, for pre-installation meeting procedures.
   B. Convene two weeks before starting work of this section.

1.4 SUBMITTALS
   A. See Section 01 33 00 – Submittal Procedures for submittals.
   B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
      1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
      2. List of backing materials approved for use with the specific product.
      3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
      4. Substrates the product should not be used on.
      5. Substrates for which use of primer is required.
   C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
   D. Installation Plan: Submit at least four weeks prior to start of installation.
   E. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
   F. Field Quality Control Plan: Submit at least two weeks prior to start of installation.
   G. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.
   H. Installation Log: Submit filled out log for each length or instance of sealant installed.
   I. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.
1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

C. Installation Plan: Include schedule of sealed joints, including the following.
   1. Installation Log Form: Include the following data fields, with known information filled out.
      a. Date of installation.
      b. Name of installer.
      c. Actual joint width; provide space to indicate maximum and minimum width.
      d. Actual joint depth to face of backing material at centerline of joint.
      e. Air temperature.

D. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
   1. Identification of testing agency.
   2. Name(s) of sealant manufacturers’ field representatives who will be observing
   3. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
      a. Substrate; if more than one type of substrate is involved in a single joint, provide two entries on form, for testing each sealant substrate side separately.
      b. Test date.
      c. Sealant used.
      d. Stated movement capability of sealant.
      e. Copy of test method documents.
      f. Age of sealant upon date of testing.
      g. Test results, modeled after the sample form in the test method document.
      h. Indicate use of photographic record of test.

E. Field Quality Control Plan:
   1. Visual inspection of entire length of sealant joints.
   2. Destructive field adhesion testing of sealant joints, except interior acrylic latex sealant.
      a. For each different sealant and substrate combination, allow for one test every 100 feet in the first 1000 linear feet, and one test per 1000 linear feet thereafter, or once per floor on each elevation.
      b. If any failures occur in the first 1000 linear feet, continue testing at frequency of one test per 500 linear feet at no extra cost to Owner.
   3. Field testing agency's qualifications.
   4. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

F. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Have a copy of the test method document available during tests.
   3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
   4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
   5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Owner.

G. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inch long.
2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.
4. Record results on Field Quality Control Log.

PART 2 PRODUCTS

2.1 JOINT SEALANT APPLICATIONS
A. Scope:
1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
   a. Wall expansion and control joints.
   b. Joints between door, window, and other frames and adjacent construction.
   c. Joints between different exposed materials.
   d. Openings below ledge angles in masonry.
   e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
   b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
   c. Other joints indicated below.
3. Do not seal the following types of joints.
   a. Intentional weepholes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.

B. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.2 JOINT SEALANTS - GENERAL
A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.3 NONSAG JOINT SEALANTS
A. Type ____- Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Applications: Use for:
   a. Joints between plumbing fixtures and floor and wall surfaces.
b. Joints between kitchen and bath countertops and wall surfaces.


3. Manufacturers:
   c. Pecora Corporation: www.pecora.com/

   d. Or approved equal.

B. Type____ - Interior Concealed Perimeter Sealant: Silicone; ASTM C 920, Type S, Grade NS, uses NT, G, M, A and O, single component.

1. Applications: Use for:
   a. Concealed Joints between door/windows and adjacent materials.
   b. Concealed Joints between metal frames and other materials.


3. Products:
   b. Or approved equal.

C. Type_____ - Acoustical Sealant for Concealed Locations:

1. Applications: Use for concealed locations only:
   a. Sealant bead between top stud runner and structure and between bottom stud track and floor.

2. Exposed and Concealed Joints:
   b. Pecora; AC-20 FTR Acoustical Sealant: www.pecora.com

3. Concealed Joints:

2.4 ACCESSORIES

A. Silicone Strips: Extruded elastomeric silicone profile.

1. Extruded low modules elastomeric silicone:
   a. Tensile Strength: 400 psi per ASTM D412.
   b. Elongation: 400 percent per ASTM D412.

2. Width: 4 inches.

3. Application Between glazing pocket at Curtain Wall framing and rough opening.

4. Color: White

5. Products:
   b. Or approved equal.

B. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

1. Bi-Cellular: Polyethylene foam rod, 25 to 33 percent larger in diameter than joint width.

2. Manufacturers:
   a. Bi-Cellular:
      1) Backer Rod Mfg, Inc.; Titan Foam.
   b. Or approved equal.

C. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

D. Joint Protection:

1. Manufacturer: Weathercap, Inc.
   b. Profile: Type A.

E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

F. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

G. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

H. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify that joints are ready to receive work.
   B. Verify that backing materials are compatible with sealants.
   C. Verify that backer rods are of the correct size.
   D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
      1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
      2. Notify Architect of date and time that tests will be performed, at least 7 days in advance.
      3. Arrange for sealant manufacturer's technical representative to be present during tests.
      4. Record each test on Preinstallation Adhesion Test Log as indicated.
      5. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
      6. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.2 PREPARATION
   A. Remove loose materials and foreign matter that could impair adhesion of sealant.
   B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
   C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
   D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
   
   E. Concrete and Masonry:
      1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, or mechanical abrading; remove loose particles from cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
      2. Where surfaces have been treated, remove surface treatment by sandblasting or wire brushing.
      3. Remove laitance and mortar from masonry joint cavities
      4. Remove laitance and form-release agents from concrete.
   
   F. Metal surfaces:
      1. Clean steel surfaces with metal or wire brush to remove mill scale and rust.
         a. Prime surfaces as recommended by manufacturer.
      2. Clean nonporous surfaces with chemical cleaner which leaves no residue to remove oil and grease, and protective coatings, wiping surfaces with clean rags.

   G. Protect elements surrounding the work of this section from damage or disfigurement.
1. Use tape or other materials recommended by manufacturer to prevent contact of sealant with adjoining surfaces that would otherwise be permanently stained or damaged by such contact or by cleaning methods to remove sealant smears.

2. Concrete sealed with water repellent. Protect joints prior to applying sealer or apply sealer after sealant is installed and cured.

H. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.3 INSTALLATION

A. Prepare Job Site Daily Log Reports.

B. Perform work in accordance with sealant manufacturer’s requirements for preparation of surfaces and material installation instructions.

C. Perform installation in accordance with ASTM C1193.

D. Perform acoustical sealant application work in accordance with ASTM C919.

E. Sealant Backings:
   1. Install material to uniform depth below sealant.
   2. Using tool, smoothly and uniformly place backup material to depth of approximately 1/2 joint width (1/4 inch minimum), compressing backup material 25 percent to 50 percent and securing a positive fit.
   3. Do not leave gaps between ends of sealant backings.
   4. Do not stretch, twist, puncture, or tear sealant backings.

F. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   2. Neck dimension no greater than 1/3 of the joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

G. Install bond breaker backing tape where backer rod cannot be used.

H. Primers: Use primer approved by manufacturer for substrates being sealed, in accordance with manufacturer’s recommendations.

I. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

J. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

K. Mask joints where appearance of primer or sealant on adjacent surfaces would be objectionable.
   1. Provide dams where necessary to contain sealant.
   2. Remove masking tape immediately after tooling without disturbing joint seal.

L. Tool joints concave.
   1. Provide uniformly smooth joints with slightly concave surface, flush at edges with adjacent surface, according to ASTM C 1193, unless otherwise indicated.
   2. Do not use tooling agent unless specifically recommended in writing by sealant manufacturer.
   3. Leave sealant surface neat and smooth.

M. Apply two (2) beads of acoustical sealant to bottom of track.

3.4 FIELD QUALITY CONTROL

A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
1. Contractor to perform testing.

B. Destructive Adhesion Testing: If there are any failures in first 1000 linear feet, notify Owner immediately.

1. Attendees for test meeting:
   a. Sealant manufacturer's technical representative.
   b. Contractor
   c. Installer
   d. Architect
   e. Owner

2. Initial Performance Testing:
   a. Minimum four (4) locations and minimum two (2) at window perimeters in accordance with ASTM C1193 and as determined by Architect.
      1) Prepare substrate surface for sealant application.
      2) Install sealant joint.
      3) Allow proper sealant cure time.
      4) Knife cut across sealant joint and two inches along each side of joint.
      5) Pull sealant out of joint at angle less than 90 degrees from cut piece and joint.

3. Follow-up Testing:
   a. First 1000 Linear Feet: One test every 100 linear feet as soon as sealant is cured.
      b. After first 1000 linear feet, if good results occur in first 1000 linear feet.
         1) One test per 1000 linear feet.
         2) One test per floor per elevation.
         3) One test per week per installation crew.

4. Testing Documentation:
   a. Date and location.
   b. Installed age of sealant.
   c. Test result, sealant failure type and degree of force (much or little).
   d. Dimension of bead configuration.

5. Test Success: Sealant separates from itself, cohesive failure, adhering to substrate and failing in bond to itself.

6. Test Failure: Sealants from substrate, failing in bond to substrate, adhesive failure.
   a. Repair field adhesion tests immediately after determining and documenting results.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

D. Repair destructive test location damage immediately after evaluation and recording of results.
PART 1 GENERAL

1.1 SECTION INCLUDES
   A. Non-fire and Fire-rated hollow metal frames.
   B. Hollow metal borrowed lites glazing frames.
   C. Accessories, including glazing, louvers, and matching panels.

1.2 REFERENCE STANDARDS
   B. ANSI A250.11 - Recommended Erection Instructions for Steel Frames; 2012.
   D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.
   F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
   I. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.
   K. ITS (DIR) - Directory of Listed Products; current edition.
   L. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
   P. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.
   R. SDI 111 - Recommended Details for Standard Steel Doors, Frames, Accessories and Related Components; 2009.
   T. UL (DIR) - Online Certifications Directory; Current Edition.
1.3 SUBMITTALS
A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
   1. Certification: Submit certification that Work complies with specified standards.
C. Submit data that frame assemblies, have been tested and approved by governing jurisdiction for following labeled construction:
   1. Fire protection rating label for doors and frames.
   2. Smoke control “S” label for door and frame assemblies.
   3. Temperature rate rise label for doors.
D. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
   1. Door and Frame Schedule: Use same reference numbers for details and openings as those in Contract Drawings.
   2. Indicate coordination of glazing frames and stops with glass and glazing requirements.
E. Manufacturer’s Qualification Statement.

1.4 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years experience and approved by manufacturer.
C. Unless specifically otherwise approved by Architect, provide doors and welded frames from a single manufacturer.

1.5 COORDINATION
A. Coordinate as required with other trades to assure proper and adequate provision in Work of those trades for interface with Work of this Section.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
B. Protect doors and frames from damage.
C. Store frames and doors upright in protected dry area, above ground or floor, with at least 1/4 inch spaces between individual units, to permit air circulation.
D. Brace bottom ends of frame jambs against displacement
E. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS
2.1 MANUFACTURERS
A. Hollow Metal Frames:
6. Or approved equal.

2.2 PERFORMANCE REQUIREMENTS
A. Refer to Door and Frame Schedule on the drawings for frame sizes, fire ratings, sound ratings, finishing, door hardware to be installed, and other variations, if any.
B. Requirements for Hollow Metal Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
4. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
5. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal frames.
   a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

2.3 HOLLOW METAL FRAMES
A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
B. Frame Finish: Factory primed and field finished.
C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.
   2. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
D. Interior Door Frames, Fire-Rated: Provide smoke gaskets.
   1. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
   2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C or NFPA 252 ("positive pressure fire tests").
      a. Provide units listed and labeled by testing agency acceptable to authorities having jurisdiction, ITS (DIR), or UL (DIR).
      b. Attach fire rating label to each fire rated unit.
   3. Smoke and Draft Control Doors (Indicated with Letter "S" on Drawings and/or Door Schedule): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure at both ambient and elevated temperatures; with "S" label; if necessary, provide additional gasketing or edge sealing.
E. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
F. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
2.4 FINISHES
   A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
      1. Interior doors not in contact with concrete or CMU.

2.5 ACCESSORIES
   A. Glazing: As specified in Section 08 80 00, factory installed.
   B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
      1. Place stops on secure side of interior doors for glass and louvers.
      2. 18 gage steel minimum.
      3. Square profile.
   C. Astragals for Double Doors: Specified in Section 08 71 00.
   D. Reinforcement:
      1. Provide Manufacturer standard for finish hardware being provided under Section 08 71 00.
   E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
   F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.6 FABRICATION
   A. Fabricate steel frame units to be rigid, neat in appearance, and free from defects, warp, or buckle in compliance with ANSI A250.8 requirements.
      1. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and molding from either cold or hot-rolled steel sheet.
   B. Bevel lock and hinge side edges of doors 1/8 inch in 2 inches.
   C. Clearances: Fabricate with following clearances, except for fire doors provide clearances according to NFPA 80.
      1. Between doors and frames: 1/8 inch.
      2. Between door bottoms and thresholds: 1/4 inch.
      4. Between meeting edges of non-fire rated pairs of doors: 3/32 inch

PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify existing conditions before starting work.
   B. Verify that opening sizes and tolerances are acceptable.
   C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 COORDINATION
   A. Coordinate with other trades to assure proper and adequate provision in work of those trades for interface with Work of this Section.
   B. Protect work of others from damage.

3.3 INSTALLATION
   A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
      2. Reviewed shop drawings.
      3. Requirements of governmental agencies having jurisdiction.
4. Set doors flush with frame face and plumb to hold in any position.
5. Fit doors in frames within specified clearances.

B. Coordinate frame anchor placement with wall construction.
   1. Comply with provisions of ANSI A250.11, and following:
      a. Where possible, place frames prior to construction of enclosing walls.
      b. Set frames accurately into position, aligned and braced securely until permanent anchors are set.
         1) Remove steel shipping spreaders prior to setting frames.
         2) Use precisely-cut installation spreaders at sill and mid-height or sill and third-points in frames over 7'-0" opening height to maintain rabbet opening width.
         3) Frames in final position to be plus or minus 1/16 inch maximum from squared and plumbed alignment.
      c. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
      d. At in-place construction, set frames and secure to adjacent construction with machine screws and suitable anchorage devices. Provide "Z" fillers at each screw location.
      e. Provide sealant between frame and adjacent wall material.

C. Install door hardware as specified in Section 08 71 00.
   1. Prepare doors and frames to receive hardware according to final door hardware schedule and templates provided by hardware supplier.
   2. Comply with requirements of ANSI A250.6.
   3. Provide space, cutouts, reinforcing for concealed overhead door closers and provisions for fastening in top rail of doors or head of frames, as applicable.

D. Comply with glazing installation requirements of Section 08 80 00.

3.4 TOLERANCES
   A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
   B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5 ADJUSTING
   A. Adjust for smooth and balanced door movement.

3.6 CLEAN, ADJUSTMENT AND PROTECTION
   A. During warranty period, check and adjust operating finish hardware items for smooth and quiet operation.
   B. Immediately after erection, sand smooth rusted and damaged areas of prime coat, and apply touch-up of compatible, air-drying primer.
   C. Clean, without damaging, exposed surfaces of Work of this Section and repair as required.
   D. Remove from jobsite refuse and debris created and dispose per Section 01 74 00.

3.7 SCHEDULE - See Drawings

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Flush wood doors; flush configuration; non-rated.

1.2 REFERENCE STANDARDS
B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
E. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.3 SUBMITTALS
A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
C. Samples: Submit two samples of door construction, 8 by 8 inch in size cut from top corner of door including edge treatment.
D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
E. Test Reports: Show compliance with specified requirements for the following:
   1. Rated assemblies listing and approval by authority having jurisdiction for the following:
      a. Fire protection rating label for doors and frames.
      b. Smoke control “S” label for door and frame assemblies.
      c. Temperature rise label for doors.
   F. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing.
      1. Details of door construction, including core and edge construction and trim for openings.
      2. Indicate net door clearance for doors on accessible path per ICC A117.1 or as indicated on drawings.
   G. Door Schedule: Use same reference numbers for details and openings as those in Contract Drawings.
      1. Indicate coordination of glazing frames and stops with glass and glazing requirements.
   H. Oversize Construction Certification: For fire rated door assemblies that exceed limitations of labeled assemblies, submit certification that each door and frame assembly has been constructed to conform to design, materials, and construction equivalent to requirements for labeled construction.
   I. Manufacturer's Installation Instructions: Indicate special installation instructions.
   J. Warranty, executed in Owner's name.

1.4 REGULATORY REQUIREMENTS
A. Fire-Rated Wood Doors: Provide doors complying with NFPA 80 that are listed and labeled for fire ratings indicated, base on testing according to NFPA 252.
B. Fire door assemblies shall be labeled for fire resistance and smoke control ("S" label) in accordance with NFPA 252 and UL 10C.
   1. Meet appropriate Factory Mutual, Underwriters Laboratories, or Warnock Hersey requirements and have acceptance label permanently attached to each fire door assembly.

C. For stair doors, and where indicated or required by Building Code in exit enclosures, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

1.5 QUALITY ASSURANCE
A. Use skilled workers trained and experienced in necessary crafts and familiar with requirements and methods needed for proper performance of the Work.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

C. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.
   1. Stack flat on 2 x 4 lumber, laid 12 inches from ends and across center.
   2. Under bottom door and over top of stack, provide plywood or corrugated cardboard to protect door surfaces.

D. Handling: Do not drag doors across one another; lift doors and carry them into position. Handle with clean gloves.

E. Store 7 days minimum at building temperature and humidity before installing.

1.7 PROJECT CONDITIONS
A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.8 ENVIRONMENTAL CONDITIONS
A. Maintain 50 degrees F or above in areas where wood doors are installed.

B. Maintain 30 percent minimum to 60 percent maximum humidity in areas where wood doors are installed.

1.9 COORDINATION
A. Coordinate with other trades as required to assure proper and adequate provision in work of those trades for interface with work of this Section.
   1. Coordinate doors to receive hardware specified in Section 08 71 00.
1.10 WARRANTY
   A. Interior Doors: Provide manufacturer's warranty for the life of the installation.
   B. Provide warranty for the following term:
      1. Interior Doors: Life of installation.
      2. Replace, rehang and refinish without any additional cost to Owner any delaminated doors
         or any doors exceeding tolerance limits.
   C. Include coverage for delamination of veneer, warping beyond specified installation tolerances,
      defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS
   A. High Pressure Decorative Laminate (HPDL) Faced Doors: Type WD-3 and WD-4
      2. Or approved equal.

2.2 DOORS AND PANELS
   A. Requirements for Doors and Frames:
      2. Door Edge Profile: Beveled on both edges.
      3. Door Texture: As indicated on drawings.
   B. Doors: Refer to drawings for locations and additional requirements.
      1. Quality Level: Premium Grade, in accordance with AWI/AWMAC Architectural Woodwork
         Quality Standards Illustrated, Section 1300.
      2. High Pressure Decorative Laminate (HPDL) Faced Doors: 5-ply unless otherwise
         indicated.
   C. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
      1. Provide solid core doors at each location.
      2. Types: Provide the following types, as scheduled:
         a. Flush Face.
      4. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required
         fire rating, provide flush wood door assemblies in compliance with WDMA I.S. 1A
         requirements for "S" label; no additional gasketing or edge sealing allowed.
      5. High pressure decorative laminate (HPDL) finish as indicated on drawings.

2.3 DOOR AND PANEL CORES
   A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and
      faces as indicated.

2.4 DOOR FACINGS:
   A. Type WD-3
   B. Veneer Facing for Transparent Finish: See Drawings - Material and Finishes Schedule.
   C. Facing Adhesive: Type I - waterproof.

2.5 DOOR FACINGS:
   A. Type WD-4
   B. High Pressure Decorative Laminate (HPDL) Facing: See Drawings - Material and Finishes
      Schedule.
   C. Face Veneer Impact Resistance - ASTM D-4226: 86 in/lb. (99.08kg/cm³) to confirm impact
      resistance of face finish.
D. Facing Adhesive: Type I - waterproof.

2.6 DOOR FRAMES
A. Hollow Metal Door Frames: As specified in Section 08 11 13.

2.7 DOOR CONSTRUCTION
A. Fabricate doors in accordance with door quality standard specified.
B. Cores Constructed with stiles and rails:
C. Bond edge banding to core with adhesive.
D. Provide solid blocks at lock edge for hardware reinforcement.
E. Fit door edge trim to edge of stiles after applying veneer facing.
F. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
G. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
H. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
I. Provide edge clearances in accordance with the quality standard specified.
J. Machine and hand sand exposed surfaces.

2.8 ACCESSORIES
A. Hollow Metal Door Frames: As specified in Section 08 11 13.
B. Metal Louvers:
  1. Material and Finish: Roll formed steel; pre-painted finish to color as selected.
  2. Louver Free Area: 50 percent.
C. Glazed Openings:
  2. Glazing: Single vision units, 1/4 inch thick glass.
  3. Tint: Clear.
D. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
E. Door Hardware: As specified in Section 08 71 00.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify existing conditions before starting work.
  1. Correct conditions detrimental to timely and proper completion of Work.
  2. Do not proceed until unsatisfactory conditions are corrected.
B. Verify that opening sizes and tolerances are acceptable.
C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 COORDINATION
A. Coordinate to assure proper and adequate provision of Work and interface other trades.
B. Protect work of others from damage.
3.3 INSTALLATION

A. Install doors in accordance with manufacturer's instructions, quality standard and as specified.
   2. Reviewed Shop Drawings.
   3. Requirements of governmental agencies having jurisdiction.
   4. Install smoke control doors with frames that have been constructed and tested as an
      assembly in accordance with Building Code and approved for "S" label.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Field-Finished Doors: Trimming to fit is acceptable.
   1. Adjust width of non-rated doors by cutting equally on both jamb edges.
   2. Trim maximum of 3/4 inch off bottom edges.
   3. Seal trimmed edges in accordance with manufacturer recommendation.

D. Fitting and machining:
   1. Tolerances:
      a. Bottom: 1/4 inch clearance maximum.
      b. Top: 1/8 inch clearance maximum.
      c. Lock edge and hinge edge: Bevel 1/8 inch in 2 inches maximum.

E. Use machine tools to cut or drill for hardware.

F. Coordinate installation of doors with installation of frames and hardware in accordance with
   recommendations of manufacturers.
   1. See Section 08 71 00 for additional hardware.

G. Coordinate installation of glazing.

H. Replace or rehang doors which are hinge bound and do not swing or operate freely or are not
   flush with frame face when closed.
   1. Door left in any position of its swing shall hold.

3.4 COMPLIANCE

A. Owner reserves right to request and pay for inspection by a representative of reference
   organization to determine that Work of this Section has been performed in accordance with
   specified standards.

B. In event inspection determines Work of this Section does not comply with specified
   requirements, immediately remove non-complying items and replace with items complying with
   specified requirements, at no additional cost to Owner, and reimburse Owner for cost of
   inspection.

3.5 TOLERANCES

A. Comply with specified quality standard for telegraphing, warp, and squareness.

B. Squareness: 1/8 inch maximum difference between 2 diagonal measurements.

C. Maximum Vertical Distortion (Bow): 1/8 inch1/4 inch measured with straight edge or taut
   string, top to bottom, over an imaginary 36 by 84 inches surface area.

D. Maximum Width Distortion (Cup): 1/8 inch1/4 inch measured with straight edge or taut string,
   edge to edge, over an imaginary 36 by 84 inches surface area.

3.6 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

C. During warranty period, check, adjust and service moving parts to operate smoothly and
   quietly.
1. Adjust weatherstripping, gaskets, and door bottoms for correct clearance.

3.7 CLEANING
   A. Clean, without damaging, exposed surfaces affected by Work of this Section, and repair as necessary.
   B. Remove from jobsite refuse and debris created and dispose per Section 01 74 19.

3.8 SCHEDULE - See Drawings

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
   A. Hardware for Interior doors.
   B. Electrically operated and controlled hardware.
   C. Lock cylinders for doors for which hardware is specified in other sections.
   D. Thresholds.
   E. Weatherstripping, seals and door gaskets.

1.2 REFERENCE STANDARDS

1.3 ADMINISTRATIVE REQUIREMENTS
   A. See Section 01 31 19 - Project Meetings for pre-installation meeting procedures.
   B. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.
   C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
   D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
   E. Convey Owner's keying requirements to manufacturers.
   F. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.
      1. Prior to commencement of hardware work, schedule meeting with Owner, Contractor, Contractor’s field superintendent, hardware installer, and other interested parties to review methods and procedures to be used to achieve end results.
   G. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.4 SUBMITTALS
   A. See Section 01 33 00 – Submittal Procedures for submittals.
   B. Product Data
      1. Hardware: Manufacturer's specifications, maintenance and keying manual, and installation instructions of finish hardware. Include photographs, marked templates and other data required to show compliance with these specifications.
   C. Finish Hardware Schedule.
1. **Format:** Comply with scheduling sequence and vertical format in DHI’s (Door & Hardware Institute) “Sequence and Format for Hardware Schedule.” Double space entries and number/date each page.

2. **Content:**
   a. Identification number, location, hand, fire rating, degree of opening and material of each door and frame.
   b. Type, style, function, size, quantity and finish of each door hardware item.
   c. Include description and function of each lockset and exit device.
   d. Complete designations of items required for each door or opening including name and manufacturer.
   e. Fastenings and other pertinent information on attachment of hardware.
   f. Explanation of abbreviations, symbols and codes contained in schedule.
   g. Mounting locations for door hardware.
   h. Include separate schedule of key and masterkey system.

3. Approval of this list by Owner not to relieve Contractor of responsibility to provide finish hardware components required for complete operating installation.

**D. Keying Information:** Provide keying and bitting information to Owner.

**E. Cut sheets:**
1. One (1) set of manufacturer cut sheets for each hardware item supplied.

**F. Templates/Diagrams:**
1. Deliver templates of approved finish hardware items compatible with other work.
2. Electrical diagrams, including riser and point to point hook-up for each door with electrified hardware.

**G. Shop Drawings:**
1. Indicate locations and mounting heights of each type of hardware, catalog cuts, electrical characteristics and connection requirements.
2. Submit manufacturer's parts lists and templates.

**H. Manufacturer's Installation Instructions:** Indicate special procedures, perimeter conditions requiring special attention.

**I. Maintenance Data:** Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

**J. Maintenance Materials and Tools:**
1. See Section 01 77 00 – Closeout Procedures for additional provisions.
2. Provide ten extra key lock cylinders for each master keyed group.
3. Provide special wrenches and tools applicable to each different or special hardware component.
4. Provide maintenance tools and accessories supplied by hardware component manufacturer.

**K. Keys:** Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

**L. Warranty:** Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

### 1.5 QUALITY ASSURANCE

**A.** Provide services of an AHC or DHI member of Door Hardware Institute to:
1. Be available for consultation with Architect/Owner at no additional cost to Owner during progress of construction.

**B. Hardware Supplier Qualifications:** Company specializing in supplying commercial door hardware with 5 years of experience.
1. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

2. Hardware consultant must be an employee of supplier.

C. Hardware supplier shall have and maintain a factory direct status with manufacturer’s specified or approved during course of project.

D. Where several manufacturer’s are specified for one type of hardware, use only products of one manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Hardware to comply with applicable local and/or State fire and current building codes.

B. Hardware installed at doors with U.L. fire-resistant rating to meet required rating.

C. Doors installed for smoke protection to receive hardware as recommended by NFPA.

D. Provide hardware according to requirements of Building Code for fire door assemblies labeled for fire resistance and smoke control (“S” label).

E. Electric equipment to have U.L. approved listing for complete assembly.

F. Comply with requirements of ANSI A117.1. and The Americans with Disabilities Act (ADA) and State Building Code regarding access for disabled.

1.7 DELIVERY, STORAGE AND HANDLING

A. Individually package each unit of finish hardware, complete with proper fastenings and appurtenances, clearly marked on outside to indicate contents and specific locations in Work.

B. Provide experienced employee designated to receive, take charge of, and distribute hardware at building site, and provide locked area for storage of hardware.

C. Protect from damage.

1. Stockpile items sufficiently in advance to assure proper and adequate provision in Work of those trades for interface with Work of this Section.

1.8 WARRANTY

A. See Section 01 77 00 - Closeout Procedures, for additional warranty requirements.

B. Warrant operation of locksets for three (3) years and seven (7) years for ND series locks.

C. Warrant operation of closers for thirty (30) years.

D. Warrant operation of door operators for two (2) years.

E. Warrant operation of exit devices for three (3) years.

1.9 CERTIFICATION

A. Prior to Substantial Completion Date, provide written certificate that hardware is complete and conforms to Specifications and approved submittals.

1.10 CLOSEOUT SUBMITTALS

A. As specified in Section 01 77 00.

B. Operating Tools: Furnish adjusting tools.

C. Keys: Stamp keys for identification and deliver to Owner. Furnish keys for each lock as specified. Use of final keys will not be permitted during construction.

1. Delivery of Hardware: Deliver in unopened containers fully identified with manufacturer’s name, number and finish.
PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with following:
   1. Applicable provisions of Federal, State, and local codes.
   2. 36 CFR 1191, ADA Standards for Accessible Design.
   6. Hardware on Fire-Rated Doors: Listed and classified by UL (BMD) as suitable for purpose specified and indicated.
   7. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of applicable code.
   8. Products Requiring Electrical Connection: Listed and classified by UL (BMD) as suitable for purpose specified and indicated.

2.2 HARDWARE FINISHES

A. Produce finishes as stated herein. Finishes of same designation, that come from more than one source, shall match when items are viewed at arms length and approximately 2 feet apart.
   1. Unless otherwise specified, match finish of each item of hardware with finish selected for lock sets and latches.

2.3 GENERAL

A. Fasteners:
   1. Furnish necessary flat head screws, bolts, and other fasteners of suitable size and type to anchor hardware in position for long life under hard use.
   2. Where necessary, furnish fasteners with expansion shields, sex bolts, and other anchors as required and recommended by hardware manufacturer.
      a. Toggle Bolts: Not permitted.
   3. Provide fasteners which harmonize with hardware as to finish and material.
   4. Conceal if possible when door is in closed position; exposed fasteners to have Phillips head.

B. Locks and Latches: Verify:
   1. Operation
   2. Hand of doors
   3. Function for each opening.

C. Closers: Verify for each door:
   1. Hand of door
   2. Degree of opening
   3. Frequency of use
4. Head condition.
   a. Provide closers which do not limit door swing.
   b. Furnish drop plates for narrow top rails.
   c. Furnish manufacturer's standard one piece cast arm at parallel arm location.
   d. Furnish closers at fire-resistant rated doors, exterior doors and elsewhere as shown.

D. Where butts are required to swing 180 degrees, furnish butts of sufficient throw to clear trim.
   1. Furnish 1-1/2 pair of butts, minimum, per leaf unless specifically scheduled otherwise.

E. Furnish silencers for door frames at rate of three (3) for each single door and two (2) for each
door or pair of doors; except gasketed doors and doors with light seals or sound seals.
   1. Furnish gaskets for rated doors to corridors or other exitways.

F. Furnish door stops in number and type to protect finishes wherever doors or hardware could
strike adjacent surfaces and materials.

G. Hardware Locations:
   1. Mount hardware at recommended location of manufacturer or per requirements of ICC
      A117.1.

2.4 KEYING

A. Factory or locally key following:
   1. Furnish a Schlage 'Everest 29-S' master key system.
   2. Meet with Owner to determine specific keying requirements.
      a. Furnish keying schedule within ten (10) days of key meeting for Owner review and
         approval.

B. Furnish nickel silver keys for each lock as follows:
   1. Three (3) change keys per cylinder.
   2. Six (6) masterkeys for each set.
   3. Three (3) grand-masterkeys (if applicable.)

C. Construction keying:
   1. Furnish a construction key system with 10 keys for locks and cylinders: seven (7) for
      Contractor and three (3) for Owner.
   2. Use only construction keys during construction.
   3. Upon Substantial Completion of Work, void construction key system and, in presence of
      Architect and Owner, demonstrate specified keying system is operating properly.

D. Identification and delivery:
   1. Stamp permanent keys, "DO NOT DUPLICATE".

E. Key storage cabinet
   1. Manufacturer:
      a. MMF
      b. Telkee
      c. Bommer, or approved equal.
   2. Type: Surface mounted, with key control tags.
   3. Capacity: As required permanent keys plus 25 percent.
   4. Location: As selected by Owner.

F. Key lock box
   1. Heavy-duty, surface mounted, solid stainless-steel box with hinged door and interior
gasket seal, single drill resistant lock with dust covers.
      a. Model: 3200 series
      b. Size: 4 inch high x 5 inch wide x 3 ¼ inch deep and suitable for security key card.
      c. Lock: UL Listed, double action rotating tumblers, hardened steel pins.
      d. Housing: ¼ inch steel plate.
e. Door: ½ inch thick, hinged steel door with interior gasket.
f. Alarm tamper switch: Not required.
g. Finish: Black, TGIC polyester powder coat, factory applied.

3. Location: As indicated on Drawings.
a. Provide stainless steel washers or metal plate to prevent pull-through.

4. Ordering and installation:
   a. Contractor must obtain authorization order form from local fire department.
      1) Orders will not be accepted without authorization form.
   b. Install box with door in open position.
   c. Contractor shall arrange for Fire Department and Owner to inspect installation at same meeting.
   d. Fire Department shall load keys into vault and lock box while Owner is observing.

2.5 PRODUCTS

A. Single Source:
   1. Except as specifically otherwise approved in advance by Owner, furnish for each items only product of a single manufacturer.

B. Hinges:
   1. Standard Hinges: Mortise type with ball bearings.
      a. Out-swinging doors with locks to have non-removable pins.

C. Continuous Hinges: Full mortise split nylon pin & barrel or geared type, with symmetrically templated hole pattern and non-handed.

D. Locks and Latches:
   1. Latchbolt: Anti-friction type with curved strike lip.
      a. Provide extended lip where necessary to protect door frame trim from damage.
      b. Match hardware finish.
   2. Fabricate with 3 3/4 inches backset from door edge where surface applied gasketing at door frame stops and 2 3/4 inches elsewhere.
   3. Type: Lever handle, unless otherwise noted.
   4. Provide mortise locks with integral occupancy indicator Unisex toilet and bathing rooms.
      a. Unit to be equipped with ADA thumbturn and have simultaneous retraction of latch and deadbolt when inside lever is turned.
      b. Occupancy indicator and lockset assembly to be by same manufacturer and designed for use in this application.

E. Exit Devices:
   1. Furnish with provisions for concealed mounting.
      a. Through-bolts not acceptable unless required by fire codes or fire tests.
   2. Include impact resistant, flush mounted end cap.
      a. End caps to be of heavy-duty alloy construction and provide horizontal adjustment for flush alignment with device cover plate.
      b. No raised edges to protrude from end cap.
   3. Furnish with:
      a. Hydraulic touch pad dampener for quiet operation of device.
      b. Deadlocking latchbolts and roller strikes.
   5. Supply plastic installation template.

F. Flush Bolts:
   1. For floor locations, provide dust-proof strikes if ‘LBB’ (less bottom bolt) option cannot be used.

G. Door Closers:
1. Mount on room side, not corridor or lobby side of doors bordering circulation system unless otherwise shown.

2. Fasteners: Concealed.

3. Closer to have:
   a. Heavy duty arms.
   b. Adjustable spring power with indicator dial.
   c. Stick-on templates.
   d. Self reaming/tapping screws.
   e. Pressure relief valves: Not permitted.

H. Door Operators:
1. Furnish products necessary to provide functioning low energy electrically powered automatic door operator system.

2. Fasteners: Concealed.

3. Operator to have:
   a. Heavy duty arms
   b. Adjustable spring power
   c. Hydraulic checking action.
   d. Pressure relief valves: Not permitted.

I. Stops:
1. Do not use floor stops unless specifically approved by Owner or shown otherwise.

2. If wall stops cannot be installed so as to be in contact with lock/latch half of door leaf, provide concealed or surface overhead holder.

J. Kickplates:
1. Metal, as specified in Door Hardware Groups.

2. Secure with oval-head full-thread screws, spaced uniformly at maximum of five (5) inches on center at kickplate perimeter.

3. Kickplates:
   a. 18 gage
   b. Beveled on 4 edges.

K. Finishes: As shown on Door Hardware Groups.

L. Manufacturer and Acceptable Substitutes:

Acceptable

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<tr>
<th>Item</th>
<th>Manufacturer</th>
<th>Substitute</th>
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<tr>
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<td>4. Cylinders:</td>
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<td>Schlage Electronics</td>
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<td>7. Flush Bolts:</td>
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<td>ABH, Trimco</td>
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<td>8. Surface Closers:</td>
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<td>16. Weatherstripping/Gasketing:</td>
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17. Door Bottoms: Zero (ZER) National Guard, Pemko
18. Thresholds: Zero (ZER) National Guard, Pemko
19. Silencers: Ives (IVE) Trimco, Hager

PART 3 EXECUTION

3.1 EXAMINATION
A. Examine conditions under which Work of this Section will be performed.
1. Correct conditions detrimental to timely and proper completion of Work.
2. Do not proceed until unsatisfactory conditions are corrected.
B. Protect work of others from damage.

3.2 COORDINATION
A. Coordinate with other trades to assure proper and adequate provision in Work of those trades for interface with Work of this Section.

3.3 INSTALLATION
A. Install Work accordance with:
1. Hardware groups specified.
2. Approved Schedule.
3. Applicable requirements of governmental agencies having jurisdiction.
4. Manufacturer’s and referenced standard’s recommended installation procedures.
B. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.
C. Mounting heights for hardware from finished floor to center line of hardware item:
1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
2. For steel doors and frames: See Section 08 11 13.
3. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."
4. Wood doors: See Section 08 14 16.
D. Accurately locate, fit and install square, plumb and true.
1. Provide hairline fit at joints
2. Securely fasten.
E. After fitting mortised hardware to surfaces to be painted, remove and store hardware in original package in secure place until painting is completed, then install permanently.

3.4 CLEANING, ADJUSTMENT AND PROTECTION
A. Clean, without damaging, exposed surfaces affected by work of this Section and repair as necessary.
B. Remove from site refuse created by this Work, and dispose of in legal manner.
C. Remove protective coating completely from exposed surfaces as soon as progress of Work permits with safety.
D. Properly wrap hardware subjected to hand usage during construction for protection; hardware finish damaged through carelessness to be replaced at no expense to Owner.
E. Upon completion of Work, and as condition of its acceptance, provide inspection, and adjustment.
1. At time of Substantial Completion, during and at end of warranty period, test, adjust and where necessary lubricate moving parts including keyways for free, smooth and quiet operation.
   a. Lubricate locks with fine powdered graphite only.
2. After ventilation system is balanced, adjust closers as necessary to meet ADA and Building Code regarding time required for closing operation and force required to open and provide written report pertaining to overall operation and installation of hardware.

3.5 FINISH HARDWARE GROUPS
   A. See Section 08 71 01 Door Hardware Groups.

END OF SECTION
### Hardware Group #01
**8EH-01**

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<td>Wall Stop</td>
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<td>Silencer</td>
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**Comments**

Door to have keypad with integrated badge reader

### Hardware Group #2
**8EH-03.1**

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**Comments**

Door to have keypad with integrated badge reader

### Hardware Group #3
**8EH-05**

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**Comments**

Door to have badge reader

AMA Project Number: 191360
### Hardware Group #4
8EH-37

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**Door to have badge reader**

### Hardware Group #5
8EH-COR-A

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<td>1</td>
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<td>3</td>
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**Door to have badge reader, 2 door operators**

### Hardware Group #6
8EH-STR-13

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**Existing door to have badge reader inside stairwell, delayed emergency exiting**

AMA Project Number: 191360
## Hardware Group #7

### 8EH-02

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<td>4040XP</td>
<td>LCN</td>
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<tr>
<td>Silencer</td>
<td>1 EA</td>
<td>SR64 ½&quot;</td>
<td>Ives</td>
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**Public toilet with privacy lock functions**

**END OF SECTION**
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Glazing units, for interior relites, non rated doors.
B. Plastic films.

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS
A. Product Data on Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

1.4 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.1 GLASS MATERIALS
A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

2.2 GLAZING UNITS
A. Type GI-20 - Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Annealed float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.
B. Monolithic Safety Glazing: Non-fire-rated.
   1. Applications:
      a. Glazed lites in doors, except fire doors.
      b. Glazed sidelights to doors, except in fire-rated walls and partitions.
c. Glazed view windows and panels in partitions enclosing Therapy and Playrooms, except in fire-rated walls and partitions.
d. Other locations required by applicable federal, state, and local codes and regulations.
e. Other locations indicated on drawings.

2. Glass Type: Fully tempered safety glass as specified.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

2.3 PLASTIC FILMS
A. - Decorative film glazing.
   1. Application: Locations as indicated on drawings.
   2. Type and Style: As selected by Owner.
   3. Manufacturers:

2.4 ACCESSORIES
A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II.
   Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II.
   Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

PART 3 EXECUTION
3.1 VERIFICATION OF CONDITIONS
A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.2 PREPARATION
A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL
A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
B. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.4 INSTALLATION - PLASTIC FILM
A. Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.
B. Place without air bubbles, creases or visible distortion.
C. Install film tight to perimeter of glass and carefully trim film with razor sharp knife. Provide 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required. Do not score the glass.
3.5 FIELD QUALITY CONTROL
   A. See Section 01 45 00 – Contractor Quality Control, for additional requirements.
   B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
   C. Monitor and report installation procedures and unacceptable conditions.

3.6 CLEANING
   A. Replace broken, cracked, scratched, or otherwise damaged glass.
   B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
   C. Remove non-permanent labels immediately after glazing installation is complete.
   D. Clean glass and adjacent surfaces after sealants are fully cured.
   E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.7 PROTECTION
   A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
   B. Do not store materials close enough to glass to create a heat trap and cause breakage.
   C. Protect glass surfaces adjacent to or below exterior concrete and masonry surfaces from build up of dirt, scum, alkaline deposits, or stains.
   D. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION
SECTION 08 83 00
MIRRORS

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Glass mirrors.
   1. Annealed float glass.
   2. Tempered safety glass.
1.2 REFERENCE STANDARDS
1.3 SUBMITTALS
A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
D. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
1.4 QUALITY ASSURANCE
A. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.
1.5 FIELD CONDITIONS
A. Do not install mirrors when ambient temperature is less than 50 degrees F.
B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.
1.6 WARRANTY
A. See Section 01 78 36 - Warranties, for additional warranty requirements.
B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.1 MANUFACTURERS

2.2 MATERIALS
A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
B. Mirror Glass : Clear float and tempered safety type with copper and silver coating, organic overcoating, arrised edges, 1/4 inch thick minimum.
   1. Size: As scheduled.
2. Edges: Polished or bevel per schedule

2.3 GLAZING COMPOUNDS
   A. Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Uses M and A; single component; chemical or solvent curing; non-bleeding, non-staining, cured Shore A hardness of 15 to 25; color as selected.

2.4 ACCESSORIES
   A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.
   B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness.
   C. Glazing Clips: Manufacturer's standard type.
   D. Mirror Attachment Accessories: Stainless steel J-profile channels.
   E. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify that openings for mirrored glazing are correctly sized and within tolerance.
   B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.2 PREPARATION
   A. Clean contact surfaces with solvent and wipe dry.
   B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.
   C. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.3 INSTALLATION
   A. Install mirrors in accordance with manufacturer's recommendations.
   B. Set mirrors plumb and level, and free of optical distortion.
   C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
   D. Frameless Mirrors: Set mirrors in proper place with adhesive, applied in accordance with adhesive manufacturer's instructions.

3.4 CLEANING
   A. Remove wet glazing materials from finish surfaces.
   B. Remove labels after work is complete.
   C. Clean mirrors and adjacent surfaces.

3.5 PROTECTION
   A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION
SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES
A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
B. Removal of existing floor coverings.
C. Preparation of existing concrete floor slabs for installation of floor coverings.
D. Testing of concrete floor slabs for moisture and alkalinity (pH).
E. Remedial floor coatings.

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS
A. Visual Observation Report: For existing floor coverings to be removed.
B. Floor Covering and Adhesive Manufacturers’ Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer’s required bond/compatibility test procedure.
C. Testing Agency’s Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   5. Recommendations for remediation of unsatisfactory surfaces.
   7. Submit report not more than two business days after conclusion of testing.
D. Adhesive Bond and Compatibility Test Report.
E. Copy of RFCI (RWP).

1.4 QUALITY ASSURANCE
A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
B. Contractor may perform adhesive and bond test with Contractor’s own personnel or hire a testing agency.
C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner’s project contact information.
D. Contractor’s Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
B. Deliver materials in manufacturer's packaging; include installation instructions.
C. Keep materials from freezing.

1.6 FIELD CONDITIONS
A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS
2.1 MATERIALS
A. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
   1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
   2. Products:
      a. ARDEX Engineered Cements; ARDEX MC RAPID: www.ardexamericas.com/#sle.
      b. Custom Building Products; TechMVC Moisture Vapor and Alkalinity Barrier: www.custombuildingproducts.com/#sle.
      c. Or approved equal.

PART 3 EXECUTION
3.1 CONCRETE SLAB PREPARATION
A. Perform following operations in the order indicated:
   1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
      a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
      b. Removal of existing floor covering.
   2. Preliminary cleaning.
   3. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
   4. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   6. Specified remediation, if required.
   7. Patching, smoothing, and leveling, as required.
   8. Other preparation specified.
   10. Protection.
B. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
   3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2 REMOVAL OF EXISTING FLOOR COVERINGS
   A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.
   B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.3 PRELIMINARY CLEANING
   A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
   B. Do not use solvents or other chemicals for cleaning.

3.4 MOISTURE VAPOR EMISSION TESTING
   A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
   B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
   C. Test in accordance with ASTM F1869 and as follows.
   D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
   E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
   F. Report: Report the information required by the test method.

3.5 ALKALINITY TESTING
   A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
   B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
   C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
   D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.6 PREPARATION
A. See individual floor covering section(s) for additional requirements.
B. Comply with requirements and recommendations of floor covering manufacturer.
C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
D. Do not fill expansion joints, isolation joints, or other moving joints.

3.7 ADHESIVE BOND AND COMPATIBILITY TESTING
A. Comply with requirements and recommendations of floor covering manufacturer.

3.8 APPLICATION OF REMEDIAL FLOOR COATING
A. Comply with requirements and recommendations of coating manufacturer.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Performance criteria for gypsum board assemblies.
B. Metal stud wall framing.
C. Flat Drywall Suspensions Systems.
D. Acoustical Insulation.
E. Gypsum wallboard.
F. Joint treatment and accessories.

1.2 REFERENCE STANDARDS
H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.
I. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members; 2018.
J. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.
M. ASTM C1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections; 2018.
P. ASTM E413 - Classification for Rating Sound Insulation; 2016.
S. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
V. NWCB GWB-2 - Northwest Wall and Ceiling Bureau; Finishing and judging of gypsum wallboard
W. NWCB GWB-3 - Northwest Wall and Ceiling Bureau; Recommendations for gypsum wallboard finishes.
X. NWCB GWB-4 - Northwest Wall and Ceiling Bureau; Installation of control joints.
Y. NWCB FR-3 - Northwest Wall and Ceiling Bureau; Installing resilient channels.

1.3 PERFORMANCE REQUIREMENTS
A. Wall Deflection: Not to exceed L/360 of wall height.
B. Interior Partitions: Construct component parts so completed partition will withstand minimum 5 pounds per square foot inward and outward pressure normal to wall plane.

1.4 SUBMITTALS
A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Product Data: Provide data on metal framing, gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.
C. Shop Drawings:
   1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
   2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE
A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.
B. Metal Framing Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.
   1. Member of Steel Stud Manufacturers Association (SSMA).
   2. SSMA Certification Label: Provide label that manufacturing facilities satisfy the SSMA program certification requirements.
C. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

1.6 REGULATORY REQUIREMENTS
A. For fire-resistant rated partitions, construct gypsum board assemblies in accordance with design designation listing of testing agency indicated, or otherwise acceptable to governing authority, to obtain designated rating.
B. Line blockouts in walls for recessed toilet accessories, fire extinguisher cabinets, and the like, with gypsum board as necessary to preserve fire-resistive rating of partition.
1.7 DELIVERY, STORAGE, AND HANDLING
   A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer, with labels identifying fire-resistance rating and water resistance.
   B. Store gypsum panels flat in a manner to prevent sagging.
   C. Do not overload floor decks with concentrated accumulation of materials.
   D. Store above ground, under cover and protected from damage.

1.8 FIELD CONDITIONS
   A. Maintain between 55 degrees F and 75 degrees F for 24 hours before installation, during installation, and for 24 hours after materials have dried.
   B. Maintain at least 30 foot candles of illumination measured 3 feet above floor in Work spaces during joint treatment.
   C. Maintain sufficient ventilation for proper joint treatment drying.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES
   A. Provide completed assemblies complying with ASTM C840 and GA-216.
      1. See PART 3 for finishing requirements.
   B. Acoustical Attenuation for Interior Partitions: STC of 60 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
      1. See Section 01 84 19 for additional acoustical requirements.
   C. Fire Rated Assemblies: Provide completed assemblies complying with applicable code.
      1. ICC IBC Item Numbers: Comply with applicable requirements of ICC IBC for the particular assembly.
      2. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
      3. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.2 METAL FRAMING MATERIALS
   A. Manufacturers - Metal Framing, Connectors, and Accessories:
      5. Steeler: www.steeler.com
      6. Scaffco Steel Stud Manufacturing Co: www.scaffco.com
      9. Or approved equal.
   B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/360 at 5 psf.
      1. Studs in partitions with tile finish: 20 gauge.
      2. Studs adjacent to door jambs, behind grab bars and handrails: 18 gauge.
      3. Studs: "C" shaped with flat or formed webs with knurled faces.
      5. Type RC-1: Resilient Furring Channels: 1/2 inch depth, for attachment to substrate through one leg only.
a. Thickness: 22 mil (0.022 inch), corrosion resistant steel per ASTM A653/A653M, G40 for interior walls or ceilings.
c. Products:
   1) ClarkDietrich; RC Deluxe Resilient Channel: www.clarkdietrich.com/#sle.
   2) Substitutions: See Section 01 60 00 - Product Requirements.
d. Manufacturer’s standard hot-dip galvanized coating per ASTM A653/A653M.
   1) G 185 hot-dip galvanized coating for exterior soffits.
6. Type RSIC-1: Resilient Isolation Clips:
b. Product:
   1) Clip: Resilient Sound Isolation Clips by Acoustical Solutions:
      (a) Thickness: 18 gauge.
   2) Drywall Furring Channel:
      (a) Thickness: 25 gauge.
      (b) Width: 2-9/16 to 2 11/16 inch.
      (c) Depth: 7/8 inch.
      (d) Manufacturers:
         (1) Same manufacturer as other framing materials.
c. Fasteners: Type recommended by manufacturer for application.
7. Z-Furring Members:
a. Thickness: 25 gauge, corrosion resistant steel per ASTM A653/A653M, G185 for conditions outside weather barrier.
b. Depth: As indicated in Drawings.
c. Face Flange: 1-1/4 inch.
d. Wall Attachment Flange: 7/8 inch.
8. Blocking, Steel Flat Strap and Backing Plate:
a. Corrosion resistant steel per ASTM A653/A653M, length as indicated, or required to suit application.
b. Size: 16 gauge by 10 inches wide, unless otherwise indicated.
c. Specifically, provide the following non-structural framing and blocking:
   1) Cabinets and shelf supports.
   2) Wall brackets.
   3) Handrails.
   4) Grab bars.
   5) Towel and bath accessories.
   6) Wall-mounted door stops.
   7) Chalkboards and marker boards.
   8) Wall paneling and trim.
   9) Joints of rigid wall coverings that occur between studs.
C. Flat Drywall Suspensions Systems:
1. Manufacturers:
2. Main Tees: Fire-Rated Heavy Duty classification 1-1/2 inch high x 144 inch long, integral reversible splice with knurled face.
   a. Straight Main Tee: 15/16 inch Face
3. Cross Members: Fire-Rated members with knurled face.
a. Cross Tees: 1-1/2 inch high x 48 inch long with 1-1/2 inch wide face. Tees must have quick release cross tee ends to provide positive locking and removability without the need for tools.

4. Accessory Cross Tees: Cross tees must have knurled faces. Cross tees have quick release cross tee ends to provide positive locking and removability without the need for tools.
   a. Fire-Rated 1-1/2 inch high x 24 inch long with 15/16 inch face
   b. Non Fire-Rated 1-1/2 inch high x 96 inch long with 15/16 inch face

5. Wall moldings: Single web with knurled face.
   a. 1 inch x 1-1/2 inch x 144 inch long wall molding.
   b. 144 inch x 1-9/16 inch x 1 inch x 1 inch channel molding.

6. Accessories:
   a. Transition Clip, type recommended by manufacturer for system.
   b. Splice Clip, type recommended by manufacturer for system.

D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and secured with deflection clips or screws each side of stud.
   1. Deflection Clip Manufacturer:
      b. Or approved equal.

2.3 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   8. Or approved equal.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
   3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
   5. Paper-Faced Products:
      a. American Gypsum; EagleRoc Regular Gypsum Wallboard and FireBloc Type X Gypsum Wallboard.
      b. CertainTeed Corporation; ProRoc Brand Gypsum Board Type X.
      c. Georgia-Pacific Gypsum; ToughRock Fireguard X.
      d. National Gypsum Company; Gold Bond Brand Gypsum Wallboard Type X.
      e. USG Corporation; Sheetrock Brand Gypsum Panels Type X.
      f. Or approved equal.

C. Moisture Resistant Gypsum Board: One of the following products:
   1. Application: Surfaces which are in moisture atmospheres but will not be wet including: restrooms, bathrooms, showers.
2. Moisture resistant gypsum core with paper facing in accordance with ASTM C1396/C1396M.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
4. Water absorption not greater than 5 percent by weight after two hours immersion in accordance with ASTM C473.
   b. Products:
      1) Georgia Pacific; Products; ToughRock Mold Guard; www.buildgp.com.
      4) Or approved equal.

2.4 GYPSUM WALLBOARD ACCESSORIES
A. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
   1. Exposed and Concealed Joints:
      d. Or approved equal.
   2. Concealed Joints:
      c. Or approved equal.
   3. Sheet Caulking:
      d. Or approved equal.
B. Water Resistant Sealant: Clear translucent silicone with mildew inhibitor.
   1. Manufacturer:
      d. Or approved equal.
C. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
   1. Form metal accessories from zinc-coated steel not lighter than: 0.012 inch.
   2. Types: As detailed or required for finished appearance.
   3. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
   4. Products:
      a. Same manufacturer as framing materials.
      5. Casing beads: Provide channel shape with an exposed wing, and with a concealed wing not less than 7/8 inches wide, U-bead or LC-bead, to suit condition indicated.
      6. Corner beads: Provide angle shapes with wings not less than 7/8 inches wide and perforated for nailing and joint treatment, or with combination metal and paper wings bonded together, not less than 1-1/4 inches wide and suitable for joint treatment.
      7. Control Joints: One-piece control joint formed from rolled zinc with V-shaped slot and removable strip covering slot opening.
D. Beads, Joint Accessories, and Other Trim for Rated Assemblies: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
   1. Corner Beads: 90 degree outside corners with 1-1/2 inch wings.
E. Architectural Reveal Beads:
   1. Reveal Depth: 1/2 inch.
   2. Reveal Width: 1/2 inch.
   3. Shapes: As indicated on drawings.
   4. Products:
      b. Or approved equal.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

I. Screws: ASTM C1002; self-piercing tapping type, electroplated for exterior locations per ASTM B117 with a salt spray rating of 1000 hrs.

J. Screws: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs.
   1. Wood Studs: Not less than 1-1/4 inch long.
   2. Metal Studs: Not less than 1 inch long.

K. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
   1. Fasteners: To meet Building Code requirements:

L. Adhesive for Metal: Special adhesive recommended for fastening gypsum panels to steel framing.

M. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum panels.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Field verify dimensions prior to installation; if dimensions vary significantly from Drawings, obtain Owner’s approval before proceeding.
   B. Verify that project conditions are appropriate for work of this section to commence.
      1. Verify wood framing is dry with 19 percent maximum moisture content at time of covering.
      2. Correct conditions detrimental to timely and proper completion of Work.
      3. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION
   A. Coordinate with other trades to assure proper and adequate provision in work of those trades for interface with Work of this Section.

3.3 FRAMING INSTALLATION
   A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
   B. Anchor components firmly into position plumb, level and true.
   C. Accurately lay out partition lines from dimensions shown in Drawings.
   D. Studs: Space studs as scheduled, maximum 24 inches on center.
      1. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
         a. Prior to installation, apply 2 beads of acoustical sealant to back side of runners.
2. Stud partition framing to be full height to structural supports and floor sub structure except where partitions are indicated to terminate at suspended ceilings.
3. Stud partitions stopping at or slightly above ceiling: Brace partition to structure to stabilize partitions.
4. Isolate steel framing where framing and furring abuts structure at following locations:
   a. Install deflection and firestop track top runner at fire-resistive rated assemblies.
   b. Attach jamb studs at openings to track with stud clips.
   c. Where building structure abuts ceiling perimeter and where structure penetrates ceilings.
5. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

E. Do not bridge building control and expansion joints with steel framing or furring members; independently frame both sides of joints.

F. Do not splice studs.

G. Align utility openings in stud webs.

H. Space partition framing at 16 inches o.c. maximum, unless otherwise noted.

I. Form corners and intersections with three studs.
   1. Locate studs within 2 inches of internal corners.

J. Cavity walls or other walls without finish material on both faces of studs: Provide horizontal bridging between adjacent studs to eliminate stud rotation.

K. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

L. Acoustical Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.
   1. Resilient channel shall be installed perpendicular to framing members.
   2. Install the channel so that the bottom part of the channel is attached to the studs. Gypsum wallboard to be attached to top side, so the weight of gypsum board pulls channel away from studs.
   3. Position channels 6 inch maximum distance from the wall-ceiling angle.
   4. Cantilever channel ends no more than 6 inch.
   5. Mount electrical boxes and other junction boxes to framing.
   6. Install gypsum board with 1/8 inch to 1/4 inch gap around perimeter of each room at all walls for acoustical sealant application. Seal gap using acoustical caulk.
   7. Use 1 inch screws on first layer of gypsum board and 1-5/8 inch screws on 2nd layer of gypsum board. Do not allow gypsum wallboard fasteners to touch the wall studs, or TJIs.

M. Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.

N. Blocking: Install mechanically fastened steel sheet blocking for support of items shown on the drawings and of the following items:
   1. Framed openings.
   2. Wall- mounted door stops
   3. Cabinets and shelf supports
   4. Wall mounted cabinets.
   5. Wall brackets
   6. Handrails
   7. Plumbing fixtures.
   8. Toilet partitions.
   9. Toilet and bath accessories.
   10. Grab bars, for required and future grab bars.
11. Wall mounted door hardware.
12. Wall mounted bike racks.
13. Wall mounted mirrors.
14. Window blinds, including roller shades.
15. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items and trim.
16. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
17. Where ceiling mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.4 FLAT DRYWALL SUSPENSION SYSTEM FRAMING
A. Install suspended drywall framing system in accordance with manufacturer's instructions.
B. Attach perimeter wall track or angle where grid suspension system meets vertical surfaces.
C. Component and hanger wire installation:
   1. Flat Ceilings: Main tees shall be spaced a maximum of 48 inch on center and supported by hanger wires spaced a maximum 48 inch on center and as specified by UL Fire Resistance Directory attaching hanger wires directly to structure above.
   2. Cross tees shall be spaced per manufacturers’ recommendations and as specified by UL Fire Resistance Directory.
      a. When constructing stepped soffits, bracing of the drywall suspension system and/or additional hanger wires may be necessary to ensure stability and structural performance during and after drywall attachment.
      b. Maximum vertical soffit height is 48 inch (Maximum unsupported drywall area shall not exceed 48” x 24”). Cross tee spacing in horizontal soffit plane is not to exceed 24”. Intermediate cross tees are necessary to maintain visually acceptable drywall planes and drywall corners.
   4. General hanger wire notes: Hanger wires are required within 12 inch on both sides of a pivoted splice clip. At least 1 hanger wire is required within 12 inch of a transition clip.
   5. Limitations: Do not support wires from mechanical and/or electrical equipment occurring above ceiling.

3.5 ACOUSTICAL ACCESSORIES INSTALLATION
A. Acoustical Furring: Install resilient channels at maximum 16 inches on center. Locate joints over framing members.
   1. Resilient channel shall be installed perpendicular to framing members.
   2. Install the channel so that the bottom part of the channel is attached to the studs. Gypsum wallboard to be attached to top side, so the weight of gypsum board pulls channel away from studs.
   3. Position channels 6 inch maximum distance from the wall-ceiling angle.
   4. Cantilever channel ends no more than 6 inch.
   5. Mount electrical boxes and other junction boxes to framing.
   6. Install gypsum board with 1/8 inch to 1/4 inch gap around perimeter of each room at all walls for acoustical sealant application. Seal gap using acoustical caulk.
   7. Use 1 inch screws on first layer of gypsum board and 1-5/8 inch screws on 2nd layer of gypsum board. Do not allow gypsum wallboard fasteners to touch the wall studs, or TJIs.
B. RSIC-1 Clips:
   1. Space resilient sound isolation clips at maximum of 24 x 48 inches on center
   2. Do not exceed design load of 36 pounds per isolation clip.
3. Splicing drywall furring channels: Do not allow drywall furring channels or gypsum board to contact ceiling or wall framing members.
4. Install gypsum board with 1/8 inch to 1/4 inch gap around perimeter of each room at all walls for acoustical sealant application. Seal gap using acoustical caulk.
5. Install drywall furring channels perpendicular to framing members; spaced 24 inch on center.
6. Locate resilient sound isolation clips maximum of 8 inch from ends of drywall furring channels.
7. Locate drywall furring channels maximum of 3 inch from parallel wall assemblies.

C. Acoustic Sealant: Install in accordance with manufacturer's instructions.
1. Place two beads continuously on substrate before installation of perimeter framing members.
2. Place continuous bead at perimeter of each layer of gypsum board.
3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.6 BOARD INSTALLATION
A. General:
1. Install gypsum board in accordance with ASTM C754 on non-loading bearing steel framing complying with ASTM C645.
2. Install gypsum board in accordance with ASTM C955 on load bearing steel framing.
3. Install gypsum board in light contact but not forced into place, with not more than 1/16 inch between panels.
4. Support edges with framing members.
5. Internal and external corners: Conceal cut edges of boards by overlapping covered edges of abutting boards.
   a. Drive specified screws with clutch-controlled power screwdrivers.
   b. Dimple board surface 1/32 inch with fastener; do not fracture face paper.
7. Isolate perimeter of non-load bearing partitions at structural abutments, except at floors.
   a. Provide 1/4 to 2 inch wide joints at these locations.
   b. Trim edges with U-bead edge trim where edges of gypsum board are exposed.
   c. Seal joints with acoustical sealant.
8. Isolate perimeter of partitions at ceilings.
   a. Provide 1/2 inch wide uniform joint at these locations.
   b. Trim edges with U-bead edge trim.
   c. Seal joints with acoustical sealant or firestopping..
9. Install with a minimum of 1/4 inch gap between gypsum board and floor.
B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.
C. Moisture-Resistant Gypsum Board:
   1. Install on walls in wet areas, such as toilet rooms, janitor’s closets, and the like, except where glass-mat water-resistant gypsum tile backer board is installed for tile applications.
D. Acoustical or Sound Partitions:
   1. Provide acoustical sealant to form an airtight seal at penetrations and perimeter of sound-rated partitions, floors and ceilings.
   2. Comply with ASTM C 919 for application of acoustical sealant at acoustical assemblies and sound rated partitions.
      a. Install backer-rod at gaps to be sealed exceeding 3/8-inch.
b. Provide sheet caulking to seal back and sides of junction boxes, pipes, etc recessed in sound-rated partitions.

c. Maintain a 1/4-inch air space around all junction boxes and seal airtight with acoustical sealant.

d. Partitions meet ceilings and floors: Apply continuous bead of sealant behind board edges and press back of board into sealant.

3. Install resilient furring channels for partitions and ceilings, where shown or indicated.

3.7 CEILING INSTALLATION

A. Install gypsum board to ceilings with long dimension of board at right angles to supporting members.

B. Board may be installed with long dimension parallel to supporting members that are spaced 16 inches o.c. when attachment members are provided at end joints.

C. Where water-resistant board is used at ceilings, provide supports at 12 inches o.c.

D. Multilayer Applications:
1. Offset face layer joints at least one stud or furring member from base layer joints.
2. Fasten both base layer and face layer with screws, and with adhesive between layers.

3.8 INSTALLATION OF TRIM AND ACCESSORIES

A. Corner Beads: Install at external corners, using longest practical lengths.
1. Install specified corner bead, fitting neatly over corner and securing with same type fasteners used for installing wallboard.
2. Space fasteners approximately 6 inches o.c. and drive through wallboard into framing or furring member.
3. After corner bead has been secured into position, treat corner with joint compound and reinforcing tape as specified for joints, feathering joint compound out from 8 to 10 inches on each side of corner.

B. Internal corners: Treat as specified for joints, but fold reinforcing tape lengthwise through middle and fit neatly into corner.

C. Trim Locations:
1. Drawings do not show locations and requirements for trim.
2. Carefully study Drawings and installation, and provide trim normally recommended by manufacturer of gypsum board.
3. Install rolled formed profiles where indicated.
D. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.9 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. Verify that gypsum board is fastened as specified to supporting framework.

C. Finish gypsum board in scheduled areas in accordance with levels defined in NWCB GWB 2 & 3, ASTM C 840 and as scheduled below.
1. Above Finished Ceilings Concealed From View: Level 1.
2. Utility Areas and Areas Behind Cabinetry: Level 2.
3. Walls and Ceilings to Receive Flat or Eggshell Paint Finish: Level 4.
4. Level 1 Finish: One coat application.
   a. Embed tape in joint compound with surfaces free of excess joint compound.
   b. Tool marks and ridges are acceptable.
   c. Cover fastener heads with one coat of joint compound in fire resistive assemblies.
5. Level 2 Finish: One coat application.
   a. Embed tape in joint compound, wipe off excess and leave a thin coat of joint compound over tape.
   b. Tool marks and ridges are acceptable.
   c. Cover fastener heads with one coat of joint compound.
6. Level 3 Finish: Two coat application for texture finish.
   a. Embed tape in joint compound, wipe off excess and leave a thin coat of joint compound over tape.
   b. Cover fastener heads with one coat of joint compound.
   c. Apply separate coat of joint compound over dry first coat, leaving smooth surface free of ridges, tool marks, sanding grooves and other imperfections.
   d. Apply specified texture finish.
7. Level 4 Finish: Three coat application.
   a. Embed tape in joint compound leaving a smooth thin coat of joint compound over tape.
   b. Apply separate coat of joint compound over dry first coat, leaving smooth surface free of ridges, tool marks and sanding grooves.
   c. Apply final coat of joint compound feathered out over dry second coat, leaving smooth surface flush with gypsum board and free of marks.
      1) Feather finishing compound to not less than 12 inches wide.
   d. Cover fastener heads with coat of joint compound followed with separate second and final coats as described above for taped joints.
   e. When finishing compounds are dry, sandpaper to obtain uniformly smooth surface, taking care to not scuff paper surface of wallboard.
   f. Wipe gypsum board surfaces with damp cloth.
8. Level 5 Finish:
   a. Same as Level 4 Finish plus the following:
   b. Spray apply high build drywall surfercer or joint compound over entire gypsumboard surface after joints have been properly treated.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Apply joint treatment and finishing compound by machine or hand tool.
2. Apply joint tape over joints and to flanges of trim accessories except those with trim accessories not requiring tape.
3. Feather coats of joint compound so that camber is maximum 1/32 inch.
3.10 WATER RESISTANT SEALANT
   A. Apply a continuous bead of water resistant sealant around cutouts at raw edges and at
      penetrations of water-resistant gypsum board and glass-mat water resistant tile backer board.

3.11 FINISH
   A. Wall: Smooth.
   B. Ceilings: Smooth.

3.12 TOLERANCES
   A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet
      and 1/16 inch in any running foot.
      1. Check trim for conformance to tolerances.

3.13 REPAIRS
   A. Repair screw pops by installing new screw approximately 1-1/2 inches away from projecting
      screw and reset projecting screw if face paper is fractured, remove projecting screw, fill
      damaged surface and finish flush and smooth.
   B. Fill cracks; finish flush and smooth.

3.14 CLEANING UP
   A. Clean, without damaging, exposed surfaces affected by Work of this Section, and repair as
      necessary.
   B. In addition to other requirements for cleaning, use necessary care to prevent scattering
      gypsum board scraps and dust, and to prevent tracking gypsum and joint finishing compound
      onto floor surfaces.
   C. Remove scrap, debris, and surplus material of this Section at completion of each segment of
      installation and dispose per Section 01 74 00.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Tile for wall applications.
B. Coated glass mat backer board as tile substrate.
C. Non-ceramic trim.

1.2 REFERENCE STANDARDS
A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009(Revised).
O. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).


V. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.


1.3 SUBMITTALS

A. See Section 01 33 00 – Submittal Procedures for submittals.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.6 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.1 TILE

A. Manufacturers: All products by the same manufacturer.
   2. Or approved equal.

B. Glazed Wall Tile, Type T-3: ANSI A137.1, standard grade.
   1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
   2. Size: 1M by 3M inch, nominal.
   3. Surface Finish: As indicated on drawings.
   4. Color(s): As indicated on drawings.
2.2 TRIM AND ACCESSORIES

A. Non-Ceramic Transition Strip: Satin brass anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:
      a. Open edges of wall tile.
      b. Wall corners, outside and inside.
      c. Borders and other trim as indicated on drawings.
   2. Manufacturers:
      b. Or approved equal.

2.3 SETTING MATERIALS

   1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
   2. Products:
      a. ARDEX Engineered Cements; ARDEX N 23MICROTEC: www.ardexamericas.com/#sle.
      b. Custom Building Products; ProLite Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
      c. Merkrete, by Parex USA, Inc; Merkrete 735 Premium Flex: www.merkrete.com/#sle.
      d. Or approved equal.

2.4 GROUTS

A. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
   1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
   2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
   3. Color(s): As selected by Architect from manufacturer's full line.
   4. Products:
      a. ARDEX Engineered Cements; ARDEX FL: www.ardexamericas.com/#sle.
      d. Merkrete, by Parex USA, Inc; Merkrete Pro Grout: www.merkrete.com/#sle.
      e. Or approved equal.

2.5 MAINTENANCE MATERIALS

A. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
   1. Composition: Water-based colorless silicone.
   2. Application: Protect tile and install grout sealer to grout only unless noted otherwise.
   3. Products:
      a. Merkrete, by Parex USA, Inc; Merkrete Grout Sealer: www.merkrete.com/#sle.
      b. Or approved equal.

2.6 ACCESSORY MATERIALS

A. Gypsum Board Primer: As recommended by Tile Manufacturer.
B. Leveling and Patching Compound: Trowelable, nonflammable, as recommended by tile manufacturer.
C. Self-Leveling and Patching Compound: Pre-blended cementitious, for thicknesses from feather edge to 1/2 inch.
   1. Products:
      a. Compatible compound with thin-set materials, adhesives and grouts.
   2. Primer: As recommended by topping manufacturer.
D. Backer Board: Coated glass mat type complying with ASTM C1178/C1178M; inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder.
   1. Product: Dens-Shield Tile Backer manufactured by Georgia-Pacific Corporation, or approved equal.
   2. Fire Resistant Type: Type X core, thickness 5/8 inch.
E. Mesh Tape: 2 inch wide self-adhesive fiberglass mesh tape.
F. Cleaning Materials:
   1. American Olean Tile Co. Division
   2. National Gypsum Co.
   3. Hillyard Chemical Co.
   4. Or approved equal.
G. Color Enhancer:
   1. Manufacturer: Miracle Sealants Co.
      a. Mira Matte.
   2. Or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
   1. Floor surface to be within 1/8 inch in 10'-0" for thin set tile (Minimum Localized Value (MLV) of 50.
B. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
   1. Moisture Emission Rate: Not greater than 3 lb per 1000 sq ft per 24 hours, test in accordance with ASTM F1869 and ASTM F2170.
   2. In-Situ Relative Humidity: 75%.
   3. Alkalinity (pH): Verify pH range of 5 to 9, test in accordance with ASTM F710.
C. Correct conditions detrimental to proper and timely completion of Work.

3.2 PREPARATION
A. Clean existing concrete floor surface as recommended in forward to ANSI A 108.5 and ANSI A 108.6.
B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with leveling and patching compound to achieve smooth, flat, hard surface.
   1. Irregularities not to exceed F(F): Specified Overall Value (SOV) of 50; Minimum Localized Value (MLV) of 50, not to exceed 1/8 inch in 10 feet.
C. Protect surrounding work from damage.
D. Vacuum clean surfaces and damp clean.
E. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
F. Install backer board in accordance with ANSI A108/A118/A136.1 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
1. Build-up and feather out substrates with leveling compound a minimum of 4 feet from change in floor finishes to achieve alignment of surface finishes.

3.3 INSTALLATION - GENERAL
A. Acoustical Isolation Pad: Install as indicated on drawings and/or called for in TCNA assembly.
B. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.
C. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
   1. Joints:
      a. Lay tile in pattern indicated on Drawings with aligned joints.
      b. Adjust joints to minimize tile cutting.
      c. Provide uniform joints.
      d. Install sealant at joints between tile and plumbing fixtures
D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
F. Form internal angles square and external angles bullnosed.
G. Install non-ceramic trim in accordance with manufacturer's instructions.
H. Sound tile after setting. Replace hollow sounding units.
I. Keep control and expansion joints free of mortar, grout, and adhesive.
J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
L. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.
N. Metal Edge Strips: Install at locations indicated, or where exposed edge of tile meets carpet, wood, or other flooring that finishes flush with top of tile.
O. Subdrainage System: Install where shown on drawings and/or called for in TCNA Assembly.
P. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - WALL TILE
A. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

3.5 FIELD QUALITY CONTROL
A. An independent testing agency will perform field quality control tests, as specified in Section 01 45 23.
B. Independent testing agency will inspect concrete surface for conformance to contract documents.
C. Provide free access to concrete inspection and testing at project site and cooperate with appointed firm.
D. Flatness and Levelness Tolerances:
   1. Measure floor slabs for suspended floors and slabs-on-grade to verify compliance with tolerance requirements of ASTM E1155 and ACI 117.
   2. Floor Profiler:
a. Dipstick by Face Construction Technologies.
3. Measure floor finish tolerances 2 week prior to start of Work.
4. Make repairs to obtain specified Flatness.

3.6 CLEANING

A. Adjusting Defective Work:
   1. Replace cracked, chipped, broken, and unbonded tile.
   2. Rake and regROUT defective grout joints.

B. Clean tile and grout surfaces.

C. Color Enhancer: Apply to stone after applying sealer in accordance with manufacturer's written instructions.

D. Remove and recycle debris from project site per Section 01 74 00.

END OF SECTION
SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Suspended metal grid ceiling system.
B. Lateral support
C. Acoustical units.

1.2 REFERENCE STANDARDS
E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.
F. CISCA - Ceilings and Interior Systems Construction; Ceiling Systems Handbook.

1.3 PERFORMANCE REQUIREMENTS
A. Suspension System: Designed for appropriate forces per Building Code and conform to the following:
   1. Perform design under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State in which the Project is located.
   2. Provide for Occupancy category III and IV.
   3. Seismic Design Category D, E, & F, construction in accordance with CISCA standard for seismic zones 3 and 4 with modifications as noted ASCE 7 standard.
   4. Special inspection structure anchorage as required by the authority having jurisdiction.
B. Prescriptive Design Suspension System: Conform with the following:
   1. Provide for Occupancy category I and II only.
   2. Ceilings with interstitial spaces less then 12 inches to framing are not required to have lateral force bracing.
   3. Shot-in Anchors in seismic design categories D, E, and F to have ICC-ES approval for seismic applications and overhead installations.
      a. Special inspection as required by the authority having jurisdiction.
   5. Lateral force bracing required for ceilings over 144 sq. ft.

1.4 SUBMITTALS
A. Shop Drawings: Indicate lateral restraint, anchorage, grid layout and related dimensioning, compression post installation, and mechanical and electrical items installed in the ceiling.
B. Product Data: Provide data on suspension system components, acoustical units, and materials list of items proposed.

C. Manufacturer's written recommended installation procedures.

1.5 QUALITY ASSURANCE

A. Fire-Resistive Assemblies: Complete assembly listed and classified by UL (FRD) for the fire resistance indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acoustic Tiles/Panels:
   4. Or approved equal.

2.2 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.
   1. Units for Installation in Fire-Rated Suspension System: Listed and classified for the fire-resistive assembly as part of suspension system.

B. Acoustical Panels: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
   1. Size: As Indicated on Drawings.
   2. Thickness: 15/16 inches.
   5. Suspension System: Exposed grid.

2.3 SUSPENSION SYSTEM(S)

A. Manufacturers:
   3. Or approved equal.

B. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required to meet seismic requirements indicated on drawings and specified herein.
   1. Design per Building Code for seismic categories D, E, & F, ASCE 7-02 or 05, CISA recommendation for seismic zones 3 & 4.

C. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; heavy-duty.
   1. Profile: Tee; 15/16 inch wide face.
   2. Construction: Double web.

D. Fire-Rated Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; light-duty.
   1. Profile: Tee; 15/16 inch wide face.
   2. Construction: Double web.
2.4 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
   1. Hanger Wire: Galvanized carbon steel, soft temper, prestretched, yield stress load at least three times design load, but not less than 12 gage.

B. Perimeter Moldings: Same material and finish as grid.
   1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Fasteners: To meet Building Code requirements.

D. Acoustical Sealant For Perimeter Moldings: Specified in Section 07 92 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.
   1. Correct conditions detrimental to timely and proper completion of Work.

C. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636/C 636M, ASTM E 580/E 580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lateral bracing:
   1. Provide lateral bracing as required by Building Code.
   2. Secure lateral bracing to structural members.
   3. Secure lateral bracing at right angles to direction of partition and four ways in large ceiling areas.

D. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

F. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

K. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Install in bed of acoustical sealant.
2. Use longest practical lengths.
3. Overlap and rivet corners.
L. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

3.3 INSTALLATION - ACOUSTICAL UNITS
A. Install acoustical units in accordance with manufacturer's instructions.
B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
C. Lay directional patterned units with pattern parallel to longest room axis.
   1. Edge panels to be equal and 4 inches, minimum wide.
D. Fit border trim neatly against abutting surfaces.
E. Install units after above-ceiling work is complete.
F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
G. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.
H. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements or governmental agencies having jurisdiction.

3.4 CLEANING
A. Clean surfaces of grid and acoustical materials.
B. Use cleaning materials recommended for purpose by manufacturer of material being cleaned.
C. Remove and replace panels and tiles that cannot be successfully cleaned and repaired to eliminate evidence of damage.

3.5 TOLERANCES
A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Resilient sheet flooring.
B. Resilient tile flooring.
C. Self Cove Resilient base.
D. Installation accessories.

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS
A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
B. Shop Drawings: Indicate seaming plan and tile layout including project specific scaled drawings.
C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
D. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.
E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
B. Store all materials off of the floor in an acclimatized, weather-tight space.
C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
D. Protect roll materials from damage by storing on end.

1.5 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1 SHEET FLOORING

A. Sheet Vinyl Safety Flooring Type SV-1: Heterogeneous with color and pattern throughout wear layer thickness, with non-woven polyester/cellulose, glass fiber reinforcement backing.
   1. Manufacturers and Types: See drawings material and finishes schedule.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
   4. Wear Layer Thickness: 0.078 inch minimum.
   5. Slip Resistance: .88/D 1.03/W.
   7. Static Load Resistance: 125 psi minimum, when tested as specified in ASTM F970.
   9. Integral coved base with cap strip.

B. Rubber Sheet Flooring - Type See Material and Finishes Schedule: Vulcanized rubber compound 913 with environmentally compatible color pigments that are free of toxic heavy metals like lead, cadmium or mercury.
   1. Manufacturers:
      a. NORA Envirocare, by Interface: www.nora.com/us
      b. Or approved equal.
   2. Minimum Requirements: Comply with ASTM F1859, Type 1, without backing.
   3. VOC Content: GREENGUARD Gold Certified for Low VOC Emissions CA 01350 Compliant
   4. Thickness: 2.0 mm minimum.
   5. Sheet Width: 48 inch minimum.
   7. Integral coved base with cap strip.
   9. Color: To be selected by Architect from manufacturer’s full range.

C. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.2 TILE FLOORING

A. See drawings for Material and Finishes Schedule.

B. Bio Based Floor Tile: Homogeneous, with color extending throughout thickness.
   1. Manufacturers:
      b. Or approved equal.
   2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
   4. Size: As indicated on drawings.
   5. Thickness: 0.125 inch.
   6. Color: As indicated on drawings.
2.3 RESILIENT BASE
   A. Resilient Base - Type RB-1: ASTM F1861, Type TS rubber, vulcanized thermoset; top set, Style B, Cove as follows:
      1. Manufacturers:
         b. Or approved equal.
      2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
      3. Height: 6 inch.
      4. Thickness: 0.125 inch.
      5. Finish: Satin.
      7. Color: As indicated on drawings.

2.4 ACCESSORIES
   A. Subfloor Filler: Gray Portland cement-based “moisture tolerant” underlayment; type recommended by adhesive material manufacturer.
   B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
   C. Trim for Coved Base:
      2. Or approved equal.
   D. Filler for Coved Base: Plastic.
      1. Product: Altro, cove former stick 20R 1 inch radius.
      2. Or approved equal.
   E. Gulley edge: Acceptable material, vinyl, sized to suit application:
      1. Altro Gulley Edge.
      2. Or approved equal.

PART 3 EXECUTION
3.1 EXAMINATION
   A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
   B. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive resilient flooring.
   C. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
   D. Verify that concrete sub-floor and self leveling underlayment surfaces are dry enough and ready for wood flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710 and ASTM F2170; obtain instructions if test results are not within limits recommended by wood flooring manufacturer and adhesive materials manufacturer.
      1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested.
      3. In-Situ Relative Humidity: 75%.
   E. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
   F. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION
   A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).
B. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.3 INSTALLATION - General
A. Starting installation constitutes acceptance of sub-floor conditions.
B. Install in accordance with manufacturer's written instructions.
C. Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set.
   2. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 26 05 26 for grounding and bonding to building grounding system.
   3. Fit joints and butt seams tightly.
   4. Set flooring in place, press with heavy roller to attain full adhesion.
D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4 INSTALLATION - Sheet Flooring
A. Install per approved shop drawings.
B. Install in accordance with manufacturer's instructions.
C. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.
D. Seams are prohibited in bathrooms, kitchens, toilet rooms, and custodial closets.
E. Cut sheet at seams in accordance with manufacturer's instructions.
F. Seal seams by heat welding where indicated.
G. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
H. Coved Base: Install as detailed on drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

3.5 INSTALLATION - Tile Flooring
A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.
C. Install square tile to ashlar pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

3.6 INSTALLATION - Resilient Base
A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
B. Install base on solid backing. Bond tightly to wall and floor surfaces.
C. Scribe and fit to door frames and other interruptions.
D. Types: Unless noted otherwise.
   1. Style B: Cove Base - Resilient Flooring.
3.7 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.
B. Clean in accordance with manufacturer's written instructions.
C. Remove and recycle debris from project site per Section 01 74 00.

END OF SECTION
PART 1 GENERAL
1.1 SECTION INCLUDES
A. Prefinished slotted panel system for merchandise display.

1.2 SUBMITTALS
A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Product Data: Manufacturer's product data sheets on each product to be used and installation instructions.
C. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.3 DELIVERY, STORAGE, AND HANDLING
A. Store panels in cool dry environment. Do not subject to moisture.
B. Do not stack panels directly on floor.

1.4 FIELD CONDITIONS
A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS
2.1 MANUFACTURERS
A. Spacewall West; www.spacewallwest.com/kent-wa/
B. Or approved equal..

2.2 MATERIALS
A. Slotted Display Panels Type SW-1: Marlite Display wall; prefinished medium density fiberboard with engineered grooves designed to fit standard merchandising fixtures.
   1. Fiberboard: 48 pcf density; internal bond strength of 110 psi; formaldehyde emission of 0.3 ppm or less; complying with 24 CFR 3280.
   2. Panel Size: Plus minus 0.0625 inch, with squareness tolerance of 0.125 inch on diagonal. Horizontal mount, cut to size on site.
      a. (2) each 48 inch tall by 79 inches long.
      b. (2) each 48 inch tall by 31 inches long.
   3. Thickness: 3/4 inch plus/minus 0.008 inch.
   4. Groove Spacing: 6 inches on center, plus/minus 0.015 inch.
   5. Surface Finish: High pressure laminate, 0.03 inch thick, cold press bonded with PVA Type II water resistant adhesive.
   6. Surface Color/Pattern: Wilsonart 7909-60, Fusion, Maple..
   8. Accessories:
      a. Inside and outside corner trim strips.

PART 3 EXECUTION
3.1 EXAMINATION
A. Do not begin installation until building is completely enclosed and interior conditions are being maintained as intended during occupancy; approximately 70 degrees F.
3.2 PREPARATION
   A. Open cartons and allow product to acclimate to room conditions for at least 48 hours prior to installation.
   B. Prepare surfaces using the methods recommended by the manufacturer.
   C. Protect existing surfaces from damage due to installation.

3.3 INSTALLATION
   A. Install in strict accordance with manufacturer's instructions, especially in regard to fastening and bracket spacing necessary to achieve optimum capacity.
   B. Avoid contamination of panel faces with adhesives, solvents, or cleaners; clean as necessary and replace if not possible to repair to original condition.
   C. Protect installed products until completion of project.
   D. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Prime surfaces to receive wall coverings.
   3. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   7. Concealed pipes, ducts, and conduits.

1.2 DEFINITIONS

A. Specular Gloss: Ranges determined per Master Painters Institute (MPI). Sheen is specified to establish required gloss range.

<table>
<thead>
<tr>
<th>Sheen</th>
<th>Geometry/Deg.</th>
<th>Gloss Range</th>
<th>MPI Gloss Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat</td>
<td>60</td>
<td>Below 5</td>
<td>1</td>
</tr>
<tr>
<td>Eggshell</td>
<td>60</td>
<td>10 to 25</td>
<td>3</td>
</tr>
<tr>
<td>Satin</td>
<td>60</td>
<td>20 to 35</td>
<td>4</td>
</tr>
<tr>
<td>Semi-Gloss</td>
<td>60</td>
<td>35 to 70</td>
<td>5</td>
</tr>
<tr>
<td>Gloss</td>
<td>60</td>
<td>70 to 85</td>
<td>6</td>
</tr>
</tbody>
</table>

B. Finish (i.e. gloss level) of painted surfaces shall be as specified herein or as noted on Finish Schedule.

1.3 REFERENCE STANDARDS


E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
1.4 SUBMITTALS

A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
B. Paints:
   8. Or approved equal.
C. Primer Sealers: Same manufacturer as top coats.
D. Substitutions: See Section 01 25 00 – Substitution Procedures.
2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and
      uniformly dispersed to a homogeneous coating, with good flow and brushing properties,
      and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a
      single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is
      specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in
      the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for
         Architectural Coatings.
      b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and
         Maintenance Coatings; www.otcair.org; specifically:
         1) Opaque, Flat: 50 g/L, maximum.
         2) Opaque, Nonflat: 150 g/L, maximum.
         3) Opaque, High Gloss: 250 g/L, maximum.
         4) Varnishes: 350 g/L, maximum.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59,
      Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added
      at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Colors: As indicated on drawings.
   1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the
      wall/ceiling they are mounted on/under.

2.3 PAINT SYSTEMS - INTERIOR

A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsumboard.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Interior Latex.
      a. Primer Products
         1) BEHR: Premium Plus Interior Drywall Primer & Sealer, 73.
         2) Benjamin Moore: Ultra Spec® 500 Interior Latex Primer N534.
         3) PPG Paints: 6-4900XI Speedhide Interior Latex Sealer Quick Drying.
         5) Rodda: 503601 MP Ultra Low VOC Interior Primer/Sealer.
         7) Or approved equal.
         1) BEHR: Behr Pro i300 Interior Eggshell. 330.
         5) Rodda: 523601 Master Painter UL VOC Interior Satin Finish.
         6) Miller Paint: Acro Pure Ultra-Low VOC Interior Eggshell 1103XX.
         7) Or approved equal.
         1) BEHR: Behr Pro i100 Interior Flat, 110.
         2) Benjamin Moore: Ultra Spec® 500 Interior Flat Finish N536.
         3) PPG Paints: 6-4110XI Speedhide Zero VOC Interior Latex Flat.
B. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete and concrete masonry units.

1. Two top coats and one coat primer.
2. Top Coat(s): Institutional Low Odor/VOC Interior Latex.
   a. Primer Products:
      1) BEHR: Premium Plus All-in-One Primer & Sealer, 75.
      2) Benjamin Moore: Ultra Spec Masonry 100% Acrylic Sealer 608.
      3) PPG Paints; 17-921XI Seal Grip Universal Acrylic Primer.
      4) Sherwin-Williams: Loxon Int/Ext Concrete & Masonry Primer, A24W8300.
      5) Rodda: 501601 First Coat Interior/Exterior Primer.
      6) Miller Paint: Kril Primer/Sealer Int/Ext Alkali-Resistant Primer 620011.
      7) Or approved equal.
      1) BEHR: Behr Pro i300 Interior Eggshell, 330.
      3) PPG Paints Speedhide zero Latex, 6-4310XI Series, Eggshell.
      5) Rodda: 523601 Master Painter UL VOC Interior Satin Finish.
      6) Miller Paint: Acro Pure Ultra-Low VOC Interior Eggshell 1103XX.
      7) Or approved equal.
3. Top Coat(s): Water-Based Epoxy Finish for Concrete:
   a. Primer Products:
      1) BEHR: Premium Plus All-in-One Primer & Sealer, 75.
      2) Benjamin Moore: Ultra Spec Masonry 100% Acrylic Sealer 608.
      3) PPG Paints; 17-921XI Seal Grip Universal Acrylic Primer.
      4) Sherwin-Williams: Loxon Int/Ext Concrete & Masonry Primer, A24W8300.
      6) Miller Paint: Kril Primer/Sealer Int/Ext Alkali-Resistant Primer 620011.
      7) Or approved equal.
      1) BEHR: Behr Pro Pre-Catalyzed Waterborne Epoxy Semi-Gloss HP150.
      2) Benjamin Moore: V341 COROTECH WB Pre-Cat Epoxy Coating Semi-Gloss.
      3) PPG Paints; 16-510 Pitt Glaze WB1 Interior Pre-Catalyzed Semi-Gloss or 16-310 Eggshell Acrylic Epoxy-self priming.
      4) PPG Paints: Amerlock 2 VOC Epoxy.
      5) Sherwin-Williams Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.
      6) Rodda: 70503 EcoLogic WB Epoxy.
      8) Or approved equal.
4. Top Coat(s): Water-Based Epoxy Finish for CMU:
   a. Primer Products:
      1) BEHR: Behr Pro Block Filler Primer, 50.
      2) Benjamin Moore: Ultra Spec® Masonry Hi-Build Block Filler 571.
      3) PPG Paints; 6-15XI Speedhide Hi Fill Latex Block Filler.
      5) Rodda: 501901 Block Filler.
      6) Miller Paint: Kril Block Filler 481011.
      7) Or approved equal.
   b. Paint Products: Wet Environments.
      1) BEHR: Behr Pro Pre-Catalyzed Waterborne Epoxy Semi-Gloss HP150.
      2) Benjamin Moore: V341 COROTECH WB Pre-Cat Epoxy Coating Semi-Gloss.
3) PPG Paints; Amerlock 2 VOC Epoxy.
4) Sherwin-Williams Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.
5) Rodda: 70503 EcoLogic WB Epoxy.
7) Or approved equal.

5. Top Coat(s): Water-Based Epoxy Finish for Walls and Ceilings, Wet Environments:
   a. Primer Products:
      1) BEHR: Premium Plus Multi-Surface Primer & Sealer 436.
      2) Benjamin Moore: Insl-X Aqua Lock Plus AQ-0XXX.
      3) PPG Paints; Amerlock 2 VOC Epoxy-self priming.
      4) Sherwin-Williams: Pro Industrial WB Catalyzed Epoxy, Gloss, B73 Series.
      5) Rodda: 70503 EcoLogic WB Epoxy.
      7) Or approved equal.
   b. Paint Products: Wet Environments.
      1) BEHR: Behr Pro Pre-Catalyzed Waterborne Epoxy Semi-Gloss HP150.
      2) Benjamin Moore: V341 COROTECH WB Pre-Cat Epoxy Coating Semi-Gloss.
      3) PPG Paints; Amerlock 2 VOC Epoxy.
      4) Sherwin-Williams Pro Industrial Water Based Catalyzed Epoxy, B73 Series.
      5) Rodda: 70503 EcoLogic WB Epoxy.
      7) Or approved equal.

C. Medium Metal Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and frames:
   1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
   2. Two top coats and one coat primer.
   3. Interior Epoxy-Modified Latex.
      a. Paint Products:
         1) BEHR: Premium Plus Multi-Surface Primer, 436.
         2) Benjamin Moore: Ultra Spec HP Acrylic Metal Primer HP04.
         3) PPG Paints; Pitt-Tech Plus Waterborne Acrylic Primer/Finish 4020PF.
         5) Rodda: 70323 EcoLogic Rustex Primer.
         6) Miller Paint: Acrimetal DTM Int/Ext Velvet Primer/Finish 310210.
         7) Or approved equal.
      b. Paint Products:
         1) BEHR: Behr Pro Pre-Catalyzed Waterborne Epoxy Semi-Gloss HP150.
         2) Benjamin Moore: V341 COROTECH WB Pre-Cat Epoxy Coating Semi-Gloss.
         3) PPG Paints; 16-510 Pitt Glaze WB1 Interior Pre-Catalyzed Semi-Gloss or 16-310 Eggshell Acrylic Epoxy-self priming.
         4) Sherwin-Williams: Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.
         5) Rodda: 70503 EcoLogic WB Epoxy.
         7) Or approved equal.

D. Medium Duty Vertical and Overhead: Including shop primed steel, galvanized steel, and aluminum.
   1. Two top coats and one coat primer.
   2. Primer Products:
      c. PPG Paints; Pitt-Tech Plus Waterborne Acrylic Primer/Finish 4020PF.
      e. Rodda: 70323 EcoLogic Rustex Primer.
g. Or approved equal.

   a. BEHR: Direct To Metal Semi-Gloss, 3200.
   c. PPG Paints; Break Through Water-Borne Acrylic Satin V51-410.
   e. Rodda: 528901 Multi Master DTM Enamel Satin.
   f. Miller Paint: Acrimetal DTM Int/Ext Acrylic Semi Gloss 3105XX.
   g. Or approved equal.

E. Medium Wood Duty Door/Trim: For surfaces subject to frequent contact by occupants, including wood:
   1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
   2. Two top coats and one coat primer.
   3. Interior Epoxy-Modified Latex.
      a. Primer Products:
         1) BEHR: Premium Plus All-In-One Primer & Sealer, 75.
         2) Benjamin Moore: Advance® Waterborne Alkyd Primer 0790.
         3) PPG Paints; 17-921XI Seal Grip Universal Acrylic Primer.
         4) Sherwin-Williams PrepRite ProBlock Latex, B51-600.
         5) Rodda: 502001 Unique Enamel Undercoater.
         6) Miller Paint: Miller Prime All Purpose Stain Blocking Primer 470011.
         7) Or approved equal.
      b. Paint Products:
         1) BEHR: Behr Pro Pre-Catalyzed Waterborne Epoxy Semi-Gloss HP150.
         2) Benjamin Moore: V341 COROTECH WB Pre-Cat Epoxy Coating Semi-Gloss.
         3) PPG Paints; 16-510 Pitt Glaze WB1 Interior Pre-Catalyzed Semi-Gloss or 16-310 Eggshell Acrylic Epoxy-self priming.
         4) Sherwin-Williams: Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.
         5) Rodda: 70503 EcoLogic WB Epoxy.
         7) Or approved equal.

F. Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
   1. Shop primer by others.
   2. Top Coat: Latex Dry Fall.
      a. Paint Products:
         1) BEHR: Behr Pro Dryfall Flat.
         2) Benjamin Moore: Benjamin Moore Dry Fall Latex Flat 395.
         3) PPG Paints Speedhide Super Tech Water Based Interior Dry-Fog, 6-725XI, Flat.
         4) Sherwin-Williams Pro Industrial Waterborne Acrylic Dryfall, B-42-80 Series, Flat.
         5) Rodda: 513801 Acrylic DryFall Flat.
         6) Miller Paint: Aqua Fall Interior Flat Dry Fall 181111.
         7) Or approved equal.
   3. Top Coat: Water Based Dry Fall for Galvanized Steel.
      a. Paint Products:
         1) BEHR: Behr Pro Dryfall Flat.
         2) Benjamin Moore: Benjamin Moore Dry Fall Latex Flat 395.
         3) PPG Paints Speedhide Super Tech Water Based Interior Dry-Fog, 6-725XI, Flat.
4) Sherwin-Williams Pro Industrial Waterborne Acrylic Dryfall, B-42-80 Series, Flat.
5) Rodda: 513801 Acrylic DryFall Flat.
6) Miller Paint: Aqua Fall Interior Flat Dry Fall 181111.
7) Or approved equal.

G. Concrete Floors to be Painted.
   1. Two top coats without primer.
   2. Latex Floor Paint, Low Gloss.
      a. Paint Products:
         1) Behr Premium Interior/Exterior Porch and Patio Floor Paint, Low-Lustre [No. 6050].
         2) Benjamin Moore: Insl-X HotTrax Epoxy Fortified Acrylic Concrete and Garage Floor Paint HTF-xxx.
         4) Sherwin-Williams: Armorseal 8100 Water Based Epoxy Flooring, B70-8100/8160 Series.
         5) Rustoleum: 5600 System Acrylic Urethane Floor Paint.
         7) Or approved equal.

   1. 2 top coats, no stain.
   2. Fire-Resistive Coating System: Water-based, asbestos-free, factory-mixed thin film intumescent coating system with smooth and uniform finish texture.
   3. Thickness: Dry mil thickness in accordance with acceptable test data for substrate.
   4. Surface Burning Characteristics, when tested in accordance with ASTM E84, Class A:
      a. Flame Spread Index: 25, maximum.
      b. Smoke Developed Index: 50, maximum.
   5. Product(s):
      d. Or approved equal.

I. Smoke Containment System and Elevator Doors, if painted:
   1. Contact smoke containment manufacture prior to initiating any painting of system or its components.
      a. Field painting of hoistway door frames, and auxiliary rails will require stripping of existing paint to base metal and repainting with a sprayed 0.005 inch thick maximum paint resistant to 400ºF.
      b. Use Valspar Hi-heat silicone coatings or Sherwin Williams Flame Control #850 Series or smoke containment system manufacturer approved alternate.

J. Gypsum Board/Plaster, Vapor Barrier Primer:
   1. Applications include walls, ceilings, and soffits as part of building vapor barrier.
   2. Perm Rating: Less than 1 perm per ASTM E96/E96M.
   3. Products:
      b. PPG Paints: Seal Grip Perm Sealer Vapor Barrier Primer 17-9801.
      d. Rodda: 507901 Vapor Block.
      e. Or approved equal.
PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
D. Seal surfaces that might cause bleed through or staining of topcoat.
E. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
F. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
G. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

3.2 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
E. Sand wood and metal surfaces lightly between coats to achieve required finish.
F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Contractor Furnished Contractor Installed Signage.
B. Room and door signs.
C. Interior directional and informational signs.

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS
A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.
D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. See Appendix D - Signage Standards.

2.2 SIGNAGE APPLICATIONS
A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Character Height: 1 inch.
   4. Sign Height: 2 inches, unless otherwise indicated.
   5. Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.

7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.

8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

C. Interior Directional and Informational Signs:
   1. Sign Type: Same as room and door signs.

2.3 SIGN TYPES
   A. See Appendix D Signage Standards.
   B. Color and Font: See Appendix D.

2.4 TACTILE SIGNAGE MEDIA
   A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:

2.5 ACCESSORIES
   A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
   B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Install neatly, with horizontal edges level.
   C. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Panelized LED video display systems.
B. Coordinate all specification information for Video Display Systems, AV, and Interactive Walls with requirements outlined in Appendix F

1.2 REFERENCE STANDARDS
B. UL 879 - Electric Sign Components; Current Edition, Including All Revisions.

1.3 SUBMITTALS
A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Product Data: Provide manufacturer's data sheets on panelized LED display systems including recommendations for preparation, storage and handling, and installation.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Deliver and store products in compliance with manufacturer instructions.

1.5 WARRANTY
A. See Section 01 78 36 - Warranties, for additional warranty requirements.
B. Provide six year manufacturer warranty

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Barco, Inc.: www.barco.com/#sle.
D. Or approved equal.

2.2 PANELIZED LED VIDEO DISPLAY
A. Performance Requirements:
   1. Comply with performance standards based on tests conducted in accordance with ANSI/Infocomm 10.
   2. Provide products that are listed and labeled as complying with UL 879, where applicable.
B. System Type: Flat.
   1. Pixel Pitch: 3.8 mm
   4. Brightness: 1000 Nits adjustable
   5. Mount Type: Custom Wall Mount.
   7. Height & Length to be coordinated with Construction Documents and Appendix F
   8. Service Access: Front, Rear, or Front/Rear.
   9. Data Connections: Shielded twisted pair CAT 5e/6e (Ethercon) or Fiber Optic.
   11. Working Voltage: 120 VAC / 240 VAC at 60Hz.

2.3 CONTROLS
A. Interface Unit:

1. With the following abilities; scale media, rotate media, adjust brightness, loop output, and input selection.
2. Working Voltage: 120 VAC / 240 VAC at 60Hz.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates and support structure is in place and properly prepared.
B. Verify that required power and data sources are provided.
C. Verify that space is available for centrally located components.

3.2 PREPARATION

A. Prepare substrates using the methods recommended by the manufacturer for achieving the best result under the project conditions.
B. Do not proceed with installation until support structure and substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install message center and signs level and plumb with fasteners recommended by the manufacturer.
C. Record any necessary changes to the system design.

3.4 CLOSEOUT ACTIVITIES

A. See Section 01 77 00 - Closeout Procedures, for closeout submittals.
B. Demonstrate proper operation and maintenance of equipment to Owner's designated representative.

END OF SECTION
SECTION 10 21 23
CUBICLE CURTAINS AND TRACK

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Suspended overhead curtain track and guides.
B. Surface mounted overhead curtain track and guides.
C. Cubicle curtains.

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS
A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Product Data: Provide data for curtain fabric characteristics.
C. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes.
D. Samples: Submit two fabric samples, 8 by 8 inch in size illustrating fabric color.
E. Samples: Submit 12 by 12 inch sample patch of curtain cloth with representative top, bottom, and edge hem stitch detail, heading with reinforcement and carrier attachment to curtain header.
F. Samples: Submit 12 inch sample length of curtain track including typical splice, wall and ceiling hanger, and escutcheon.
G. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
H. Maintenance Data: Include recommended cleaning methods and materials and stain removal methods.

1.4 MOCK-UP
A. Provide System mock-up, 8 feet long by 1 feet wide, with curtain track, curtain, cords and accessories.
   1. Provide mock-up of each type of installation with complete system.
   2. Revise as necessary to secure Owner's approval.
B. Locate where directed.
C. Mock-up may remain as part of the Work.
   1. Mock-up is not permitted to be part of permanent work, completely demolish and remove mock-up from job site upon completion and acceptance of Work of this Section

1.5 QUALITY ASSURANCE
A. Use skilled workers trained and experienced in necessary crafts who are familiar with requirements and methods needed for proper performance of Work of this Section.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Accept curtain materials on site and inspect for damage.
B. Store curtain materials on site and deliver to Owner for installation when requested.
1.7 FIELD MEASUREMENTS
   A. Field verify dimensions prior to fabrication; if vary significantly from Contract documents, obtain Owner’s approval before proceeding.

PART 2 PRODUCTS

2.1 MANUFACTURERS
   A. Cubicle Track and Curtains:
      4. Kirsch
      5. In Pro Corp.,
      6. Or approved equal.

2.2 PRODUCTS
   A. Type: Kirsch 9600 track with 9616 Carrier, or approved equal.
   B. Track Material: Extruded aluminum 6063-T5 alloy, tempered.
   C. Location: As indicated in Room Finish Schedule and as shown in Drawings.
   D. Tack Profile: “C” shape.
   E. Track Material: Extruded aluminum 6063-T5 alloy, tempered.
   F. Finish: Clear anodized.

2.3 TRACKS AND TRACK COMPONENTS
   A. Tracks: Extruded aluminum sections; one piece per track run.
      1. Profile: Channel.
      3. Structural Performance: Capable of supporting vertical test load of 50 lbs without visible deflection of track or damage to supports, safely supporting moving loads, and sufficiently rigid to resist visible deflection and without permanent set.
      4. Track End Stop: To fit track section.
      5. Track Bends: Minimum 12 inch radius; fabricated without deformation of track section or impeding movement of carriers.
   B. Curtain Carriers: Nylon rollers, size and type compatible with track; designed to eliminate bind when curtain is pulled; fitted to curtain to prevent accidental curtain removal.
   C. Wand: Plastic, attached to lead carrier, for pull-to-close action.
   D. Installation Accessories: Types required for specified mounting method and substrate conditions.

2.4 CURTAINS
   A. Cubicle Curtains:
      1. “CC” Numbers are to help designate location of Finish Schedule and Room Finish Schedule.
      2. Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      3. Inherently flame resistant or flameproofed; capable of passing NFPA 701 test.
      5. Color/Pattern: See Drawings Material and Finishes Schedule.
B. Open Mesh Cloth: Open weave to permit air circulation; flameproof material, manufacturer's standard color.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify that surfaces and supports above ceiling are ready to receive work of this Section.
      1. Correct conditions detrimental to timely and proper completion of Work.
      2. Do not proceed until unsatisfactory conditions are corrected.
   B. Verify that field measurements are as indicated.

3.2 COORDINATION
   A. Coordinate as required with other trades to assure proper and adequate provision in work of those trades for interface with work of this section.

3.3 INSTALLATION
   A. Install curtain track to be secure, rigid, and true to ceiling line.
   B. Secure track to ceiling system.
      1. Where anchorage to ceiling suspension system is not possible, provide solid blocking/backing of 3/4 inch cold rolled steel channels above ceiling for attachment.
   C. Install curtains on carriers ensuring smooth operation.

3.4 CLEANING, ADJUSTMENT AND PROTECTION
   A. Adjust moving parts to operate smoothly and quietly.
   B. Clean, without damaging, exposed surfaces affected by work of this Section.
      1. Repair damaged surfaces.
   C. Remove from site refuse created by this work, and dispose of in a legal manner.

3.5 SCHEDULES
   A. Break and Treatment Rooms: Nylon type, track tight to ceiling.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Corner guards.
B. Protective wall covering.
C. Chair Rails - OFCI

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS
A. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
B. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.
C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit three sections of corner guards, bumper rails, and protective corridor handrails, 24 inches long.
   2. Submit three samples of protective wall covering, 6 by 6 inches square.
   3. Submit three samples of a section of each mural section, 6 by 6 inches square. Section for production to be coordinated with Owner.
   4. Submit three full-size samples of trim protectors.
D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.
E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 77 00 – Closeout Procedures, for additional provisions.
F. Maintenance Data: For each type of product. Include information regarding recommended and potentially detrimental cleaning materials and methods.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
B. Protect work from moisture damage.
C. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in conformance with manufacturer's recommendations for each type of item.
PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Corner Guards:
   1. See Drawings and Material and Finishes Schedule.

B. Protective Wall Covering:
   1. Construction Specialties, Inc; Acrovyn by Design Wall Covering: www.c-sgroup.com/#sle., or approved equal.
   2. See Drawings - Material and Finishes Schedule.

2.2 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for conformance to applicable provisions of ASTM D256 and/or ASTM F476.

B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance conforming to applicable provisions of ASTM D543.

C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.3 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
   1. Type CG-1 & CG-2: See drawings for Material and Finishes Schedule.
   2. Material: Type 304 stainless steel, No. 4 Satin finish.
   3. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
   4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   5. Width of Wings: 3-1/2 inches.
   7. Length: One piece.

B. Corner Guards - Surface Mounted:
   1. Type CG-3: See drawings for Material and Finishes Schedule.
   2. Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
   3. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
   4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   5. Width of Wings: 3 inches.
   7. Length: One piece.

C. Protective Wall Covering System: Type PWC-2
   1. Manufacturer: Construction Specialties; Product Acrovyn-4000; www.c-sgroup.com., or approved equal.
   2. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free.
   3. Thickness: 0.040 inch.
   4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 350 or less, when tested in accordance with ASTM E84.
   5. Color and Size: As indicated on drawings.
6. **Accessories**: Provide manufacturer's standard wrapped edges, trim and moldings for a complete system.

7. **Mounting**: Adhesive.

**D. Protective Wall Covering System: Type PWC-5**

1. **Manufacturer**: Construction Specialties; Product Acrovyn By Design; www.c-sggroup.com., or approved equal.
2. **Material**: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free.
3. **Description**: Engineered PETG rigid sheet, Nominal .040” (1.02mm) thick rigid sheet supplied in 4’ x 8’ or 10’ (1.2m x 2.4m or 3.0m) sheet sizes in standard Suede texture. High definition graphic file reverse printed on clear sheet and sealed with protective backer. Acrovyn aluminum trims for joints/transitions.
4. **Surface Burning Characteristics**: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
5. **Color and Size**: As indicated on drawings.
6. **Accessories**: Provide manufacturer's standard color-matched trim and moldings as selected by Architect for a complete system.
   a. **Inside Corner**: Coordinate with Owner.
   b. **Outside Corner**: Thermoformed.
   c. **Exposed edges**: Thermoformed.
7. **Mounting**: Adhesive.
8. **Aluminum Trim**: Optional aluminum trims to be alloy 6063 T5 with clear or colored anodized finish; minimum strength and durability properties as specified in ASTM B221.
   a. **Finish**: Anodized - Color as selected by Owner.

**E. Chair Rail: Type CR-1**

1. **Manufacturer**: As indicated on drawings.

### 2.4 FABRICATION

**A.** Fabricate components with tight joints, corners and seams.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

**A.** Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
**B.** Verify that field measurements are as indicated on drawings.
**C.** Verify that substrate surfaces for adhered items are clean and smooth.

#### 3.2 INSTALLATION

**A.** Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
**B.** Position corner guard above finish floor as indicated on drawings.

#### 3.3 TOLERANCES

**A.** Maximum Variation From Required Height: 1/4 inch.
**B.** Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

#### 3.4 CLEANING

**A.** See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
**B.** Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

**END OF SECTION**
SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Commercial toilet accessories.
B. Commercial shower and bath accessories.
C. Under-lavatory pipe supply covers.

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS
A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.1 Refer to drawings for product schedule indicating Furnished by Owner Installed by Owner (FOIO) and Furnished by Owner Installed by Contractor (FOIC).

2.2 MANUFACTURERS
A. Commercial Toilet, Shower, and Bath Accessories:
   2. Bobrick Washroom Equipment, Inc.; www.bobrick.com
   5. Or approved equal..

2.3 MATERIALS
A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
B. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

2.4 FINISHES
A. Stainless Steel: Satin finish, unless otherwise noted.
B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

2.5 Commercial Toilet Accessories
A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, stainless steel, spindleless type for tension spring delivery designed to prevent theft of tissue roll.
   1. Products:
a. GP Pro Manufacturing; Model 56796.
   b. Or approved equal.

B. Paper Towel Dispenser: Electric, roll paper type.
   2. Paper Discharge: Touchless automatic.
   3. Capacity: 6 inch diameter roll.
   5. Power: Battery operated.

C. Soap Dispenser: Soap lather dispenser, wall-mounted, surface, with plastic cover and
   horizontal stainless steel tank and working parts; push type soap valve, check valve, and
   window gauge refill indicator.
   1. Products:
      a. Provon Foam Dispenser; Model 197104.
      b. Or approved equal.

D. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance
      with ASTM C1503.
   2. Size: As indicated on drawings.
   3. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and
      tamperproof hanging system; satin finish.
   4. Products:
      a. Bobrick Model B-165 1830.
      b. Or approved equal.

E. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at
   base, tumbler lock.
   2. Products:
      a. Kimberly Clark; Model KCC09506.
      b. Or approved equal.

F. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking
   bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

2.6 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and
   backplate for concealed attachment, satin finish.
   1. Products:
      a. Grainger Model 45NG73.
      b. Or approved equal.

2.7 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
   1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under
      lavatories or sinks to comply with ADA Standards.
   2. Products:
      a. Plumberex Specialty Products, Inc; Plumberex Handy-Shield Maxx:
         www.plumberex.com/#sle.
      b. Or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify exact location of accessories for installation.
C. Verify location of backing or blocking for attachment of grab bars.

3.2 PREPARATION

3.3 INSTALLATION
A. Install accessories in accordance with manufacturers’ instructions in locations indicated on drawings.
B. Install plumb and level, securely and rigidly anchored to substrate.
C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Other Accessories: As indicated on drawings.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Phenolic lockers.

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS
A. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
B. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.
C. Full Size Sample: One full-size locker of each construction specified for evaluation of construction.
D. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Phenolic Lockers:
   1. Columbia Lockers, a division of PSiSC; Phenolic Lockers: www.psisc.com/#sle.
   3. Or approved equal.

2.2 LOCKER APPLICATIONS
A. Personal Lockers: Phenolic lockers, wall mounted with matching closed base.
   1. Accessibility: Comply with ICC A117.1 and ADA Standards.
   2. Size H x W x D: As detailed on drawings.
   3. Locker Configuration: As detailed on drawings.
   4. Fittings: Size and configuration as indicated on drawings.
   5. Ventilation: By open space between the back of the door and lockerbody.
   6. Locking: Padlock hasps, for padlocks provided by Owner.

2.3 PHENOLIC LOCKERS
A. Lockers: Factory assembled, made of phenolic core panels with mortise and tenon joints and stainless steel mechanical joint fasteners; fully finished inside and out; each locker capable of standing alone.
   1. Doors: Full overlay, covering full width and height of locker body; squareedges.
   2. Panel Core Exposed at Edges: Machine polished, without chips or tool marks; square edge unless otherwise indicated.
   3. Where locker ends or sides are exposed, finish the same as fronts or provide extra panels to match fronts.
5. Fasteners for Accessories and Locking Mechanisms: Tamperproof type.
6. Fixed shelf held back from face - as indicated on drawings.

B. Component Thicknesses:
   1. Doors: 1/2 inch minimum thickness.
   2. Locker Body: One of the following combinations:
      a. Tops, bottoms, and shelves 1/2 inch; sides 3/8 inch; backs 1/4 inch; minimum.
   3. End Panels and Filler Panels: 1/2 inch minimum thickness.

C. Phenolic Core Panels: Nonporous phenolic resin and paper core formed under high pressure, with natural colored finished edges, integral melamine surface, matte finish, and uniform surface appearance; glued laminated panels not acceptable.
   1. Surface Burning Characteristics: Flame spread index of 75 or less, and smoke developed index of 450 or less; when tested in accordance with ASTM E84.

D. Hinges: Stainless steel, black powder coat or satin finish; minimum of 180 degree opening; either exposed barrel 5-knuckle hinge attached to back of door and inside of body with tamperproof screws, or concealed cabinetwork style hinge attached with tamperproof screws.

E. Coat Hooks: Stainless steel or reinforced nylon; attached with tamperproof screws.

F. Number Plates: Manufacturer's standard, minimum 4-digit, permanently attached with adhesive; may be field installed.

G. Locks: Locker manufacturer's standard type indicated above.

H. Lock Strike: Stainless steel, or black high impact ABS plastic strike plate attached to locker body with throughbolts.

I. Mail Slot: 1 inch high x 10 inch wide with 1/2 inch radius corners.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify that prepared bases are in correct position and configuration.

3.2 INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Place and secure on prepared base.
   C. Install lockers plumb and square.
   D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.
   E. Bolt adjoining locker units together to provide rigid installation.
   F. Install end panels, filler panels, and sloped tops.
   G. Install accessories.

3.3 CLEANING
   A. Clean locker interiors and exterior surfaces.

END OF SECTION
SECTION 11 66 23
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Physical Therapy Equipment

1.2 REFERENCE STANDARDS
B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 ADMINISTRATIVE REQUIREMENTS
A. Large Components: Ensure that large components can be moved into final position without damage to other construction.
B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.

1.4 SUBMITTALS
A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Electrical characteristics and connection locations.
   2. Manufacturer's installation instructions.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.
B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.
C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS
A. See drawings for sizes and locations, unless noted otherwise.
B. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.
C. Hardware: Heavy duty steel hardware, as recommended by manufacturer.
D. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.

PART 3 EXECUTION

3.1 EXAMINATION
A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.
B. Inspect areas and conditions before installation, and notify Owner in writing of unsatisfactory or detrimental conditions.
C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.

3.2 INSTALLATION
A. Install in accordance with Contract Documents and manufacturer's instructions.
B. Install equipment rigid, straight, plumb, and level.
C. Secure equipment with manufacturer's recommended anchoring devices.
D. Separate dissimilar metals to prevent electrolytic corrosion.

3.3 ADJUSTING
A. Verify proper placement of equipment.
B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.

3.4 CLEANING
A. Remove masking or protective covering from finished surfaces.
B. Clean equipment in accordance with manufacturer's recommendations.

END OF SECTION
SECTION 11 73 00
CEILING MOUNTED PATIENT LIFT SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Ceiling Mounted Patient Lift Systems for the transfer of physically challenged patients are specified in this section.

1.2 QUALITY ASSURANCE
A. Certification for compliance is required for Ceiling Mounted Patient Lift Systems. Certifications shall be provided by an independent third party who will conduct testing to ensure that the ceiling lift and charging system are safe and in compliance with ISO 10535 & UL 60601-1.
B. Inspection of equipment after installation is required prior to use for patient movement. Inspection shall be in accordance with manufacturer’s installation checklist and the facilities installation checklist (Patient Safety Alert AL14-07).

1.3 SUBMITTALS
A. See Section 01 33 00 – Submittal Procedures for submittals.
B. Manufacturer’s Certificate: Certify that lift meet or exceed specified requirements.
C. Product Data:
   1. Lifting Capacity
   2. Lifting Speed
   3. Horizontal Displacement Speeds
   4. Horizontal Axis Motor
   5. Vertical Axis Motor
   6. Emergency Brake
   7. Emergency Lowering Device
   8. Emergency Stopping Device
   9. Electronic Soft-Start and Soft-Stop Motor Control
   10. Current Limiter for Circuit Protection
   11. Low Battery Disconnect System
   12. Strap Length
   13. Equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity, standard connections, manufacturer’s recommendations and behavior problems (e.g., vibration, thermal expansion,) associated with equipment or piping so that the proposed installation can be properly reviewed.
D. Shop Drawings:
   1. Individual Room layouts showing location of lift system installation shall be approved before proceeding with installation of lifts.
E. Manufacturer’s Checklist for after installation inspection.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Basis of Design: Arjo; Product Maxi Sky 2; www.arjo.com
B. Or approved equal.

2.2 CEILING TRACK SYSTEM
A. Ceiling Track Material: High strength extruded aluminum T66081-T5 at a thickness of 3/16 inches.
B. Provide anchor supports as indicated on structural drawings.
2.3 LIFT UNIT
A. Lift Unit shall be constructed of a steel frame system (2205lbs / 1000kg tested) driven by a gear reduced high torque motor.
B. Lift system features:
1. Lifting capacity: 440 lbs (200 kg)
2. Electronic soft-start and soft-stop motor control
3. Emergency lowering device
4. Emergency stopping device
6. Safety device that stops the motor to lift when batteries are low.
7. Lifting speed: 2.3in/s (6 cm/s), 1.6in/s (3.5cm) in full capacity
8. Horizontal displacement speed: 5.9in/s (150mm/s)
9. Horizontal axis motor: 24VDC at 62 watts and vertical axis motor at 110 watts
10. Emergency brake (in case of mechanical failure)
11. Strap length up to 90in (2.3m) tested for 2998lbs (1360kg)
12. Cab: VO plastic–fire retardant, UL 94.
13. Wireless remote control.

2.4 MOTORS
A. Vertical Movement-DC Motor
1. Type: Class A, fully enclosed, permanent magnet.
2. Rating: 24Vdc, 1.1A, 110W, 4000RPM, 0.3N-m.
3. Mounting: Secured to chassis.
B. Horizontal Movement-DC Motor
1. Type: Fully enclosed, permanent magnet, integral reducer.
2. Rating: 24Vdc, 1.8A, 62W, 260RPM, 1.0N-m.
3. Mounting: Secured to chassis.

2.5 BATTERIES
A. Life cycle (number of charging cycles) for batteries shall be in compliance with IEC 801-2.
B. Provide rechargeable batteries with up to 120 transfers with a load of 200lbs and up to 70 transfers with its maximum load of 440lbs.

2.6 CHARGER
A. Charger Input: 100-240 Vac, 50/60 Hz.
B. Charger Output: 27 Vdc, 1 A max.
C. Provide clip on charging station with indicator lights.

2.7 STRAPS AND SLING
A. Straps: Threaded nylon.
1. Straps shall ensure patient’s safety by preventing the patient from falling out of sling.
B. Sling Material: Polyester/nylon net that is pliable, breathable and easy to use.
C. Sling shall cradle patient body.

PART 3 - EXECUTION
3.1 INSTALLATION
A. Install ceiling mounted patient lift system as per manufacturer's instruction and under supervision of manufacturer's qualified representative and as shown on drawings.
B. Distance in between suspended ceiling and anchors is more than 18 inches consult with manufacturer to determine if lateral braces will be required.

3.2 INSTRUCTION AND PERSONNEL TRAINING
   A. Provided for required personnel to educate them on proper operation and maintenance for lift system equipment.

3.3 TEST
   A. Conduct performance test, in presence of the Resident Engineer and a manufacturer’s field representative, to show that patient lift system equipment and control devices operate properly and in accordance with design and specification requirements.

3.4 INSPECTION
   A. Inspection of installed ceiling mounted patient lift systems shall be conducted in accordance with the manufacturer’s installation checklist and the facilities installation checklist (Patient Safety Alert AL14-07) prior to use for patient movement.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
   A. Manually operated sunscreen roller shades.
   B. Manually operated room-darkening shades.

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS
   A. See Section 01 33 00 – Submittal Procedures for submittals.
   B. Product Data: Manufacturer's data sheets on each product to be used, including:
      1. Preparation instructions and recommendations.
      2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
      3. Storage and handling requirements and recommendations.
      4. Mounting details and installation methods.
   C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
      1. Prepare shop drawings on AutoCAD or Microstation format using base sheets provided electronically by the Owner.
   D. 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.
   E. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
   F. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.
   G. Environmental Certification:
      1. Submit written certification from manufacturer, including third party evaluation, recycling characteristics, and perpetual use certification.
      2. Initial submittals, which do not include the Environmental Certification, below will be rejected.
      3. Materials that are simply 'PVC free' without identifying their inputs shall not qualify as meeting the intent of this specification and shall be rejected.
   H. Third Party Evaluation:
      1. Provide documentation stating the shade cloth has undergone third party evaluation for all chemical inputs, down to a scale of 100 parts per million, that have been evaluated for human and environmental safety.
      2. Identify any and all inputs, which are known to be carcinogenic, mutagenic, teratogenic, reproductively toxic, or endocrine disrupting.
      3. Identify items that are toxic to aquatic systems, contain heavy metals, or organohalogens.
4. Material shall contain no inputs that are known problems to human or environmental health per the above major criteria, except for an input that is required to meet local fire codes.

I. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.4 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than twenty years of experience.
B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.
C. Fire-Test-Response Characteristics: Passes NFPA 701, small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
D. Anti-Microbial Characteristics: 'No Growth' per ASTM G21 results for fungi.

1.5 MOCK-UP
A. Provide a mock-up of one roller shade assembly for evaluation of mounting, appearance and accessories.
   1. Locate mock-up in window designated by Architect.
   2. Do not proceed with remaining work until, mock-up is accepted by Owner.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.7 FIELD CONDITIONS
A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 WARRANTY
A. Roller Shade Hardware, Chain and Shadecloth (except EcoVeilä): Manufacturer's standard non-depreciating twenty-five year limited warranty.
B. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 PRODUCTS

2.1 MANUFACTURERS
B. Or approved equal.

2.2 APPLICATIONS/SOCPE
A. Roller Shade Schedule:
   1. Manual operating, chain drive, sunscreen roller shades in all exterior windows of rooms and spaces shown on the Drawings.
   2. Manual operating interior, chain drive room darkening roller shades with blackout fabric in all exterior windows of rooms and spaces shown on Drawings, and related mounting systems and accessories.
2.3 SHADE CLOTH
A. Type WT-1: Refer to the drawings Material and Finishes Schedule.

2.4 SHADE BAND
A. Shade Bands: Includes fabric, hem weight, hem-pocket, shade roller tube, and attachment of shade band to roller tube. Sewn hems and open hem pockets are not acceptable.
   1. Hem Pockets and Hem Weights:
      a. Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights.
      b. Weights to be of appropriate size and weight for shade band.
      c. Weight to be continuous inside a sealed hem pocket.
      d. Hem pocket construction and hem weights to be similar, for all shades within one room.
   2. Shade band and Shade Roller Attachment:
      a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection.
      1) Tubes less than 1.55 inch in diameter are not acceptable.
      b. Provide for positive mechanical engagement with drive / brake mechanism.
      c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
      d. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.5 SHADE FABRICATION
A. Units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
B. Shadecloth to hang flat without buckling or distortion.
C. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling.
D. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design.
E. Fabricate hem as follows:
   1. Concealed hemtube.
F. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands.
   1. Width-to-height (W:H) ratios shall not exceed manufacturer's standards.
   2. Battens to be roll-formed stainless steel or tempered steel.

2.6 COMPONENTS
A. Access and Material Requirements:
   1. Allow for removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
   2. Allows for removal and re-mounting of shade bands without having to remove shade tube, drive or operating support brackets.
   3. Use only Delrin engineered plastics by DuPont for plastic components of shade hardware. Styrene based plastics, and/or polyester, or reinforced polyester will not be acceptable.
B. Manual Operated Chain Drive Hardware and Brackets:
   1. Universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets.
2. Hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.

3. Shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.

4. Shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.

5. Shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.

6. Positive mechanical engagement of drive mechanism to shade roller tube.
   a. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable

7. Shade hardware constructed of minimum 1/8-inch thick plated steel or heavier as required to support 150 percent of the full weight of each shade.

8. Drive Bracket / Brake Assembly:
   a. Model M5 to be fully integrated with accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
   b. Model M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch steel pin.
   c. Brake shall be an over-running clutch design which disengages to 90 percent during the raising and lowering of a shade.
   d. Pull Force: Withstand 50 lbs.in stopped position.
   e. Braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. Oil impregnated hub design to include an articulated brake assembly, for a smooth, non-jerky operation in raising and lowering shades.
   f. Assembly to be permanently lubricated.
   1) Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
   g. M5 assembly shall be fully mounted on the steel support bracket, and fully independent of shade tube assembly, which may be removed and reinstalled without effecting roller shade limit adjustments.

C. Drive Chain:
   1. #10 qualified stainless steel chain rated to 90 lb. minimum breaking strength.
   2. Nickel plate chain shall not be accepted.

2.7 ACCESSORIES

A. Roller Shade Pocket for recessed mounting in acoustical tile, or drywall ceilings as indicated on the Drawings.
   1. Provide either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.
   a. Provide "Vented Pocket" such that there will be a minimum of four 1 inch (25.4 mm) diameter holes per foot allowing the solar gain to flow above the ceiling line.

B. Fascia:
   1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
   2. Fascia shall be able to be installed across two or more shade bands in one piece.
   3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
5. Notching of Fascia for manual chain shall not be acceptable.

C. Room Darkening Side and / or Sill Channels:
   1. Extruded aluminum with polybond edge seals and SnapLoc-mounting brackets and with concealed fastening. Exposed fastening is not acceptable. Channels shall accept one-piece exposed blackout hembar with vinyl seal to assure side light control and sill light control.
      b. For shadebands over 8 feet, provide ElectroShade side channels.
   2. Color: Selected from manufacturer’s standard colors.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Do not begin installation until substrates have been properly prepared.
   B. If substrate preparation is the responsibility of another installer, notify Owner of unsatisfactory preparation before proceeding.

3.2 PREPARATION
   A. Clean surfaces thoroughly prior to installation.
   B. Prepare surfaces using the methods recommended by the manufacturer.

3.3 INSTALLATION
   A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow proper clearances for window operation hardware.
   B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
   C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
   D. Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION
   A. Protect installed products until completion of project.
   B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Countertops for architectural cabinet work.

1.2 REFERENCE STANDARDS
B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
G. PS 1 - Structural Plywood; 2009.

1.3 SUBMITTALS
A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.
B. Shop Drawings: Complete details of materials, installation and seaming locations; combine with shop drawings of cabinets and casework specified in other sections.
C. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
D. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
E. Installation Instructions: Manufacturer's installation instructions and recommendations.
F. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.4 QUALITY ASSURANCE
A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 FIELD CONDITIONS
A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
PART 2 PRODUCTS

2.1 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
   2. See Drawings Materials and Finishes Schedule.
      a. Manufacturers:
         1) Basis of Design Manufacturer: Dupont; Product: Corian: www.corian.com/#sle.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. Color and Pattern: As indicated on drawings.
   3. Other Components Thickness: 1/2 inch, minimum.
   4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

2.2 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Metal Support Bracket:
   1. See Drawings for detail information.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

D. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.3 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Owner of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.
3.2 PREPARATION
A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION
A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
B. Seal joint between back/end splashes and vertical surfaces.

3.4 TOLERANCES
A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING
A. Clean countertops surfaces thoroughly.

3.6 PROTECTION
A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Brass ball valves.
   2. Bronze ball valves.
   3. Iron ball valves.

B. Related Sections:
   1. Section 22 11 16 "Domestic Water Piping" for valves applicable only to this piping.

1.02 DEFINITIONS

A. CWP: Cold working pressure.
B. EPDM: Ethylene propylene copolymer rubber.
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
D. NRS: Nonrising stem.
E. OS&Y: Outside screw and yoke.
F. RS: Rising stem.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.04 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
   1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
   2. ASME B31.1 for power piping valves.
   3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set angle, gate, and globe valves closed to prevent rattling.
   4. Set ball and plug valves open to minimize exposure of functional surfaces.
   5. Set butterfly valves closed or slightly open.
   6. Block check valves in either closed or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.
B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
   1. Gate Valves: With rising stem.
   2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:
   1. Flanged: With flanges according to ASME B16.1 for iron valves.
   2. Grooved: With grooves according to AWWA C606.
   4. Threaded: With threads according to ASME B1.20.1.

F. Valve Bypass and Drain Connections: MSS SP-45.

2.02 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
   1. Manufacturers: Provide products by one of the following:
      a. Conbraco Industries, Inc.
      b. Apolo Valves
      c. Milwaukee Valve Company.
      d. Or approved equal.
   2. Description:
      b. SWP Rating: 150 psig.
      c. CWP Rating: 600 psig.
      d. Body Design: Two piece.
      e. Body Material: Bronze.
      f. Ends: Threaded.
      g. Seats: PTFE or TFE.
      h. Stem: Bronze.
      i. Ball: Chrome-plated brass.
      j. Port: Full.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.02 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
B. Locate valves for easy access and provide separate support where necessary.
C. Install valves in horizontal piping with stem at or above center of pipe.
D. Install valves in position to allow full stem movement.

3.03 ADJUSTING
A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.04 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS
A. If valve applications are not indicated, use the following:
   1. Shutoff Service: Ball valves.
   2. Throttling Service: Globe or angle valves.
B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
C. Select valves, except wafer types, with the following end connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
   2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
   4. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.05 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE
A. Pipe NPS 2 and Smaller:
   1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Bronze Angle Valves: Class 150, bronze disc.
   3. Ball Valves: Two piece, regular port, brass with brass trim.
   4. Bronze Swing Check Valves: Class 150, bronze disc.
   5. Bronze Gate Valves: Class 150.

3.06 SANITARY-WASTE VALVE SCHEDULE
A. Pipe NPS 2 and Smaller:
   1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Bronze Angle Valves: Class 150, nonmetallic disc.
   3. Ball Valves: One piece, full port, brass with brass trim.
   4. Bronze Swing Check Valves: Class 150, nonmetallic disc.
   5. Bronze Gate Valves: Class 150, NRS.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Metal framing systems.
   4. Thermal-hanger shield inserts.
   5. Fastener systems.
   6. Pipe positioning systems.
   7. Equipment supports.

1.02 DEFINITIONS
A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.03 PERFORMANCE REQUIREMENTS
A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
   1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
   2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
   3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.04 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
   1. Trapeze pipe hangers.
   2. Metal framing systems.
   3. Fiberglass strut systems.
   4. Pipe stands.
   5. Equipment supports.
C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Detail fabrication and assembly of trapeze hangers.
   2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.05 INFORMATIONAL SUBMITTALS
A. Welding certificates.

1.06 QUALITY ASSURANCE
A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, “Structural Welding Code - Steel.”
B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 PRODUCTS

2.01 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

B. Stainless-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

C. Copper Pipe Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.

2.02 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.03 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
      a. Unistrut Corporation; Tyco International, Ltd.
      b. Allied Tube & Conduit.
      c. Flex-Strut Inc.
      d. Or approved equal.
   3. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
   5. Channels: Continuous slotted steel channel with inturned lips.
   6. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
   10. Plastic Coating: PVC.

2.04 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
   1. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
2. Carpenter & Paterson, Inc.
4. Or approved equal.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.05 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.06 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.07 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.08 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled fiberglass struts.

F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

G. Fastener System Installation:
   1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
   2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

H. Pipe Stand Installation:
   1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
   2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.

I. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

J. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.


L. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Install lateral bracing with pipe hangers and supports to prevent swaying.

N. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

O. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

P. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

Q. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.02 EQUIPMENT SUPPORTS
   A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
   B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
   C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.03 METAL FABRICATIONS
   A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
   B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
   C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
      1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
      2. Obtain fusion without undercut or overlap.
      3. Remove welding flux immediately.
      4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.04 ADJUSTING
   A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
   B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.05 PAINTING
   A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
      1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
   B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
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C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.06 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.

2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.

4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.

6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.

7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.

8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.


10. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.

11. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.

12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

13. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.

14. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.

15. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

16. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
17. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.

18. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

19. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

20. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
   2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
   2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
   3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
   4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
   5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
   3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
   4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
   6. C-Clamps (MSS Type 23): For structural shapes.
   7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
   8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
   9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
  12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
      a. Light (MSS Type 31): 750 lb.
      b. Medium (MSS Type 32): 1500 lb.
      c. Heavy (MSS Type 33): 3000 lb.
  13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
   a. Horizontal (MSS Type 54): Mounted horizontally.
   b. Vertical (MSS Type 55): Mounted vertically.
   c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Isolation mounts.
   2. Restrained elastomeric isolation mounts.
   3. Freestanding spring isolators.
   4. Housed spring mounts.
   5. Elastomeric hangers.
   7. Spring hangers with vertical-limit stops.
   8. Pipe riser resilient supports.
   9. Resilient pipe guides.
  10. Seismic snubbers.
  11. Restraining braces and cables.

1.02 DEFINITIONS

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.03 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES.
      b. Annotate to indicate application of each product submitted and compliance with requirements.
   3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Delegated-Design Submittals: Typical support and bracing of “non-structural” architectural, mechanical and electrical items has been shown on the contract drawings. Further, the “minimum” equipment anchorage of mechanical and electrical equipment has been indicated. The contractor shall review these details and develop shop drawings all respective support and bracing details. If the contractor desires to use alternate support or bracing details than are shown on the contract drawings or if a unique support or a unique detail is needed, the contractor shall submit his proposed details to the owner for review and submit calculations of these proposed connections for the owner to review. For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators, seismic restraints, and for designing vibration isolation bases.
   2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
   3. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides
and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

4. Seismic-Restraint Details:
   a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
   b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
   c. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.04 INFORMATIONAL SUBMITTALS
   A. Coordination Drawings (Shop Drawings): Show coordination of seismic bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.
   B. Qualification Data: For professional engineer.
   C. Welding certificates.
   D. Field quality-control test reports.

1.05 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For air-mounting systems to include in operation and maintenance manuals.

1.06 QUALITY ASSURANCE
   A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
   B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
   C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   D. When unique or alternate details are required, seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproved by ICC-ES, or preapproved by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATORS
   A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Manufacturers: Subject to compliance with requirements, provide products by one of the following: Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:

   1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. Mason Industries
4. Or approved equal.

B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
   1. Resilient Material: Oil- and water-resistant neoprene.

C. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.
   1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
   2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Restrained Mounts: All-directional mountings with seismic restraint.
   1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
   2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

E. Spring Isolators: Freestanding, laterally stable, open-spring isolators.
   1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch-thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
   6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

F. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.
   1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch-thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
   2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.
   3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

G. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.
   1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
   2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel up or down before contacting a resilient collar.

H. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

I. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
   1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
   2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
   7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

J. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.
   1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
   2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
   7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
   8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

K. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

L. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.02 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
1. Amber/Booth Company, Inc.
2. Hilti, Inc
3. Mason Industries.
4. Or approved equal.

C. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES.
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

D. Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum 1/4-inch air gap, and minimum 1/4-inch thick resilient cushion.

E. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

F. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

G. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

H. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

I. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

J. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

K. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

L. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.03 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES.
B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.03 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment Restraints:
   1. Install seismic snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
   2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inches.
   3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES providing required submittals for component.
B. Piping Restraints:
   1. Comply with requirements in MSS SP-127, unless noted otherwise.
   2. See typical “non-structural” seismic bracing details for additional bracing information.
C. Install cables so they do not bend across edges of adjacent equipment or building structure.
D. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES providing required submittals for component.
E. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
F. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
G. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
H. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

5. Set anchors to manufacturer's recommended torque, using a torque wrench.

6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.

2. Schedule test with Owner, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.

3. Obtain Owner's approval before transmitting test loads to structure. Provide temporary load-spreading members.

4. Test at least four of each type and size of installed anchors and fasteners selected by Owner.

5. Test to 90 percent of rated proof load of device.


7. Measure isolator deflection.

8. Verify snubber minimum clearances.


10. Air-Mounting System Operational Test: Test the compressed-air leveling system.

11. Test and adjust air-mounting system controls and safeties.

12. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.06 ADJUSTING

A. Adjust isolators after piping system is at operating weight.
B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Section includes insulating the following plumbing piping services:
   1. Domestic cold-water piping.
   2. Domestic hot-water piping.
   3. Domestic recirculating hot-water piping.
   4. Heating hot-water piping

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Detail attachment and covering of heat tracing inside insulation.
   3. Detail insulation application at pipe expansion joints for each type of insulation.
   4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
   5. Detail removable insulation at piping specialties, equipment connections, and access panels.
   6. Detail application of field-applied jackets.
   7. Detail application at linkages of control devices.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.
1.06 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.07 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS


B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type II with all service jacket.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Johns Manville; Micro-Lok.
   b. Knauf Insulation; 1000-Degree Pipe Insulation.
   c. Owens Corning; Fiberglas Pipe Insulation
   d. Or approved equal.

2.02 INSULATING CEMENTS


1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following:
   a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.
   b. Or approved equal.

2.03 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
2.04 SEALANTS

A. Joint Sealants:
   1. Joint Sealants for Cellular-Glass and Phenolic Products provide one of the following:
      b. Eagle Bridges - Marathon Industries; 405.
      d. Or approved equal.
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Permanently flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 100 to plus 300 deg F.
   5. Color: White or gray.
   6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   7. Sealants shall comply with the testing and product requirements of the California Department of Health Services’ “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”

2.05 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Products, provide one of the following:
      a. ABI, Ideal Tape Division; 428 AWF ASJ.
      b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
      c. Compac Corporation; 104 and 105.
      d. Or approved equal.
   2. Width: 3 inches.
   3. Thickness: 11.5 mils.
   5. Elongation: 2 percent.
   6. Tensile Strength: 40 lbf/inch in width.
   7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
   1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
   2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
   a. For below-ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
   1. Vibration-control devices.
   2. Testing agency labels and stamps.
   3. Nameplates and data plates.

3.04 PENETRATIONS

A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
   4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

E. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies.

3.05 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
   1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
   2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids,
and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.06 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
### 3.07 FINISHES

**A.** Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material.

**B.** Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

### 3.08 FIELD QUALITY CONTROL

**A.** Testing Agency: Engage a qualified testing agency to perform tests and inspections.

**B.** Perform tests and inspections.

**C.** Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Owner, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

**D.** All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.09 PIPING INSULATION SCHEDULE, GENERAL

**A.** Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

**B.** Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.10 INDOOR PIPING INSULATION SCHEDULE

**A.** Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be the following:
2. NPS 1-1/4 and Larger: Insulation shall be the following:

**B.** Domestic Hot and Recirculated Hot Water:
1. NPS 1-1/4 and Smaller: Insulation shall be the following:
2. NPS 1-1/2 and Larger: Insulation shall be the following:

C. Heating Hot Water:
1. NPS 1 and Smaller: Insulation shall be the following:
   a. Cellular Glass: 1-1/2 inches thick [1 inch thick within conditioned space (Seattle Energy Code Table C403.2.9 footnote a.).]

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
   2. Encasement for piping.

1.02 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.03 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.
B. Field quality-control reports.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
B. Potable-water piping and components shall comply with NSF 14 and NSF 61.

2.02 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22.
D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
E. Copper Unions:
   1. MSS SP-123.
   4. Solder-joint or threaded ends.
F. Copper-Tube, Extruded-Tee Connections:
   1. Description: Tee formed in copper tube according to ASTM F 2014.

2.03 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:
   1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
   2. Full-face or ring type unless otherwise indicated.
B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
C. Solder Filler Metals: ASTM B 32, lead-free alloys.
D. Flux: ASTM B 813, water flushable.
E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
2.04 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Manufacturers, provide products by one of the following:
      a. Watts; a division of Watts Water Technologies, Inc.
      b. Wilkins; a Zurn company.
      c. Matco-Norca.
      d. Or approved equal.
   3. Pressure Rating: 125 psig minimum at 180 deg F.

PART 3 EXECUTION

3.01 PIPING INSTALLATION

A. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves.

G. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.
P. Install fittings for changes in direction and branch connections.

Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

R. Install sleeves for piping penetrations of walls, ceilings, and floors.

S. Install sleeve seals for piping penetrations of concrete walls and slabs.

T. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.02 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.

H. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

I. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

J. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

K. Joint Construction for Grooved-End Steel Piping: Make joints according to AWWA C606. Square cut groove ends of pipe as specified. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

L. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

M. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.
3.03 DIELECTRIC FITTING INSTALLATION
A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.
C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.

3.04 HANGER AND SUPPORT INSTALLATION
A. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
B. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Vertical Piping: MSS Type 8 or 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
   3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   4. Base of Vertical Piping: MSS Type 52, spring hangers.
C. Support vertical piping and tubing at base and at each floor.
D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
   2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
   3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
   4. NPS 2-1/2: 108 inches with 1/2-inch rod.
F. Install supports for vertical copper tubing every 10 feet.

3.05 CONNECTIONS
A. Drawings indicate general arrangement of piping, fittings, and specialties.
B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
C. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
   1. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3.06 IDENTIFICATION
A. Identify system components. Comply with requirements for identification materials and installation in Section 23 05 53 "Painting and Identification for HVAC Piping, Ducts, and Equipment"
B. Label pressure piping with system operating pressure.

3.07 FIELD QUALITY CONTROL
A. Perform the following tests and inspections:
   1. Piping Inspections:
      a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
      b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of
authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

   c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

   d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:
   a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
   b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
   c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
   e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
   f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.08 ADJUSTING

A. Perform the following adjustments before operation:
   1. Close drain valves, hydrants, and hose bibbs.
   2. Open shutoff valves to fully open position.
   3. Open throttling valves to proper setting.
   4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
      a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
      b. Adjust calibrated balancing valves to flows indicated.
   5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
   7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
   8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.09 CLEANING

A. Clean and disinfect potable domestic water piping as follows:
   1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
   2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill and isolate system according to the following:
1) Chemically flush piping systems with HydroChem 280/281 (sodium tripolyphosphate and sodium silicate) or equivalent.
2) Dispose of chemicals to the sanitary sewer after neutralization.

3.10 PIPING SCHEDULE
A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
D. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:
   1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

E. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:
   1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.
   2. Hard copper tube, ASTM B 88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.

3.11 VALVE SCHEDULE
A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
   2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
B. Use check valves to maintain correct direction of domestic water flow to and from equipment.
C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Pipe, tube, and fittings.
   2. Specialty pipe fittings.
   3. Encasement for underground metal piping.

1.02 PERFORMANCE REQUIREMENTS
A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.03 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: Include plans, elevations, sections, and details.

1.04 INFORMATIONAL SUBMITTALS
A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
B. Field quality-control reports.

1.05 QUALITY ASSURANCE
A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 PRODUCTS

2.01 PIPING MATERIALS
A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.02 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS
A. Pipe and Fittings: ASTM A 74, Service class(es).
B. Gaskets: ASTM C 564, rubber.
C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.03 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS
A. Pipe and Fittings: ASTM A 888 or CISPI 301.
B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.
C. CISPI, Hubless-Piping Couplings:
   1. Manufacturers, provide products by one of the following:
      a. ANACO-Husky.
c. Fernco Inc.
d. Or approved equal.

3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:
1. Manufacturers, provide products by one of the following:
   a. ANACO-Husky.
   b. Clamp-All Corp.
   d. Or approved equal.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

E. Cast-Iron, Hubless-Piping Couplings:
1. Manufacturers, provide products by one of the following:
   a. MG Piping Products Company.
   b. ANACO-Husky
   c. Charlotte Pipe and Foundry Company.
   d. Or approved equal.
3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.04 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:
   a. Manufacturers, provide products by one of the following:
      2) Fernco Inc.
      3) Mission Rubber Company; a division of MCP Industries, Inc.
      4) Or approved equal.
   c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
   d. Sleeve Materials:
      2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
      3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
4. Shielded, Nonpressure Transition Couplings:
   a. Manufacturers, provide products by one of the following:
      2) Mission Rubber Company; a division of MCP Industries, Inc.
      3) Dallas Specialty & Mfg. Co
      4) Or approved equal.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

5. Pressure Transition Couplings:
   a. Manufacturers, provide products by one of the following:
      2) Dresser, Inc.
      3) EBAA Iron, Inc.
      4) Or approved equal.
   c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
   d. Center-Sleeve Material: Manufacturer's standard.
   e. Gasket Material: Natural or synthetic rubber.
   f. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:
1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:
   a. Manufacturers, provide products by one of the following:
      1) Capitol Manufacturing Company.
      2) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      3) Wilkins; a Zurn company.
      4) Or approved equal.
   b. Description:
      1) Standard: ASSE 1079.
      2) Pressure Rating: 125 psig minimum at 180 deg F.
      3) End Connections: Solder-joint copper alloy and threaded ferrous.
3. Dielectric Flanges:
   a. Manufacturers, provide products by one of the following:
      1) Capitol Manufacturing Company.
      2) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      3) Wilkins; a Zurn company.
      4) Or approved equal.
   b. Description:
      1) Standard: ASSE 1079.
      2) Factory-fabricated, bolted, companion-flange assembly.
      3) Pressure Rating: 125 psig minimum at 180 deg F.
      4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
4. Dielectric-Flange Insulating Kits:
   a. Manufacturers, provide products by one of the following:
      1) Advance Products & Systems, Inc.
      2) Central Plastics Company.
      3) Pipeline Seal and Insulator, Inc.
      4) Or approved equal.
   b. Description:
      1) Nonconducting materials for field assembly of companion flanges.
      2) Pressure Rating: 150 psig.
      3) Gasket: Neoprene or phenolic.
      4) Bolt Sleeves: Phenolic or polyethylene.
      5) Washers: Phenolic with steel backing washers.
5. Dielectric Nipples:
   a. Manufacturers, provide products by one of the following:
      1) Grinnell Mechanical Products.
2) Precision Plumbing Products, Inc.
3) Victaulic Company.
4) Or approved equal.

b. Description:
   1) Standard: IAPMO PS 66
   2) Electroplated steel nipple.
   3) Pressure Rating: 300 psig at 225 deg F.
   4) End Connections: Male threaded or grooved.
   5) Lining: Inert and noncorrosive, propylene.

PART 3 EXECUTION

3.01 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices.

K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

M. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
   1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
   2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
   3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

O. Plumbing Specialties:
   1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts.
   2. Install drains in sanitary drainage gravity-flow piping.

P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves.

R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals.

S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons.

3.02 JOINT CONSTRUCTION

3.03 SPECIALTY PIPE FITTING INSTALLATION
A. Transition Couplings:
   1. Install transition couplings at joints of piping with small differences in OD's.
   2. In Drainage Piping: Shielded, nonpressure transition couplings.
   4. In Underground Force Main Piping:
      a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
      b. NPS 2 and Larger: Pressure transition couplings.

B. Dielectric Fittings:
   1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
   2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples.
   3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.
   4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.04 VALVE INSTALLATION
A. Shutoff Valves:
   1. Install shutoff valve on each sewage pump discharge.
   2. Install gate or full-port ball valve for piping NPS 2 and smaller.
   3. Install gate valve for piping NPS 2-1/2 and larger.

B. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.05 HANGER AND SUPPORT INSTALLATION
A. Comply with requirements for pipe hanger and support devices.
   1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.

3. Vertical Piping: MSS Type 8 or Type 42, clamps.

4. Install individual, straight, horizontal piping runs:
   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

6. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
   2. NPS 3: 60 inches with 1/2-inch rod.
   3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
   4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
   5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
   6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/4: 84 inches with 3/8-inch rod.
   2. NPS 1-1/2: 108 inches with 3/8-inch rod.
   3. NPS 2: 10 feet with 3/8-inch rod.
   4. NPS 2-1/2: 11 feet with 1/2-inch rod.
   5. NPS 3: 12 feet with 1/2-inch rod.
   6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
   7. NPS 6 and NPS 8: 12 feet with 3/4-inch rod.
   8. NPS 10 and NPS 12: 12 feet with 7/8-inch rod.

H. Install supports for vertical steel piping every 15 feet.

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:
   1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
   2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
   3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
   4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
   5. Comply with requirements for cleanouts.
6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Connect force-main piping to the following:
   1. Sanitary Sewer: To exterior force main.
   2. Sewage Pump: To sewage pump discharge.

E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

F. Make connections according to the following unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.07 IDENTIFICATION
A. Identify exposed sanitary waste and vent piping.

3.08 FIELD QUALITY CONTROL
A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
   4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
   5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
   6. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

4. Prepare reports for tests and required corrective action.

3.09 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Hubless, cast-iron soil pipe and fittings and sovent stack fittings; hubless-piping couplings; and coupled joints.

C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Hubless, cast-iron soil pipe and fittings and sovent stack fittings; hubless-piping couplings; and coupled joints.

D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

E. Aboveground, vent piping NPS 5 and larger shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

END OF SECTION
PART I  GENERAL

1.1  WORK INCLUDED

   A. Pipe hangers and supports
   B. Equipment bases and SUPPORTS.
   C. Seismic protection of piping and equipment.

1.2  REQUIRED SUBMITTAL DATA

   A. Equipment bases and supports.

1.3  CODES AND STANDARDS

   B. The International Building Code for seismic protection of equipment.

1.4  RELATED WORK

   A. All portions of specification Division 1 apply to this work.
   B. All portions of specification Section 23 05 00 apply to this work.
   C. Additional sections of the mechanical specifications may be required to provide a fully functional system. Refer to the specifications index.

PART II  PRODUCT

2.1  ACCEPTABLE MANUFACTURERS

   A. Guides and Anchors:
      1. Adsco, Advance Thermal Systems, ITT-Grinnell, Keflex, Elcen, Aeroquip-Barco, or approved equal.

   B. Pipe hangers and supports:
      1. Anvil, Erico, Grabler, Fee & Mason, Unistrut, Superstrut, or equal.

2.2  STRUCTURAL ATTACHMENTS

   A. Steel Structural Clamps:
1. Beam clamps, brackets, channel clamps, and bar joist clips select to suit structural system and meet loading recommendations of manufacturer.

2. Seismic retaining clips, Anvil Fig. 89X.

B. Attachment into existing concrete or masonry wall: Self-drill type Red Head, Phillips Anchors or equal. Do not use powder driven inserts.

2.3 INTERMEDIATE ATTACHMENTS

A. Hanger Rods:

1. Continuous threaded steel rod; do not use chain, wire, or perforated strap.

2. Maximum hanger rod loading as follows:

<table>
<thead>
<tr>
<th>Rod Size, Diameter in Inches</th>
<th>Maximum Load, Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>⅜</td>
<td>610</td>
</tr>
<tr>
<td>⅜</td>
<td>1130</td>
</tr>
<tr>
<td>⅝</td>
<td>1810</td>
</tr>
<tr>
<td>¾</td>
<td>2710</td>
</tr>
<tr>
<td>⅞</td>
<td>3770</td>
</tr>
<tr>
<td>1</td>
<td>4960</td>
</tr>
</tbody>
</table>

A. Trapeze Pipe Racks: Fabricate from structural angles or channels or Unistrut channels to suit weight of piping to be supported. Size for a minimum safety factor of 5.

B. Hanger Straps: Galvanized bar steel; ¾-inch wide by 18 gauge for 2½-inch and smaller pipe; ⅞-inch wide by 16 gauge for 3-inch to 4-inch pipe; 1¼-inch wide by 12 gauge for 6-inch pipe size.

2.19 PIPE ATTACHMENTS

A. Pipe RINGS:

1. Steel pipe and cast iron soil pipe: 2-inch and smaller, adjustable ring Anvil #69. 2½-inch and larger, adjustable clevis Anvil #260.
2. Copper Pipe: 2-inch and smaller, adjustable ring Anvil #CT-69. 2½-inch and larger, adjustable clevis Anvil #CT-65.

3. Finish: Copper plated where ring comes in contact with copper pipe; galvanized for contact with galvanized steel pipe; black for all other applications.

4. Application: Use only on piping systems where axial movement from thermal expansion is less than ½-inch.

5. For Hanger Straps: Elcen Figure 94 or Anvil Figure 97 with flattened-end bolt through cast iron socket; or hinged type, Modern Hanger Corporation No. 20, Elcen Figure 104, or Anvil Figure 108. Pipe rings shall be electro-galvanized, prime painted or cadmium-plated.

B. Pipe CLAMPS:


2. Horizontal racked piping: Unistrut P-1109 series or Unistrut P-2024C series clamps for Unistrut channel pipe racks.

3. Application: Use on piping systems without any thermal expansion.

C. Pipe GUIDES:

1. Select guides to accommodate insulation thickness specified, with a minimum of ⅛-inch clearance between the outside of the insulation and the inside of the guiding cylinder.

2. Pipe guides for steel pipe unless indicated otherwise on the drawings.

3. Pipe guides for copper pipe with copper shields and with 6-inch guide traverse, unless indicated otherwise on the drawings.

4. Insulating thermal barrier at pipe guides used on chilled water piping, Insulate screw heads to avoid condensation.

D. Vertical Pipe SUPPORTS:

1. Steel and iron pipe: Anvil #261 galvanized.

2. Plastic pipe: Anvil #261C.
PART III  EXECUTION

3.1  HANGER SPACING FOR PIPING

A.  Horizontal Steel Pipe: Maximum hanger spacing and minimum hanger rod diameters as follows:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Span</th>
<th>Rod Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ and ¾-inch</td>
<td>5-foot</td>
<td>⅜-inch</td>
</tr>
<tr>
<td>1 and 1¼-inch</td>
<td>7-foot</td>
<td>⅜-inch</td>
</tr>
<tr>
<td>1½-inch</td>
<td>9-foot</td>
<td>⅜-inch</td>
</tr>
<tr>
<td>2-inch</td>
<td>10-foot</td>
<td>¼-inch</td>
</tr>
<tr>
<td>2½ and 3-inch</td>
<td>12-foot</td>
<td>½-inch</td>
</tr>
<tr>
<td>4-inch</td>
<td>14-foot</td>
<td>¾-inch</td>
</tr>
<tr>
<td>6-inch</td>
<td>17-foot</td>
<td>¾-inch</td>
</tr>
<tr>
<td>8-inch</td>
<td>19-foot</td>
<td>¾-inch</td>
</tr>
<tr>
<td>10-inch</td>
<td>22-foot</td>
<td>⅞-inch</td>
</tr>
</tbody>
</table>

B.  Horizontal Copper Pipe: Maximum hanger spacing and minimum hanger rod diameters as follows:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Span</th>
<th>Rod Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>½-inch</td>
<td>5-foot</td>
<td>⅜-inch</td>
</tr>
<tr>
<td>1-inch</td>
<td>6-foot</td>
<td>⅜-inch</td>
</tr>
<tr>
<td>1¼ and 1½-inch</td>
<td>6-foot</td>
<td>¼-inch</td>
</tr>
<tr>
<td>2 and 2½-inch</td>
<td>9-foot</td>
<td>½-inch</td>
</tr>
<tr>
<td>3 and 4-inch</td>
<td>10-foot</td>
<td>½-inch</td>
</tr>
<tr>
<td>6-inch</td>
<td>14-foot</td>
<td>¾-inch</td>
</tr>
<tr>
<td>8-inch</td>
<td>16-foot</td>
<td>¾-inch</td>
</tr>
</tbody>
</table>

C.  Provide continuous support for plastic TUBING.
D.  Provide additional hangers or supports at concentrated loads such as valves, to maintain alignment and prevent sagging.
E. Vertical Piping SUPPORTS:
   1. Support piping at each floor.
   2. Provide intermediate supports to prevent excessive pipe movement.

F. Provide a minimum of 2 hangers per pipe section for grooved joint pipe.

3.2 INSTALLATION OF PIPE HANGERS AND SUPPORTS

A. Provide piping supports and hangers with a means of adjustment for leveling, grading of piping and cold spring movements.
B. Provide sufficient hanger rod lengths to limit rod displacement from thermal expansion to 4 degrees from vertical.
C. Size pipe rings and clamps to pass around the outside of the piping insulation. Provide Anvil Fig. 160 pipe covering protection saddles at pipe rings where pipe insulation does not include a vapor barrier. Provide Anvil Fig. 167 insulation protection shields at pipe rings where pipe insulation includes a vapor barrier. Provide rigid inserts as required to prevent crushing of
D. Install vertical piping supports to allow for pipe movement due to thermal expansion and contraction.
E. Do not support any pipe from any other pipe.
F. Provide bored, drilled, or reamed holes for all bolting to miscellaneous structural metals, frames or for mounts or supports. Flame cut, punched or hand sawn holes will not be accepted.
G. Install anchor bolts for all mechanical equipment and piping as required. Tightly fit and clamp base-supported equipment anchor bolts at all equipment support points. Provide locknuts where equipment is hung.

3.3 SEISMIC PROTECTION OF PIPING

A. Seismic Restraints:
   1. Provide seismic protection for all piping in accordance with the most current edition of the SMACNA publication “Seismic Restraint Manual - Guidelines for Mechanical Systems,” HMC HAZARD LEVEL.

3.4 SEISMIC PROTECTION OF EQUIPMENT

A. Provide seismic protection for all equipment in accordance with seismic and wind restraint design as detailed in ASHRAE Handbook, HVAC Applications,
PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Spring hangers.
   2. Spring hangers with vertical-limit stops.
   3. Pipe riser resilient supports.
   4. Resilient pipe guides.
   5. Seismic snubbers.
   6. Restraining braces and cables.

1.02 DEFINITIONS

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.03 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES.
      b. Annotate to indicate application of each product submitted and compliance with requirements.
   3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Delegated-Design Submittal: Typical support and bracing of “non-structural” architectural, mechanical and electrical items has been shown on the contract drawings. Further, the “minimum” equipment anchorage of mechanical and electrical equipment has been indicated. The contractor shall review these details and develop shop drawings all respective support and bracing details. If the contractor desires to use alternate support or bracing details than are shown on the contract drawings or if a unique support or a unique detail is needed, the contractor shall submit his proposed details to the owner for review and submit calculations of these proposed connections for the owner to review. For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators, seismic restraints, and for designing vibration isolation bases.
      a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
   2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
   3. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
   4. Seismic-Restraint Details:
Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.

Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.04 INFORMATIONAL SUBMITTALS
A. Coordination Drawings (Shop Drawings): Show coordination of seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.
B. Qualification Data: For professional engineer.
C. Welding certificates.
D. Air-Mounting System Performance Certification: Include natural frequency, load, and damping test data performed by an independent agency.
E. Field quality-control test reports.

1.05 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For air-mounting systems to include in operation and maintenance manuals.

1.06 QUALITY ASSURANCE
A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
D. When unique or alternate details are required, seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 PRODUCTS
2.01 VIBRATION ISOLATORS
A. Available Manufacturers, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
B. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
   1. Ace Mountings Co., Inc.
   2. Amber/Booth Company, Inc.
   3. Mason Industries.
   4. Or approved equal.

C. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
   1. Resilient Material: Oil- and water-resistant neoprene.

D. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.
   1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
   2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

E. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
   1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
   2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
   7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

F. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.
   1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
   2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
   7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
   8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.02 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.
B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
   1. Powder coating on springs and housings.
   2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
   3. Baked enamel or powder coat for metal components on isolators for interior use.
   4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.03 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment Restraints:
   1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
   2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
   3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES providing required submittals for component.

B. Piping Restraints: - see typical details for additional information.
   1. Comply with requirements in MSS SP-127 and see typical details.
   2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
   3. Brace a change of direction longer than 12 feet.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES providing required submittals for component.

E. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

F. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
HMC 8EH Burn Upgrades
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Ankrom Moisan Architects, Inc.
March 16, 2020

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G. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

H. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the owner if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION
A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

3.05 FIELD QUALITY CONTROL
A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:
1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Owner, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Owner's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Owner.
5. Test to 90 percent of rated proof load of device.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
10. Air-Mounting System Operational Test: Test the compressed-air leveling system.
11. Test and adjust air-mounting system controls and safeties.
12. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.
E. Prepare test and inspection reports.
3.06 ADJUSTING
   A. Adjust isolators after piping system is at operating weight.
   B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
   C. Adjust air-spring leveling mechanism.
   D. Adjust active height of spring isolators.
   E. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.07 DEMONSTRATION
   A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-mounting systems.

3.08 HVAC VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE SCHEDULE
   A. Supported or Suspended Equipment: Vav Units.
      1. Equipment Location: See plans.
      2. Pads:
         b. Thickness: ¼"
         c. Number of Pads: 1 thick.
      3. Component Importance Factor: 1.0.
      5. Component Amplification Factor: 1.0.

END OF SECTION
PART I  GENERAL

1.1 WORK INCLUDED

A. Mechanical systems painting.
B. Mechanical systems identification and flow arrows.
C. Repainting of factory finished equipment.
D. Valve tags.

1.2 REQUIRED SUBMITTAL DATA

A. None.

1.3 RELATED WORK

A. All portions of specification Division 1 apply to this work.
B. All portions of specification Section 23 05 00 apply to this work.
C. Additional sections of the mechanical specifications may be required to provide a fully functional system. Refer to the specifications index.

1.4 DEFINITIONS

A. “Concealed” work is defined as work installed within pipe shafts, duct spaces, above furred or hung ceilings, or otherwise built into the building and not exposed to view.
B. “Exposed” work is defined as work in walkway tunnels, Mechanical and Fan Rooms, exterior to building (including rooftops), all occupied areas and all other areas not defined as “concealed.”

1.5 MANUFACTURERS

A. General: Acceptable manufacturers are Quigley, Cowman and Campbell, Fuller, General Paint, Sherwin-Williams, Glidden Manufacture, or approved equal.

PART II  PRODUCTS

2.1 PAINT

B. Primer for Steel Surfaces: Zinc-chromate primer, Cowman & Campbell No. 1134 or approved equal.
C. Primer for zinc-coated surfaces: Metallic zinc-zinc oxide primer, W.P. Fuller No. 7747, Glidden “Rustmaster” or Dupont “Dulux.”
D. Primer for Asphalt-Coated Surfaces: Bishop-Conklin Caladium.
E. Primer-Sealer for Insulated Surfaces: Resin-type primer sealer.
F. Heat Resistant Paint: Quigley AAA high temperature paint.

2.2 PIPING IDENTIFICATION BANDS AND FLOW ARROWS
A. Snap-around markers with UV resistant inks and vinyl. Marker construction, size, color, letter type, and wording shall be in conformance with ANSI standard “Scheme for the Identification of Piping Systems.” Provide custom markers for unique service and where pressure, temperature or other conditions of the service vary in the project. Manufacturer shall be Seton, Zeston, or approved equal.

2.3 PIPING IDENTIFICATION BANDS AND FLOW ARROWS
A. Seton contact type adhesive backed, Zeston or approved equal. 1⅛-inch wide for lines up through 3-inch, 2-inch wide for larger pipes. Size and color in accordance with the most current Boeing Facilities Standard Document #D180-14 302-3, Volume I, Section A-2.

2.4 VALVE TAGS
A. Seton 1½-inch round brass with stamped characters with brass “S” hooks.

PART III EXECUTION

3.1 PAINTING
A. Paint ALL Exposed mechanical equipment including uninsulated ducting.
B. Metal Surfaces:
   1. In General: 3 mils minimum dry film thickness; apply one priming coat and one finish coat of acrylic base paint and additional coats as required to obtain minimum dry film thickness.
   2. High Temperature Surfaces (Steam and Hot Water Heating Equipment): 3 mils minimum thickness; apply one prime coat and one finish coat of heat-resistant paint and additional coats as required to obtain minimum dry film thickness.
   3. Outside Building: 4 mils minimum thickness; apply prime coat and two finish coats of acrylic base paint and additional coats as required to obtain minimum dry film thickness.
C. Insulation Surfaces: 3 mils minimum dry film thickness; apply one coat of primer-sealer, and one coat of acrylic base paint and additional coats as required to obtain minimum dry film thickness.
D. Grilles, Convectors and Finned Radiation Covers: 3 mils minimum thickness; apply spray paint; one primer coat and two coats of industrial enamel.

3.2 IDENTIFICATION AND FLOW ARROWS

A. Identify and provide flow direction arrows on all piping and equipment.
B. Apply piping identification bands and flow arrows on 10-foot centers in general, 20-foot centers in open areas where pipe is exposed, and wherever a pipe leaves or enters any wall, floor, ceiling or foundation. Place the proper band on pipe at each valve, branch connection, manifold, entrance, and exit from a tank, vessel, or piece of equipment. Apply after paint work is completed.
C. Label each piece of mechanical equipment and system with equipment or system name lettered thereon with 2-inch high block style black paint letters.
D. Provide tag on *each valve*, each remote valve and on each valve that is out of sight of its use*. Tag shall be provided with an identifying number. Post a plastic-laminated Valve Index where directed by Engineer. Index shall identify location, service, and identification number of each tagged valve.

END OF SECTION
PART 1 GENERAL

1.01 RELATED DOCUMENTS

1.02 SUMMARY

A. Section Includes:
1. Balancing Air Systems:
   a. Air systems.

1.03 DEFINITIONS

C. TAB: Testing, adjusting, and balancing.
D. TABB: Testing, Adjusting, and Balancing Bureau.
E. TAB Specialist: An entity engaged to perform TAB Work.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 15 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
D. Certified TAB reports.
E. Sample report forms.
F. Instrument calibration reports, to include the following:
   1. Instrument type and make.
   2. Serial number.
   3. Application.
   4. Dates of use.
   5. Dates of calibration.

1.05 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by NEBB.
   1. TAB Field Supervisor: Employee of the TAB contractor and certified by NEBB.
   2. TAB Technician: Employee of the TAB contractor and who is certified by NEBB as a TAB technician.
B. TAB Conference: Meet with Commissioning Authority on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.
   1. Agenda Items:
      b. The TAB plan.
      c. Coordination and cooperation of trades and subcontractors.
      d. Coordination of documentation and communication flow.
C. Certify TAB field data reports and perform the following:
1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor’s forms approved by Commissioning Authority.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

F. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

H. Provide Digital and Hard copies.

1.06 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner’s operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner’s operations.

1.07 COORDINATION

A. Notice: Provide seven days’ advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems’ designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems’ output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.
1. Relate performance data to Project conditions and requirements, including system
effects that can create undesired or unpredicted conditions that cause reduced
capacities in all or part of a system.

2. Calculate system-effect factors to reduce performance ratings of HVAC equipment
when installed under conditions different from the conditions used to rate equipment
performance. To calculate system effects for air systems, use tables and charts found
in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design."
Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing,
cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned
and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are
accessible and their controls are connected and functioning.

K. Examine system pumps to ensure absence of entrained air in the suction piping.

L. Examine operating safety interlocks and controls on HVAC equipment.

M. Report deficiencies discovered before and during performance of TAB procedures. Observe
and record system reactions to changes in conditions. Record default set points if different
from indicated values.

3.02 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:
   1. Permanent electrical-power wiring is complete.
   2. Hydronic systems are filled, clean, and free of air.
   3. Automatic temperature-control systems are operational.
   4. Equipment and duct access doors are securely closed.
   5. Balance, smoke, and fire dampers are open.
   6. Isolating and balancing valves are open and control valves are operational.
   7. Ceilings are installed in critical areas where air-pattern adjustments are required and
      access to balancing devices is provided.
   8. Windows and doors can be closed so indicated conditions for system operations can
      be met.

3.03 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures
contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of
Environmental Systems" and in this Section.
   1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the
minimum extent necessary for TAB procedures.
   1. After testing and balancing, patch probe holes in ducts with same material and
      thickness as used to construct ducts.
   2. Install and join new insulation that matches removed materials. Restore insulation,
      coverings, vapor barrier, and finish.

C. Mark equipment and balancing devices, including damper-control positions, valve position
indicators, fan-speed-control levers, and similar controls and devices, with paint or other
suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.
3.04 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed.

3.05 PROCEDURES FOR AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.
   a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:
   a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
   b. Measure static pressure directly at the fan outlet or through the flexible connection.
   c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
   d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
   a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.

5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.

6. Obtain approval from Commissioning Authority for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
   1. Measure airflow of submain and branch ducts.
      a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
   2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
   3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.
   1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
   1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
   2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.06 TOLERANCES
   A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
      1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
      2. Air Outlets and Inlets: Plus or minus 10 percent.

3.07 REPORTING
   A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
   B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.08 FINAL REPORT
   A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
      1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
      2. Include a list of instruments used for procedures, along with proof of calibration.
   B. Final Report Contents: In addition to certified field-report data, include the following:
      1. Fan curves.
      2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:
   1. Title page.
   2. Name and address of the TAB contractor.
   3. Project name.
   4. Project location.
   5. Architect's name and address.
   6. Engineer's name and address.
   7. Contractor's name and address.
   9. Signature of TAB supervisor who certifies the report.
  10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.

  11. Summary of contents including the following:
      a. Indicated versus final performance.
      b. Notable characteristics of systems.
      c. Description of system operation sequence if it varies from the Contract Documents.
  12. Nomenclature sheets for each item of equipment.
  13. Data for terminal units, including manufacturer's name, type, size, and fittings.
  14. Notes to explain why certain final data in the body of reports vary from indicated values.
  15. Test conditions for fans and pump performance forms including the following:
      a. Settings for outdoor-, return-, and exhaust-air dampers.
      b. Conditions of filters.
      c. Cooling coil, wet- and dry-bulb conditions.
      d. Face and bypass damper settings at coils.
      e. Fan drive settings including settings and percentage of maximum pitch diameter.
      f. Inlet vane settings for variable-air-volume systems.
      g. Settings for supply-air, static-pressure controller.
      h. Other system operating conditions that affect performance.

D. Fan Test Reports: For supply, return, and exhaust fans, include the following:
  1. Fan Data:
     a. System identification.
     b. Location.
     c. Make and type.
     d. Model number and size.
     e. Manufacturer's serial number.
     f. Arrangement and class.
     g. Sheave make, size in inches, and bore.
     h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
  2. Motor Data:
     a. Motor make, and frame type and size.
     b. Horsepower and rpm.
     c. Volts, phase, and hertz.
     d. Full-load amperage and service factor.
     e. Sheave make, size in inches, and bore.
     f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
     g. Number, make, and size of belts.
  3. Test Data (Indicated and Actual Values):
     a. Total airflow rate in cfm.
     b. Total system static pressure in inches wg.
     c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

E. Instrument Calibration Reports:
   1. Report Data:
      a. Instrument type and make.
      b. Serial number.
      c. Application.
      d. Dates of use.
      e. Dates of calibration.

3.09 INSPECTIONS

A. Initial Inspection:
   1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
   2. Check the following for each system:
      a. Measure airflow of at least 10 percent of air outlets.
      b. Measure water flow of at least 5 percent of terminals.
      c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
      d. Verify that balancing devices are marked with final balance position.
      e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:
   1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Commissioning Authority.
   2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Commissioning Authority.
   3. Commissioning Authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
   4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
   5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:
   1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
   2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.10 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY
A. Section includes insulating the following duct services:
   1. Indoor, exposed supply and outdoor air.

1.02 ACTION SUBMITTALS
A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
   3. Detail application of field-applied jackets.
   4. Detail application at linkages of control devices.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:
   1. Sheet Form Insulation Materials: 12 inches square.
   2. Sheet Jacket Materials: 12 inches square.
   3. Manufacturer’s Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.03 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.04 QUALITY ASSURANCE
A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.06 COORDINATION
A. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

B. Coordinate installation and testing of heat tracing.
1.07 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS


B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type II with factory-applied vinyl jacket Type III with factory-applied FSK jacket Type III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: provide the following provide one of the following:
   a. CertainTeed Corp.; SoftTouch Duct Wrap.
   b. Johns Manville; Microlite.
   c. Knauf Insulation; Friendly Feel Duct Wrap.
   d. Or approved equal.

2.02 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: provide one of the following:
   a. Aeroflex USA, Inc.
   b. Armacell LLC.
   c. Foster Brand, H.B. Fuller Construction Products
   d. Or approved equal.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.03 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Products: provide one of the following:
   a. Childers Brand; H. B. Fuller Construction Products.
   b. Foster Brand; H. B. Fuller Construction Products.
c. Knauf Insulation.
d. Or approved equal.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

2.04 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Products: provide one of the following:
      a. ABI, Ideal Tape Division; 428 AWF ASJ.
      b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
      c. Compac Corporation; 104 and 105.
      d. Or approved equal.
   2. Width: 3 inches.
   3. Thickness: 11.5 mils.
   5. Elongation: 2 percent.
   6. Tensile Strength: 40 lbf/inch in width.
   7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
   1. Products: provide one of the following:
      a. ABI, Ideal Tape Division; 488 AWF.
      b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
      c. Compac Corporation; 120.
      d. Or approved equal.
   2. Width: 2 inches.
   3. Thickness: 3.7 mils.
   5. Elongation: 5 percent.
   6. Tensile Strength: 34 lbf/inch in width.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.04 PENETRATIONS

A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
   4. Seal jacket to wall flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:
   1. Inspect ductwork, randomly selected by Owner, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.06 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:
   1. Indoor, exposed supply and outdoor air.
   2. Indoor, exposed return located in unconditioned space.

B. Items Not Insulated:
   1. Factory-insulated plenums and casings.

3.07 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. VAV box discharge ductwork shall be lined the following:

END OF SECTION
**SECTION 23 09 23**

**DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC**

**PART 1  GENERAL**

**1.01  SECTION INCLUDES**

A. System description.
B. Operator interface.
C. Controllers.
D. Power supplies and line filtering.
E. System software.
F. Controller software.
G. HVAC control programs.

**1.02  REFERENCE STANDARDS**

B. MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests; 2014g.
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03  SUBMITTALS**

A. See Section 01 33 00 - Submittal Procedures.
B. Product Data: Provide data for each system component and software module.
C. Shop Drawings:
   1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
   2. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
   3. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
   4. Indicate description and sequence of operation of operating, user, and application software.
D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

**1.04  QUALITY ASSURANCE**

A. Perform work in accordance with NFPA 70.
B. Designer Qualifications: Perform design of system using manufacturer's software 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.

**1.05  WARRANTY**

A. See Section 01 77 00 - Closeout Procedures and Section 01 78 36 – Warranties for additional warranty requirements
B. Correct defective Work within a five year period after Substantial Completion.

C. Provide five year manufacturer's warranty for field programmable micro-processor based units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Johnson Controls, Inc: www.johnsoncontrols.com/#sle.

2.02 SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.

B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.

D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units.

E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

2.03 CONTROLLERS

A. BUILDING CONTROLLERS

1. General:
   a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
   b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
   c. Share data between networked controllers.
   d. 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.
   e. Utilize real-time clock for scheduling.
   f. Continuously check processor status and memory circuits for abnormal operation.
   g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
   h. Communication with other network devices to be based on assigned protocol.

2. Communication:
   a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
   b. Perform routing when connected to a network of custom application and application specific controllers.
   c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
1) Mount within waterproof enclosures.
2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).

b. Conditioned Space:
1) Mount within dustproof enclosures.
2) Rated for operation at 32 to 120 degrees F (0 to 50 degrees C).

4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.

6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet (1 m).

B. APPLICATION SPECIFIC CONTROLLERS
1. General:
   a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
   b. Customized for operation within the confines of equipment served.
   c. Communication with other network devices to be based on assigned protocol.

2. Communication:
   a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
   b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
      2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
      2) Rated for operation at 32 to 120 degrees F (0 to 50 degrees C).

4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.

6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet (1 m).

C. INPUT/OUTPUT INTERFACE
1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.

2. All Input/Output Points:
   a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
   b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
3. Binary Inputs:
   a. Allow monitoring of On/Off signals from remote devices.
   b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
   c. Sense dry contact closure with power provided only by the controller.

4. Pulse Accumulation Input Objects: Conform to all requirements of binary input objects and accept up to 10 pulses per second.

5. Analog Inputs:
   a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
   b. Compatible with and field configurable to commonly available sensing devices.

6. Binary Outputs:
   a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
   b. Outputs provided with three position (On/Off/Auto) override switches.
   c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.

7. Analog Outputs:
   a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
   b. 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.
   c. Drift to not exceed 0.4 percent of range per year.

8. Tri State Outputs:
   a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
   b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
   c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

9. System Object Capacity:
   a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
   b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.04 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies:
   1. 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.
   2. Limit connected loads to 80 percent of rated capacity.
   3. Match DC power supply to current output and voltage requirements.
   4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
   5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
   6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
   7. Operational Ambient Conditions: 32 to 120 degrees F (0 to 50 degrees C).
   8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD 810 for shock and vibration.
   9. Line voltage units UL recognized and CSA approved.
B. Power Line Filtering:
   1. Provide external or internal transient voltage and surge suppression component for all
      workstations and controllers.
   2. Minimum surge protection attributes:
      a. Dielectric strength of 1000 volts minimum.
      b. Response time of 10 nanoseconds or less.
      c. Transverse mode noise attenuation of 65 dB or greater.
      d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

2.05 LOCAL AREA NETWORK (LAN)
A. Provide communication between control units over local area network (LAN).
B. LAN Capacity: Not less than 60 stations or nodes.
C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.
D. LAN Data Speed: Minimum 19.2 Kb.
E. Communication Techniques: Allow interface into network by multiple operation stations and
   by auto-answer/auto-dial modems. Support communication over telephone lines utilizing
   modems.
F. Transmission Median: Fiber optic or single pair of solid 24 gage twisted, shielded copper
   cable.
G. 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.

2.06 SYSTEM SOFTWARE
A. Operating System:
   1. Concurrent, multi-tasking capability.
      b. Acceptable Operating Systems:
   2. System Graphics:
      a. Allow up to 10 graphic screens, simultaneously displayed for comparison and
         monitoring of system status.
      b. Animation displayed by shifting image files based on object status.
      c. Provide method for operator with password to perform the following:
         1) Move between, change size, and change location of graphic displays.
         2) Modify on-line.
         3) Add, delete, or change dynamic objects consisting of:
            a) Analog and binary values.
            b) Dynamic text.
            c) Static text.
            d) Animation files.
   3. Custom Graphics Generation Package:
      a. Create, modify, and save graphic files and visio format graphics in PCX
         formats.
      b. HTML graphics to support web browser compatible formats.
      c. Capture or convert graphics from AutoCAD.
   4. Standard HVAC Graphics Library:
      a. HVAC Equipment:
         1) Chillers.
         2) Air Handlers.
         3) Terminal HVAC Units.
b. Ancillary Equipment:

B. Workstation System Applications:

1. Automatic System Database Save and Restore Functions:
   a. Current database copy of each Building Controller is automatically stored on hard disk.
   b. Automatic update occurs upon change in any system panel.
   c. 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.

2. Manual System Database Save and Restore Functions by Operator with Password Clearance:
   a. Save database from any system panel.
   b. Clear a panel database.
   c. Initiate a download of a specified database to any system panel.

3. Software provided allows system configuration and future changes or additions by operators under proper password protection.

4. On-line Help:
   a. Context-sensitive system assists operator in operation and editing.
   b. Available for all applications.
   c. Relevant screen data provided for particular screen display.
   d. Additional help available via hypertext.

5. Security:
   a. Operator log-on requires user name and password to view, edit, add, or delete data.
   b. System security selectable for each operator.
   c. System supervisor sets passwords and security levels for all other operators.
   d. Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
   e. Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable, time period.
   f. All system security data stored in encrypted format.

6. System Diagnostics:
   a. Operations Automatically Monitored:
      1) Workstations.
      2) Printers.
      3) Modems.
      4) Network connections.
      5) Building management panels.
      6) Controllers.
   b. Device failure is annunciated to the operator.

7. Alarm Processing:
   a. All system objects are configurable to "alarm in" and "alarm out" of normal state.
   b. Configurable Objects:
      1) Alarm limits.
      2) Alarm limit differentials.
      3) States.
      4) Reactions for each object.

8. Alarm Messages:
   b. Recognizable Features:
      1) Source.
      2) Location.
      3) Nature.

9. Configurable Alarm Reactions by Workstation and Time of Day:
a. Logging.
b. Printing.
c. Starting programs.
d. Displaying messages.
e. Dialing out to remote locations.
f. Paging.
g. Providing audible annunciation.
h. Displaying specific system graphics.

10. Custom Trend Logs:
   a. Definable for any data object in the system including interval, start time, and stop time.
   b. Trend Data:
      1) Sampled and stored on the building controller panel.
      2) Archivable on hard disk.
      3) Retrievable for use in reports, spreadsheets and standard database programs.
      4) Archival on LAN accessible storage media including hard disk, tape, Raid array drive, and virtual cloud environment.
      5) Protected and encrypted format to prevent manipulation, or editing of historical data and event logs.

11. Alarm and Event Log:
    a. View all system alarms and change of states from any system location.
    b. Events listed chronologically.
    c. Operator with proper security acknowledges and clears alarms.
    d. Alarms not cleared by operator are archived to the workstation hard disk.

12. Object, Property Status and Control:
    a. Provide a method to view, edit if applicable, the status of any object and property in the system.
    b. Status Available by the Following Methods:
       1) Menu.
       2) Graphics.
       3) Custom Programs.

13. Reports and Logs:
    a. Reporting Package:
       1) Allows operator to select, modify, or create reports.
       2) Definable as to data content, format, interval, and date.
       3) Archivable to hard disk.
    b. Real-time logs available by type or status such as alarm, lockout, normal, etc.
    c. Stored on hard disk and readily accessible by standard software applications, including spreadsheets and word processing.
    d. Set to be printed on operator command or specific time(s).

14. Reports:
    a. Standard:
       1) Objects with current values.
       2) Current alarms not locked out.
       3) Disabled and overridden objects, points and SNVTs.
       4) Objects in manual or automatic alarm lockout.
       5) Objects in alarm lockout currently in alarm.
       6) Logs:
          a) Alarm History.
          b) System messages.
          c) System events.
          d) Trends.
    b. Custom:
       1) Daily.
       2) Weekly.
3) Monthly.
4) Annual.
5) Time and date stamped.
6) Title.
7) Facility name.

c. Tenant Override:
1) Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
2) Annual report showing override usage on a monthly basis.

d. Electrical, Fuel, and Weather:
1) Electrical Meter(s):
   a) Monthly showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.
   b) Annual summary showing monthly electrical consumption and peak demand with time and date stamp for each meter.
2) Fuel Meter(s):
   a) Monthly showing daily natural gas consumption for each meter.
   b) Annual summary showing monthly consumption for each meter.
3) Weather:
   a) Monthly showing minimum, maximum, average outdoor air temperature and heating/cooling degree-days for the month.

2.07 CONTROLLER SOFTWARE

A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

B. System Security:
1. User access secured via user passwords and user names.
2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
3. User Log On/Log Off attempts are recorded.
4. Automatic Log Off occurs following the last keystroke after a user defined delay time.

C. Object or Object Group Scheduling:
1. Weekly Schedules Based on Separate, Daily Schedules:
   a. Include start, stop, optimal stop, and night economizer.
   b. 10 events maximum per schedule.
   c. Start/stop times adjustable for each group object.

D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.

E. Alarms:
1. Binary object is set to alarm based on the operator specified state.
2. Analog object to have high/low alarm limits.
3. All alarming is capable of being automatically and manually disabled.
4. Alarm Reporting:
   a. Operator determines action to be taken for alarm event.
   b. Alarms to be routed to appropriate workstation.
   c. Reporting Options:

F. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.

G. Sequencing: Application software based upon specified sequences of operation in Section 23 09 93.
H. PID Control Characteristics:
   1. Direct or reverse action.
   2. Anti-windup.
   3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.

I. Staggered Start Application:
   1. Prevents all controlled equipment from simultaneously restarting after power outage.
   2. Order of equipment startup is user selectable.

J. Energy Calculations:
   1. Accumulated instantaneous power or flow rates are converted to energy use data.
   2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
   3. 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.

K. Anti-Short Cycling:
   1. All binary output objects protected from short-cycling.
   2. Allows minimum on-time and off-time to be selected.

L. On-Off Control with Differential:
   1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
   2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.

M. Run-Time Totalization:
   1. Totalize run-times for all binary input objects.
   2. Provides operator with capability to assign high run-time alarm.

2.08 HVAC CONTROL PROGRAMS

A. General:

B. Optimal Run Time:
   1. Based on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
   2. Use outside air temperature to determine early shut down with ventilation override.
   3. Control Summary:
      a. HVAC Control system begin/end status.
      b. Optimal run time lock/unlock control status.
      c. Heating/cooling mode status.
      d. Optimal run time schedule.
      e. Start/Stop times.
      f. Selected mass temperature point ID.
      g. Optimal run time system normal start times.
      h. Occupancy and vacancy times.
   4. HVAC point summary:
      a. Control system identifier and status.
      b. Point ID and status.
      c. Outside air temperature point ID and status.

PART 3 EXECUTION

3.01 INSTALLERS

A. Installer List:
   1. JOHNSON CONTROLS.
3.02 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation.

C. Provide conduit and electrical wiring. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.03 MAINTENANCE

A. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.

B. Provide two complete inspections, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.

C. Provide complete service of systems, including call backs. Make minimum of 3 complete normal inspections of approximately 2 hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:
   1. Copper tube and fittings.
   2. Steel pipe and fittings.
   4. Transition fittings.
   5. Dielectric fittings.

1.02 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Piping layout, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Suspended ceiling components.
   2. Other building services.
   3. Structural members.

B. Qualification Data: For Installer.

C. Welding certificates.

D. Field quality-control reports.

1.03 QUALITY ASSURANCE

A. Installer Qualifications:

B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
   1. Hot-Water Heating Piping: 200 psig at 200 deg F.

2.02 COPPER PIPE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

   1. Manufacturers: provide products by one of the following:
      a. Anvil International.
      b. Star Pipe Products.
      c. Victaulic Company.
      d. Or approved equal.
   2. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
   3. Grooved-End-Tube Couplings: Rigid pattern unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, prelubricated EPDM gasket rated for minimum 230 deg F for use with housing, and steel bolts and nuts.
C. Copper or Bronze Pressure-Seal Fittings:
   1. Manufacturers: provide products by one of the following:
      a. Elkhart Products Corporation.
      b. NIBCO INC.
      c. Viega LLC.
      d. Or approved equal.
   2. Housing: Copper.
   3. O-Rings and Pipe Stops: EPDM.
   4. Tools: Manufacturer's special tools.
   5. Minimum 200-psig working-pressure rating at 250 deg F.

D. Wrought-Copper Unions: ASME B16.22.

2.03 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.


D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.

E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.

F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
   2. End Connections: Butt welding.
   3. Facings: Raised face.

H. Grooved Mechanical-Joint Fittings and Couplings:
   1. Manufacturers: provide products by one of the following:
      a. Anvil International.
      b. Victaulic Company
      c. Grinnell Mechanical Products.
      d. Or approved equal.
   2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
   3. Couplings: Ductile- or malleable-iron housing and EPDM gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

I. Steel Pressure-Seal Fittings:
   1. Manufacturers: provide products by one of the following:
      a. Victaulic Company.
      b. Viega LLC.
      c. Grinnell Mechanical Products.
      d. Or approved equal.
   2. Housing: Steel.
3. O-Rings and Pipe Stop: EPDM.
4. Tools: Manufacturer's special tool.
5. Minimum 300-psig working-pressure rating at 230 deg F.

J. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.04 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

E. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.05 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Manufacturers: provide products by one of the following:
      a. WATTS.
      b. Wilkins.
      c. Zurn Industries, LLC.
      d. Or approved equal.
   2. Description:
      b. 150 psig 250 psig.
      c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Nipples:
   1. Manufacturers: provide products by one of the following:
      a. Grinnell Mechanical Products.
      b. Precision Plumbing Products.
      c. Victaulic Company.
      d. Or approved equal.
   2. Description:
      b. Electroplated steel nipple, complying with ASTM F 1545.
      c. Pressure Rating: 300 psig at 225 deg F
      d. End Connections: Male threaded or grooved.
      e. Lining: Inert and noncorrosive, propylene.
PART 3 EXECUTION

3.01 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
   2. Schedule 40, Grade B, Type 96 steel pipe; Class 250, cast-iron, Class 300, malleable-
      iron fittings; cast-iron flanges and flange fittings; and threaded joints.
   3. Schedule 5 steel pipe; steel, pressure-seal couplings and fittings; and pressure-seal
      joints.

B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
   2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges
      and flange fittings, and welded and flanged joints.
   3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved,
      mechanical joints.

3.02 PIPING INSTALLATIONS

A. Install piping in concealed locations unless otherwise indicated and except in equipment rooms
   and service areas.

B. Install piping indicated to be exposed and piping in equipment rooms and service areas at right
   angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated
   otherwise.

C. Install piping with a like protective cover to NeatHeat 4-ft Hydronic Baseboard Heater Front
   Cover. Dimensions to be 6" tall by 3" wide. Install cover to protect exposed hydronic piping
   between heating elements.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating
   pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing
   of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple
   with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the
   branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the
   top of the main pipe.

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of
   equipment, and elsewhere as indicated.
Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

R. Install shutoff valve immediately upstream of each dielectric fitting.

### 3.03 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

### 3.04 HANGERS AND SUPPORTS

A. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

B. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 7 feet.
2. NPS 1: Maximum span, 7 feet.
3. NPS 1-1/2: Maximum span, 9 feet.
4. NPS 2: Maximum span, 10 feet.
5. NPS 2-1/2: Maximum span, 11 feet.
6. NPS 3 and Larger: Maximum span, 12 feet.

C. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

D. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

### 3.05 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

H. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

3.06 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections.

3.07 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:
   1. Leave joints, including welds, uninsulated and exposed for examination during test.
   2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
   3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
   4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
   5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:
   1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
   2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
   3. Isolate expansion tanks and determine that hydronic system is full of water.
   4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
   5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
   6. Prepare written report of testing.

C. Perform the following before operating the system:
1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Section includes special-duty valves and specialties for the following:
   1. Hot-water heating piping.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of the following:
   1. Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
   2. Air-control devices.
   3. Hydronic specialties.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
   1. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
   1. Hot-Water Heating Piping: 200 psig at 200 deg F.

2.02 VALVES

A. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:
   1. Manufacturers: provide products by one of the following:
      a. Armstrong Pumps, Inc.
      b. Bell & Gossett; a Xylem brand.
      c. Flow Design, Inc.
      d. Or approved equal.
   2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
   3. Ball: Brass or stainless steel.
   5. Disc: Glass and carbon-filled PTFE.
   6. Seat: PTFE.
   7. End Connections: Flanged or grooved.
   9. Handle Style: Lever, with memory stop to retain set position.

B. Automatic Flow-Control Valves:
   1. Manufacturers: provide products by one of the following:
      a. Flow Design, Inc
      b. Griswold Controls.
c. Flowcon Americas LLC.
d. Or approved equal

2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless steel, tamper proof, self-cleaning, and removable.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
9. Maximum Operating Temperature: 200 deg F.

2.03 AIR-CONTROL DEVICES

A. Automatic Air Vents:
1. Manufacturers: provide products by one of the following:
   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett; a Xylem brand.
   d. Or approved equal.
2. Body: Bronze or cast iron.
3. Internal Parts: Nonferrous.
5. Inlet Connection: NPS 1/2 (DN 15).
7. CWP Rating: 150 psig (1035 kPa).

2.04 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:
1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.

B. Stainless-Steel Bellow, Flexible Connectors:
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch (20-mm) misalignment.
4. CWP Rating: 150 psig (1035 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

PART 3 EXECUTION

3.01 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
B. Install calibrated-orifice, balancing valves at each branch connection to return main.
C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
D. Install check valves at each pump discharge and elsewhere as required to control flow direction.
E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.02 HYDRONIC SPECIALTIES INSTALLATION

A. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Single-wall rectangular ducts and fittings.
   2. Single-wall round and flat-oval ducts and fittings.
   4. Sealants and gaskets.
   5. Hangers and supports.

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.
   1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
   2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
   3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of the following products:
   1. Liners and adhesives.
   2. Sealants and gaskets.

B. Shop Drawings:
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Factory- and shop-fabricated ducts and fittings.
   3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
   4. Elevation of top of ducts.
   5. Dimensions of main duct runs from building grid lines.
   6. Fittings.
   7. Reinforcement and spacing.
   8. Seam and joint construction.
   9. Penetrations through fire-rated and other partitions.
   10. Equipment installation based on equipment being used on Project.
   11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
   12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.
   13. Fan coil units and associated duct work.
   14. OSA System and associated duct work.

1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
   2. Suspended ceiling components.
   3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Sprinklers.
   d. Access panels.

B. Welding certificates.

C. Field quality-control reports.

1.05 QUALITY ASSURANCE


B. Welding Qualifications: Qualify procedures and personnel according to the following:

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 PRODUCTS

2.01 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.02 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Lindab Inc.
   b. McGill AirFlow LLC.
c. SEMCO Incorporated.
d. Or approved equal.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
   2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.03 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
   1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.04 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:
   1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
   2. Tape Width: 4 inches.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

D. Flanged Joint Sealant: Comply with ASTM C 920.
2. Type: S.
3. Grade: NS.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.05 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.06 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: provide products by one of the following:
1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Ductmate Industries, Inc.
3. Hilti Corp.
5. Loos & Co.; Cableware Division.
7. TOLCO; a brand of NIBCO INC.
8. Unistrut Corporation; Tyco International, Ltd.
9. Or approved equal.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of the ICC Evaluation Service.
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 EXECUTION

3.01 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.
E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 23 33 00 "Air Duct Accessories" for fire and smoke dampers.


3.02 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
   1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   2. Outdoor, Supply-Air Ducts: Seal Class A.
   3. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
   4. Unconditioned Space, Exhaust Ducts: Seal Class C.
   5. Unconditioned Space, Return-Air Ducts: Seal Class B.
   6. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
   7. Conditioned Space, Exhaust Ducts: Seal Class B.
   8. Conditioned Space, Return-Air Ducts: Seal Class C.

3.03 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
   5. Do not use powder-actuated concrete fasteners for seismic restraints.
C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.04 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with ASCE/SEI 7.
1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
2. Brace a change of direction longer than 12 feet.
B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by an evaluation service member of the ICC Evaluation Service.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.05 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 23 33 00 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.06 FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. Duct System Cleanliness Tests:
   1. Visually inspect duct system to ensure that no visible contaminants are present.
   2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
      a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.07 START UP
A. Air Balance: Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

3.08 DUCT SCHEDULE
A. Fabricate ducts with galvanized sheet steel.

B. Supply Ducts:
   1. Ducts Connected to Units and OSA Supply Duct:
      a. Pressure Class: Positive 2-inch wg.
      b. Minimum SMACNA Seal Class: B.
      c. SMACNA Leakage Class for Rectangular: 24.
      d. SMACNA Leakage Class for Round and Flat Oval: 24.

C. Return Ducts:
   1. Ducts Connected to Units:
      a. Pressure Class: Positive or negative 2-inch wg.
      b. Minimum SMACNA Seal Class: B.
      c. SMACNA Leakage Class for Rectangular: 24.
      d. SMACNA Leakage Class for Round and Flat Oval: 24.

D. Exhaust Ducts:
   1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
      a. Pressure Class: Negative 1-inch wg.
      b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
      c. SMACNA Leakage Class for Rectangular: 12.
      d. SMACNA Leakage Class for Round and Flat Oval: 12.

E. Intermediate Reinforcement:
   2. PVC-Coated Ducts:

F. Elbow Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
      a. Velocity 1000 fpm or Lower:
         1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
      b. Velocity 1000 to 1500 fpm:
         1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
      c. Velocity 1500 fpm or Higher:
         1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
      a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
   1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
   2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
   3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.

c. Round Elbows, 14 Inches and Larger in Diameter: Welded.

g. Branch Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
      a. Rectangular Main to Rectangular Branch: 45-degree entry.
      b. Rectangular Main to Round Branch: Spin in.
   2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
      a. Velocity 1000 fpm or Lower: 90-degree tap.
      b. Velocity 1000 to 1500 fpm: Conical tap.
      c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   2. Flange connectors.
   3. Flexible connectors.
   4. Flexible ducts.
   5. Duct accessory hardware.

1.02 ACTION SUBMITTALS

A. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
   1. Detail duct accessories fabrication and installation in ducts and other construction.
      Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
      a. Special fittings.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 ASSEMBLY DESCRIPTION


B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.02 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   2. Exposed-Surface Finish: Mill phosphatized.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.03 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:
   1. Manufacturers: provide products by one of the following:
      a. Nailor Industries Inc.
      b. Ruskin Company.
      c. Trox USA Inc.
      d. Or approved equal.
   2. Standard leakage rating, with linkage outside airstream.
   3. Suitable for horizontal or vertical applications.
   4. Frames:
      a. Frame: Hat-shaped, 0.094-inch thick, galvanized sheet steel.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized-steel, 0.064 inch thick.


7. Bearings:
   a. Oil-impregnated bronze.
   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.04 FLANGE CONNECTORS

A. Manufacturers: provide products by one of the following:
   1. Ductmate Industries, Inc.
   2. Nexus PDQ; Division of Shilco Holdings Inc.
   4. Or approved equal.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.05 FLEXIBLE CONNECTORS

A. Manufacturers: provide products by one of the following:
   1. Ductmate Industries, Inc.
   2. Duro Dyne Inc.
   3. Elgen Manufacturing.
   4. Or approved equal.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

   1. Minimum Weight: 26 oz./sq. yd..
   2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F.

2.06 FLEXIBLE DUCTS

A. Manufacturers: provide products by one of the following:
   1. Flexmaster U.S.A., Inc.
   2. McGill AirFlow LLC.
   4. Or approved equal.

B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
   1. Pressure Rating: 6-inch wg positive and 1.0-inch wg negative.
3. Temperature Range: Minus 20 to plus 175 deg F.
4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1.

C. Flexible Duct Connectors:
   1. Clamps: Nylon strap in sizes 3 through 18 inches, to suit duct size.

2.07 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
   1. Install steel volume dampers in steel ducts.
   2. Install aluminum volume dampers in aluminum ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install flexible connectors to connect ducts to equipment.

G. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

H. Connect diffusers or light troffer boots to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

I. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.

J. Install duct test holes where required for testing and balancing purposes.

3.02 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors and verify that purpose of access door can be performed.
   3. Inspect turning vanes for proper and secure installation.
   4. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION
PART 1 GENERAL

1.01 RELATED DOCUMENTS

1.02 SUMMARY

A. Section Includes:
   1. Shutoff, single-duct air terminal units.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of air terminal unit.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for air terminal units.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For air terminal units.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Ceiling suspension assembly members.
   2. Size and location of initial access modules for acoustic tile.
   3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals.
   1. Include the following:
      a. Instructions for resetting minimum and maximum air volumes.
      b. Instructions for adjusting software set points.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 - Heating, Ventilating, and Air Conditioning."
2.02 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

A. Products:
   1. Enviro-Tech
   2. Johnson Controls

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 0.040-inch-thick galvanized steel, single wall.
   2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
   3. Air Outlet: S-slip and drive connections, size matching inlet size.
   4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
   5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from zero to 140 deg F (minus 18 to plus 60 deg C), shall be impervious to moisture and fungus, shall be suitable for 10-inch wg (2500-Pa) static pressure, and shall be factory tested for leaks.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.
   1. Maximum Damper Leakage: AHRI 880 rated, 2 percent of nominal airflow at 3-inch wg (750-Pa) inlet static pressure.

F. Hydronic Heating Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm), and rated for a minimum working pressure of 200 psig (1380 kPa) and a maximum entering-water temperature of 220 deg F (104 deg C). Include isolation valves, manual air vent, modulating control valve and drain valve.

G. Control devices shall be compatible with temperature controls system specified in Section 23 09 23 "Direct Digital Control (DDC) System for HVAC."
   1. Electric Damper Actuator: 24 V, powered open, spring return.
   2. Electronic Thermostat: Wall-mounted electronic type with temperature set-point display in Fahrenheit and Celsius.
   3. Terminal Unit Controller: Pressure-independent, variable-air-volume (VAV) controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:
      a. Occupied and unoccupied operating mode.
      b. Remote reset of airflow or temperature set points.
      c. Adjusting and monitoring with portable terminal.
   4. Room Sensor: Wall mounted with temperature set-point adjustment and access for connection of portable operator terminal.

PART 3 EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 5, "Hangers and Supports" and with Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes and for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4 inches (100 mm) thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.02 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install hangers and braces designed to support the air terminal units and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems." Comply with requirements for seismic-restraint devices in Section 23 05 48 "Vibration and Seismic Controls for HVAC."

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on air terminal units that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:
   1. Identify position of reinforcing steel and other embedded items before drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge Anchors: Protect threads from damage during anchor installation. Install heavy-duty sleeve anchors with sleeve fully engaged in the structural element to which anchor is to be fastened.
   4. Set anchors to manufacturer's recommended torque, using a torque wrench.
   5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.03 TERMINAL UNIT INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

C. Install wall-mounted thermostats.

3.04 CONNECTIONS

A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.
B. Hot-Water Piping: Comply with requirements in Section 23 21 13 "Hydronic Piping" and 
   Section 23 21 16 Hydronic Piping Specialties," and connect heating coils to supply with 
   shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve 
   and union or flange.

C. Comply with requirements in Section 23 31 13 "Metal Ducts for connecting ducts to air 
   terminal units.

D. Make connections to air terminal units with flexible connectors complying with requirements 
   in Section 23 33 00 "Air Duct Accessories."

3.05 IDENTIFICATION
A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum 
   factory-set airflows.

3.06 FIELD QUALITY CONTROL
A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and 
   inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections
   1. After installing air terminal units and after electrical circuitry has been energized, test 
      for compliance with requirements.
   2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest 
      until no leaks exist.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm 
      proper motor rotation and unit operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls 
      and equipment.

C. Air terminal unit will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.07 STARTUP SERVICE
A. Perform startup service.
   1. Complete installation and startup checks according to manufacturer's written 
      instructions.
   2. Verify that inlet duct connections are as recommended by air terminal unit 
      manufacturer to achieve proper performance.
   3. Verify that controls and control enclosure are accessible.
   4. Verify that control connections are complete.
   5. Verify that nameplate and identification tag are visible.
   6. Verify that controls respond to inputs as specified.

3.08 DEMONSTRATION
A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Fixed face registers and grilles.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:
   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and
      performance data including throw and drop, static-pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location,
      quantity, model number, size, and accessories furnished.

1.03 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items
   are shown and coordinated with each other, using input from Installers of the items involved:
   1. Ceiling suspension assembly members.
   2. Method of attaching hangers to building structure.
   3. Size and location of initial access modules for acoustical tile.
   4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers,
      sprinklers, access panels, and special moldings.
   5. Duct access panels.

B. Source quality-control reports.

PART 2 PRODUCTS

2.01 REGISTERS AND GRILLES

A. Adjustable Bar Register:
   1. Manufacturers: provide products by one of the following:
   2. Basis-of-Design Product: provide the following:
      a. Shoemaker.
   8. Frame: 1 inch wide.
   9. Mounting Frame:
   10. Countersunk screw.
   11. Damper Type: Adjustable opposed blade.
   12. Accessories:
      a. Front-blade gang operator.
      b. Filter.

B. Adjustable Bar Grille:
   1. Manufacturers: provide products by one of the following:
   2. Basis-of-Design Product: provide the following:
      a. Shoemaker
   8. Frame: 1 inch wide.
   9. Mounting Frame:
   10. Countersunk screw.
C. Rectangular and Square Ceiling Diffusers:
   1. Devices shall be specifically designed for variable-air-volume flows.
   2. Basis-of-Design Product: provide the following:
      a. Shoemaker
   4. Finish: Baked enamel, white
   5. Face Size: 24 by 24 inches
   6. Face Style: Four core.
   7. Mounting: Surface and T-bar
   9. Accessories:
      a. Equalizing grid.

2.02 SOURCE QUALITY CONTROL
A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.01 EXAMINATION
A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION
A. Install diffusers, registers, and grilles level and plumb.
B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.03 ADJUSTING
A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY
   - Section includes Hydronic finned-tube baseboard radiation heaters.

1.02 ACTION SUBMITTALS
   - Product Data: For each type of product.
     1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

1.03 INFORMATIONAL SUBMITTALS
   - Field quality-control reports.

PART 2 PRODUCTS

2.01 HYDRONIC FINNED-TUBE RADIATION HEATERS
   - Basis of Design:
     1. Modine Radiator Model F012
   - Performance Ratings: Rate finned-tube radiation heaters according to Hydronics Institute's "I=B=R Testing and Rating Standard for Finned-Tube (Commercial) Radiation."
   - Heating Elements: Model CP 07550C, Copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins resting on element supports. One end of tube shall be belled.
     1. Tube Diameter: NPS 3/4
     2. Entering-Air Temperature: 65 deg F.
   - Heating Elements: Copper tubing mechanically expanded into flanged collars of evenly spaced steel fins resting on element supports. Tube ends shall be threaded.
   - Element Supports: Ball-bearing cradle type to permit longitudinal movement on enclosure brackets.
   - Front Panel: Minimum 18 gauge thick steel.
   - Wall-Mounted Back Panel: Minimum 20 gauge-thick steel, full height, with full-length channel support for front panel without exposed fasteners.
   - Support Brackets: Locate at maximum 36-inch spacing to support front panel and element.
   - Access Doors: Factory made, permanently hinged with tamper-resistant fastener, minimum size 6 by 7 inches, integral with enclosure.
   - Enclosure Style: Flat top.
     1. Front Inlet Grille: Punched louver; prime coat finish to be painted in the field color to be selected by the architect.
   - Accessories: Filler sections, corners, relay sections, and splice plates all matching the enclosure and grille finishes.

PART 3 EXECUTION

3.01 EXAMINATION
   - Examine areas to receive finned-tube radiation heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for steam-piping connections to verify actual locations before installation of finned-tube radiation heaters.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 HYDRONIC FINNED-TUBE RADIATION HEATER INSTALLATION

A. Install units level and plumb.
B. Install enclosure continuously around corners, using outside and inside corner fittings.
C. Join sections with splice plates and filler pieces to provide continuous enclosure.
D. Install access doors for access to valves.
E. Install enclosure continuously from wall to wall.
F. Terminate enclosures with manufacturer's end caps except where enclosures are indicated to extend to adjoining walls.
G. Install valves within reach of access door provided in enclosure.
H. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.
I. Install piping within pedestals for freestanding units.

3.03 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
B. Units will be considered defective if they do not pass tests and inspections.
C. Prepare test and inspection reports.

END OF SECTION
PART 1 - GENERAL

1.1 EQUIPMENT AND DEVICE TESTS

A. Perform all equipment and device testing after installation and prior to substantial completion or Owner occupancy, allowing enough time for corrective action of all deficiencies.

B. Review manufacturer's installation instruction and confirm that equipment is installed in accordance with manufacturer's instructions.

C. Prior to performing tests confirm that the equipment is clean and free of construction debris and dust.

D. Phase Relationship Tests: Check connections to all new and existing equipment for proper phase relationship. During such check, disconnect all devices which could be damaged by the application of voltage or reversed phase sequence.

E. Test the open/close or energize/de-energize operation of each switch, circuit breaker, contactor and other item of electrical control with the systems fully energized and operating. Each shall be tested three times. Test report shall include a list of equipment tested and the signed initials of the electricians performing the test on a device by device basis.

F. Test new electrical equipment and existing electrical equipment that has been revised as a part of this contract.

G. Inspect and test entire electrical systems provided by this contract to verify equipment and controls are correctly operating. Power system tests shall be performed 4 to 8 weeks after substantial completion, and at such time that the maximum possible load is connected (usually highest available occupancy at mid day.)

H. Load Balance Tests: Checks all switchboards and panelboards for proper load balance between phase conductors and make adjustments as necessary to bring unbalanced phases to within 15% of average load. Check shall consist of clamp on ampere readings on each phase for a period of 15 minutes, of each panelboard. Include phase realignment of 1% of the project's 3 pole circuit breakers in bid.

I. Motor Tests: Check all motors and measure actual load current. Submit tabulation of motor currents for all motors 1 HP or more after the HVAC system has been balanced.

J. Transformer Taps: Connect all transformers at "Normal" tap. Measure secondary voltages at all new and existing transformers. Forward a list to engineer including service switchboard voltmeter reading at the time of the test for evaluation. Reconnect taps as subsequently directed.

1.2 SUBMITTALS

A. General
   1. Provide submittal information in accordance with Division 01, Section 26 05 00 - Common Work Results for Electrical and requirements described in this section.

B. Test Report
1. The Contractor shall maintain a written record of all tests and shall assemble and certify a final test report indicating all equipment tested and the results found for each. Any system, material, or workmanship which is found to have abnormal operation, shall be specifically identified.

1.3 QUALITY ASSURANCE

A. Test Equipment: The Contractor shall have a calibration program, and test instruments used shall be calibrated in accordance with NETA ATS. Provide a complete list of test equipment utilized in all of the testing. Include manufacturer, model number, current calibration date, next calibration date and age of equipment.

B. Testing, inspection, calibration and adjustments shall be performed by an engineering technician, certified by NETA or the National Institute in Engineering Technologies with a minimum of five years experience testing, calibrating electrical distribution and generation equipment, systems, and devices.

1.4 CLOSEOUT

A. Operational and Maintenance Manuals
   1. All approved submittal information
   2. Full test report in the O&M Manual
   3. Completed form for each item of equipment tested

B. One electronic version of the test report on CD and in the latest version of Microsoft Word.

C. Schedule of recommended testing frequency for all equipment tested under this contract

D. Testing company test stamps or stickers on all tested equipment. Indicate testing company name, testing date and expiration date.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. The Contractor shall provide all apparatus and material required for testing. The Contractor shall use installation tools and test equipment which are designed for the specific task and shall use this equipment per the manufacturer's instructions. All test equipment shall have current calibration certification by a third party calibration laboratory, and shall have a signed and dated calibration sticker affixed to the device. Calibration shall be traceable to the National Bureau of Standards and be less than 6 months since last calibration. Defective test equipment and installation tools shall not be used. Installation tools such as torque wrenches shall be calibration certified.

PART 3 - EXECUTION

3.1 ACCEPTANCE TESTS AND INSPECTIONS

A. The Contractor shall perform acceptance tests and inspections. Test methods, procedures, and test values shall be performed and evaluated in accordance with NETA ATS, the manufacturer's recommendations, and as required by each applicable specification section. Equipment shall be placed in service only after completion of required tests and evaluation of the test results has been completed. The following testing shall be performed:
1. Section 26 05 19 Low Voltage Electrical Power Conductors and Cables
2. Section 26 05 26 Grounding and Bonding for Electrical Systems
3. Section 26 27 26 Wiring Devices

3.2 SCHEDULE

A. Perform all testing after installation and before energizing. All primary systems shall pass tests prior to placing in service. Notify Owner 10 working days prior to performance of any test.

3.3 TEST REPORTS

A. The Contractor shall prepare test reports including description of project, description of equipment tested, description of test, test results, conclusions and recommendations, retesting results and list of test equipment used and calibration date.

B. One copy of each test report shall be delivered directly to the Owner within 7 calendar days of the test.

C. Insert a copy of each test report in the operation and maintenance manuals.

3.4 RETESTING

A. Any fault in material or in any part of the installation revealed by these tests shall be investigated, replaced or repaired by the Contractor and the same test repeated at Contractor's expense until no fault appears.

3.5 LABELS

A. Upon completion of the tests, a label shall be attached to all serviced devices. These labels shall indicate date serviced and the Contractor.

3.6 OBSERVATIONS BY ENGINEER

A. Contractor shall remove and replace covers of electrical equipment, and remove/replace ceiling tiles to permit engineer to observe equipment and wiring provided. Furnish ladder and flashlight.

3.7 TROUBLESHOOTING

A. If a system or device provided does not operate per manufacturers specifications, Contractor shall provide qualified men with tools and test equipment to find and repair problem at Contractor's expense.

3.8 SYSTEM ACCEPTANCE

A. Final acceptance of the system is contingent upon satisfactory completion of acceptance tests and inspections.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This section includes general requirements for all Division 26 work and is supplemental and in addition to the requirements of Division 01.

B. It is the intention of this Division of the Specifications and the Contract Drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and fully operational condition all equipment, materials, devices and necessary appurtenances to provide a complete electrical system. Provide all materials, appliances and apparatus not specifically mentioned herein or shown on the drawings, but which are necessary to make a complete, fully operational installation of all electrical systems shown on the contract drawings or described herein. Connect equipment and devices furnished and installed under other Divisions of this specification (or the Owner) under this Division.

C. Workmanship shall be of the best quality and competent and experienced electricians shall be employed and shall be under the supervision of a competent and experienced foreman.

D. The drawings and specifications are complimentary and what is called for (or shown) in either is required to be provided as if called for in both. Where conflicting information occurs within the drawings and specifications or between the drawings and specifications, the more expensive alternative shall be used as a basis for bidding and construction.

1.2 CODES, PERMITS, INSPECTION FEES

A. The following codes and standards are referenced in the Division 26 specifications. Perform all work and provide materials and equipment in accordance with the latest referenced codes and standards of the following organizations:

1. American National Standards Institute (ANSI)
2. National Electrical Manufacturer's Association (NEMA)
3. National Fire Protection Association (NFPA)
4. Underwriter's Laboratories (UL)
5. Department of Energy (DOE)

B. Install the electrical systems based on the following:

   NFPA 70  National Electrical Code as adopted and amended by the Local Jurisdiction.
   IBC  International Building Code as adopted and amended by the Local Jurisdiction.

C. The referenced codes establish a minimum level of requirements. Where provision of the various codes conflict with each other, the more stringent provision shall govern. If any conflict occurs between referenced codes and this specification, the codes are to govern. Compliance with code requirements shall not be construed as relieving the Contractor from complying with any requirements of the drawings or specifications which may be in excess of requirements of the governing codes and rules and not contrary to same.

D. Obtain and pay for all licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. Arrange for inspection of work by the inspectors and give the inspectors all necessary assistance in their work of inspection.
1.3 COORDINATION

A. Coordinate all work. Examine all drawings and specifications for construction details and coordination. Make every reasonable effort to provide timely notice of work affecting other trades to prevent conflicts or interference as to space requirements, dimensions, openings, block-outs, sleeving or other matters which will cause delays or necessitate work-around methods.

B. Obtain submittals and shop drawings of all equipment with electrical connections furnished under other divisions of the specification and by the Owner. Provide all wiring in accordance with specific equipment requirements. Immediately advise the Architect of any changes which may affect the contract price.

C. Special attention is called to the following items. Coordinate all conflicts prior to installation:
   1. Door swings such that switches will be located on the "strike" side of the door.
   2. Location of grilles, pipes, sprinkler heads, ducts and other mechanical equipment so that all electrical outlets, lighting fixtures and other electrical outlets and equipment are clear from and in proper relation to these items.
   3. Location of cabinets, counters and doors so that electrical outlets, lighting fixtures and equipment are clear from and in proper relation to these items.
   4. Recessing and concealing electrical materials in concrete masonry unit (CMU) walls, concrete construction and precast construction.
   5. At each panelboard location the Contractor shall monitor the work of all trades to assure that the space and clearance requirements of code are met.
   6. Review specifications for other Divisions of the work to determine where other Divisions are requiring electrical connections. Verify electrical provisions shown on contract drawings by examining shop drawing submittals of other Divisions prior to submission to the Owner. Do not proceed with ordering of supporting electrical equipment, such as circuit breakers, until electrical characteristics are verified. Proceed with rough only after verification of shop drawings.

D. Furnish, install and place in satisfactory condition all raceways, boxes, conductors and connections and all other materials required for the electrical systems shown or noted in the contract documents to be complete, fully operational and fully tested upon completion of the project. Raceways, boxes and ground connections are shown diagrammatically only and indicate the general character and approximate location. The layout does not necessarily show the total number of raceways or boxes for the circuits required, nor are the locations of indicated runs intended to show the actual routing of the raceways. Where routings of major raceways and telecommunication pathways are indicated on plan sheets, the routing information supplements the information on diagrams. If no routing information is shown, route the systems in a manner that will coordinate with new and existing infrastructure and the work of other trades.

E. The horsepower of motors and apparatus wattage’s shown on the drawings are estimated requirements of equipment furnished under other Divisions. Provide overload elements to suit actual equipment nameplate current. Advise Architect of any equipment changes or substitutions affecting electrical systems.

F. Consult the drawings for the exact height and location of all electrical equipment not specified herein or shown on the drawings. Make any minor changes (less than 6'-6" horizontal) in the location of the raceways, outlets, boxes, devices, wiring, etc., from those shown on the drawings without extra charge, where coordination requires or if so directed by the Architect before rough-in.
G. Provide inserts or sleeves for outlet boxes, conductors, cables and/or raceways as required. Coordinate the installation thereof with other trades.

1.4 WARRANTY

A. Refer to Section 01 78 36.

1.5 SUBMITTALS AND SHOP DRAWINGS

A. Comply with requirements of Section 01 33 00.

1.6 PROJECT CLOSE-OUT

A. Comply with the requirements of Section 01 77 00.

1.7 ELECTRICAL EQUIPMENT OPERATION AND MAINTENANCE (O&M) MANUALS

A. Comply with the requirements of Section 01 77 00.

B. The O&M manuals shall contain all the information needed to operate and maintain all systems and equipment provided in the project. Present and arrange information in a logical manner for efficient use by the Owner's operating personnel. The information provided shall include but not be limited to the following:

1. Equipment manufacturer, make, model number, size, nameplate data, etc.
2. Description of system configuration and operation including component identification and interrelations. A master control schematic drawings(s) may be required for this purpose.
3. Dimensional and performance data for specific unit provided as appropriate.
4. Manufacturer's recommended operation instructions.
5. Manufacturer's recommended lubrication and servicing data including frequency.
6. Complete parts list including reordering information, recommended spares and anticipated useful life (if appropriate). Parts lists shall give full ordering information assigned by the original parts manufacturer. Relabeled and/or renumbered parts information as reassigned by equipment supplier not acceptable.
7. Shop drawings.
8. Wiring diagrams.
9. Signal equipment submittals shall contain step-by-step circuit description information designed to acquaint maintenance personnel with equipment operation in each mode of operation.
10. A complete list of local (nearest) manufacturer representative and distributor contacts for each type of equipment and manufacturer. Include name, company, address, phone, fax, e-mail address, and web site.

C. Furnish complete wiring diagrams for each system for the specific system installed under the contract. "Typical" line diagrams will not be acceptable unless revised to indicate the exact field installation.

1.8 RECORD DRAWINGS

A. Comply with the requirements of Section 01 77 00,

1.9 ABBREVIATIONS AND DEFINITIONS

A. When the following abbreviations and definitions are used in relation to the work for Division 26 they shall have the following meanings:
Item | Meaning
--- | ---
AHJ | Authority Having Jurisdiction.
Boxes | Outlet, Junction or Pull Boxes.
Code | All applicable codes currently enforced at project location.
Compression | Compressed using a leverage powered (hydraulic or equivalent) crimping tool.
Connection | All materials and labor required for equipment to be fully operational.
Exterior Location | Outside of or penetrating the outer surfaces of the building weather protective membrane.
Fully Operational | Tested, approved, and operating to the satisfaction of the AHJ, manufacturer and contract documents.
Furnish | Deliver to the jobsite
Install | To enter permanently into the project and make fully operational.
Kcml | Thousand circular mils (formerly MCM).
Mfr. | Manufacturer.
NEC | National Electrical Code, National Fire Protection Association, Publication #70.
NIC | Not in Contract.
Noted | Shown or specified in the contract documents.
Provide | Furnish and install.
Required | As required by code, AHJ, contract documents, or manufacturer for the particular installation to be fully operational.
Shown | As indicated on the drawings or details.
Wiring | Raceway, conductors and connections.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment installed shall have been tested and listed by Underwriters Laboratories or other approved testing organization and shall be so labeled unless otherwise permitted by the Authority Having Jurisdiction (Inspector).

B. All materials to be new, free from defects and not less than quality herein specified. Materials shall be designated to insure satisfactory operation and operational life in the environmental conditions which will prevail where they are being installed.

C. Each type of materials furnished shall be of the same make, be standard products of manufacturers regularly engaged in production of such materials and be the manufacturer's latest standard design.

D. All materials, equipment and systems furnished that include provisions for storing, displaying, reporting, interfacing, inputting, or functioning using date specific information shall perform properly in all respects regardless of the century. Any interface to other new or existing materials, equipment or systems shall function properly and shall be century compliant, both in regards to information sent and received.

2.2 SUBSTITUTION OF MATERIALS

A. Comply with requirements of Section 01 25 00.

2.3 NAMEPLATES

A. Provide nameplates per Section 26 05 53 - Identification for Electrical Systems.
PART 3 - EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft. Handle all equipment carefully to prevent damage, breakage, denting, and scoring of finishes. Do not install damaged equipment.

B. Store products subject to damage by the elements above ground, undercover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instruction.

3.2 CUTTING BUILDING CONSTRUCTION

A. Obtain permission from the Owner and coordinate with other trades prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills or concrete saws except where space limitations prevent the use of such tools.

B. All construction materials damaged or cut into during the installation of this work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.3 SHUTDOWNS

A. Coordinate all shutdowns with Owner. All shutdowns will be during off hours unless otherwise approved by Owner. Off hours are defined as 9:00 PM to 6:00 AM Monday through Friday and all day Saturday and Sunday.

3.4 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire rated floor and wall assemblies to maintain fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section 07 84 00 "Firestopping".

3.5 PAINTING

A. Items furnished under this Division that are scratched or marred in shipment or installation shall be refinished with touchup paint selected to match installed equipment finish.

3.6 EQUIPMENT CONNECTION

A. For equipment furnished under this or other Divisions of the specifications, or by Owner, provide complete all electrical connections necessary to serve such equipment and provide required control connections to all equipment so that the equipment is fully operational upon completion of the project. Provide disconnect switch as required by code whenever an equipment connection is shown on the drawings.

B. Investigate existing equipment to be relocated and provide new connections as required.

C. Obtain rough-in requirements for equipment furnished under other divisions of this specification prior to roughing-in. Review shop drawings and submittals of other Divisions to determine requirements.
3.7 CLEAN UP

A. Comply with the requirements of Section 01 77 00.

3.8 TESTING AND DEMONSTRATION

A. Demonstrate that all electrical equipment operates as specified and in accordance with manufacturer's instructions. Perform tests in the presence of the Architect, Owner or Engineer. Provide all instruments, manufacturer's operating instructions and personnel required to conduct the tests. Repair or replace any electrical equipment that fails to operate as specified and or in accordance with manufacturer's requirements.
STANTEC SUBMITTAL LIST HMC 8EH Burn Upgrades

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END OF SECTION
PART 1 - GENERAL

1.1 EXISTING SYSTEMS MAINTAINED

A. Any existing wiring serving devices to remain in service and which is interrupted by work performed under this contract shall be rerouted to maintain circuit continuity. Contractor shall assume the risk of maintaining existing systems except relocation of wiring of #2 AWG and above shall be considered an additional cost if not shown to be relocated. If such wiring is found the Contractor shall notify Owner of wiring location, reason it must be removed and follow the requirements of Section 01 26 00.

B. The building will continue operation during the work and it is essential that no systems operation be interrupted unless scheduled with the Owner. Contractor shall assume responsibility for unscheduled interruptions and expedient repair. Any damage resulting from performance of work under this contract shall be immediately repaired to assure continuing operation and integrity at no increase in contract cost.

C. Maintain existing systems not identified for demolition. Maintaining existing systems includes relocating the systems to coordinate with Work, when Work cannot be done while the existing system is in its present location. Examine drawings of all disciplines to determine where work of other trades will or is likely to require relocation of existing systems. Relocation of any system shall be permanent.

D. Exact relocation requirement of existing systems to remain to be based on detailed coordination with other trades. Contractor to provide proposed locations of relocated devices to Owner's Representative for approval prior to commencement of work.

1.2 EXISTING SYSTEMS CONCEALED

A. The electrical drawings show portions of the existing electrical systems which are to remain, be removed or be modified as a part of the Contractor's work. Concealed features of the existing systems are derived from record drawings and the Engineer's best judgment of the configuration, but no guarantee is made as to their correctness.

1.3 DEMOLITION WORK

A. All demolition work required is not shown on the drawings.

B. The demolition drawings show portions of the existing systems which are derived from record drawings. The Contractor shall assume there is 10% more electrical systems than what is shown on the demolition drawings.

C. Verify that all circuits in any raceway that is in an area where electrical systems are to be removed are de-energized and not in use.

1.4 TEMPORARY ELECTRICAL EQUIPMENT

A. Removing, temporary hanging by chains and reinstalling in ceilings of light fixtures, speakers, detectors, exit signs and other electrical equipment is not shown on the drawings. The Contractor shall investigate the ceiling demolition work and include this work in the bid. The sequence of work shall be (1) Remove and store fixtures, detectors and speakers along with removal of ceiling, (2) Provide temporary support for wired fixtures and devices to be reinstalled in new ceiling at approximately the same location. Use chains for lighting fixture support,
Clean and reinstall in the new or replaced ceilings. Provide new lamps when so noted. Provide temporary relocation of exit signs to original location when exit is reactivated.

B. Provide temporary lighting, exit lighting, and fire notification in areas of construction that will have ongoing or intermittent public access. Temporary lighting shall comply with IES standards and other provisions of these specifications. Selected light fixtures must have battery backup to allow for egress at all times. Indicate path to nearest exit with exit signs. All temporary systems shall be removed after they are no longer in operation.

1.5 WORK OUTSIDE OF REMODEL AREAS

A. Review work of other trades and disciplines for similar impacts. Remove and relocate electrical equipment in the way of work of other trades.

B. For work outside of the Project area assume that removal and replacement of ceiling tiles is required in all finished areas.

1.6 PREMIUM TIME

A. Premium time shall be included in the Base Bid for nightly electrical system(s) outages and for other work as required by the schedule, as shown on the drawings and as noted in other Divisions of the Specifications.

PART 2 - PRODUCTS

2.1 EXISTING MATERIALS

A. All materials which are a part of the building shall remain the property of the Owner.

2.2 EXISTING MATERIALS TO BE REINSTALLED

A. Existing materials and equipment (except interior, undamaged raceways) that are removed as a part of the work or stored in surplus shall not be reinstalled as a part of the new systems unless specifically noted or authorized in writing by the Owner. Forward a copy of the authorization to the Engineer. The requirements of the specifications (i.e., condition, installation, testing, etc.) shall apply as if the materials were new, furnished by the Contractor.

2.3 EXISTING MATERIALS NOT TO BE REINSTALLED

A. In coordination with the Owner, these materials shall be made available for his inspection and decision as to whether the Owner will retain possession. Items selected for retention shall be turned over to the Owner. These items shall be delivered to a location on the premises selected by the Owner. Take reasonable care to avoid damage to this material. If the Contractor fails to conform to this requirement, he shall purchase and turn over to the Owner replacement material of like kind and quantity.

B. All material not selected for retention by the Owner and debris shall be legally disposed of by the Contractor.
PART 3 - EXECUTION

3.1 EXISTING CONDITIONS

A. Examine the structure, building, and conditions under which electrical work is to be installed for conditions detrimental to proper and timely completion of electrical work. Do not proceed with work until deficiencies or detrimental conditions have been corrected. Report deficiencies or detrimental conditions of existing electrical work which might be unsuitable to connect with or receive other work. Failure to so report shall constitute acceptance of other work as being fit and proper for the reception of electrical work.

3.2 DEMOLITION

A. Switchboards, panelboards, signaling and communication systems, other electrical equipment free standing or surface mounted, raceway (exposed) and conductors; which are no longer in service presently or as a result of this contract shall be removed. Unused flush mounted devices, outlet and other boxes in finished areas shall be removed from wall and the remaining hole patched to match adjacent wall surfaces. Unused raceways and sleeves shall be cut flush at ceiling, floor or wall and filled with grout. Unused raceways above accessible ceilings shall be removed.

B. Contractor shall remove all floor, wall or ceiling mounted electrical equipment in the "Demolition Area" indicated on the drawing even if the equipment/or device is not shown on the project drawings. If Contractor questions whether a particular device is to be removed notify the Architect noting type and location of device. If so directed the Contractor shall maintain the existing device in service without any change in contract price.

3.3 POWER OUTAGES

A. The facility will be in operation 24 hours per day, seven days per week during the construction work; therefore it is required that the Contractor schedule electrical system(s) outages with the Owner. Electrical systems(s) outages to Owner occupied areas shall not be permitted from 6:00 a.m. to 9:00 p.m. Monday through Friday.

B. Submit a written request for a power outage at least 14 days in advance identifying the areas and systems that will be affected, time and duration of the power outage. The Contractor shall receive written authorization to proceed with the outage and shall re-notify the Owner verbally at least one hour prior to the outage and also notify the Owner when the outage is completed.

C. Unscheduled Outages: In the event that the Contractor's work causes or contributes to an electrical system(s) outage (or other system fault), the Contractor is responsible for immediately correcting the problem. Contractor shall pay any premium time required to stay on the job site until problem is corrected and pay air freight for parts not locally available. If the fails to correct the problem, the Owner may charge the Contractor the cost of correcting the problem.

3.4 EXISTING SYSTEMS MAINTAINED

A. General
   1. Re-route existing circuits that are interrupted as a result of this Work that serve devices to remain in service.
   2. Power Circuits (Including removal or relocation of existing panelboards).
      a. Prior to demolition work trace out and identify each branch circuit and feeder circuit that serves loads in occupied areas.
b. Provide temporary wiring, schedule outage and reconnect loads to temporary wiring.

c. Provide new wiring in new location.

d. Schedule outage, disconnect temporary wiring, and connect loads to new wiring.
   Remove temporary wiring.

e. Outage for each circuit shall not be more than 20 minutes.

3. Signal and Communication Systems

a. Prior to demolition trace out and identify device and systems being served.

b. Provide temporary wiring to maintain operation of system throughout facility.

c. Schedule outage and connect to temporary wiring and test system.

d. Provide new wiring on new location.

e. Schedule outage, disconnect temporary wiring, and reconnect to new wiring.
   Remove temporary wiring.

f. Outage for each system shall not be more than 20 minutes.

3.5 ACCESS TO PERFORM WORK

A. Carefully remove, store or temporarily hang and re-install in undamaged condition all electrical equipment, lighting fixtures and ceiling tiles where access to perform work is required. Clean prior to re-installation. Provide new lamps when so noted.

3.6 NEW DEVICES IN REMODEL AREAS

A. Provide flush mounting for devices in existing walls. Fish conduit in wall. Where existing boxes are indicated to be reused, extend box as necessary and provide new devices and plates.

B. Contractor is cautioned that the existing building contains clay tile and concrete walls. New devices may require cutting and patching, and it shall be the responsibility of the Contractor to provide all cutting and patching required for the installation of the Division 26 work.

C. This facility has wiring embedded in raceways in concrete slabs. Provide new concealed wiring to last outlet or pull box before homerun to panel.
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

1.2 REFERENCES

B. National Electrical Manufacturers Association (NEMA).
C. Underwriter’s Laboratories, Inc. (UL).

1.3 SUBMITTALS

A. Make submittals in accordance with Section 26 05 00 - Common Work Results for Electrical.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alcan Products Corporation; Alcan Cable Division.
   3. General Cable Corporation.
   4. Senator Wire & Cable Company.
   5. Southwire Company.
   6. Or Approved Equal.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and XHHW.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   3. O-Z/Gedney; EGS Electrical Group LLC.
   4. 3M; Electrical Products Division.
   5. Tyco Electronics Corp.
   6. Or Approved Equal.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
2.3 TERMINATIONS

A. Copper conductors: Compression set, bolted, or screw type lug or direct to bolted or screw type terminal.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; Solid for No. 16 AWG and smaller; stranded for No. 14 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 16 AWG and smaller; stranded for No. 14 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Branch Circuits, Type THHN-THWN, single conductors in raceway.

B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

C. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

D. Class 1 Control Circuits: Type THHN-THWN, in raceway.

E. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION

A. Utilize type THHN/THWN wire for all power, lighting circuits except where the ambient temperature is below 0°C, use Type XHHW installation.

B. Install all wiring in a raceway system unless otherwise specified.

C. Install wire only after building interior has been protected from the weather.

D. Install wire only after mechanical work likely to damage wire has been completed.

E. Completely and thoroughly swab exterior raceways before installing wire.

F. Pull all conductors into a common raceway simultaneously.

G. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

H. Neatly train and lace wiring inside boxes, equipment and panelboards.

I. Provide conductor vertical supporting device as required by NEC 300-19.

J. Conductors from one system shall not be intermixed in the same raceway as another system unless shown otherwise. Examples of circuits not be to be intermixed are 480Y/277 with 208Y/120 volt circuits, emergency power, line voltage circuits with low voltage wiring, etc.
K. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

L. Support cables according to Division 26 Section 26 05 29 "Hangers and Supports for Electrical Systems."

M. Identify and color-code conductors and cables according to Division 26 Section 26 05 53 "Identification for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section 07 84 00 "Firestopping."

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
   1. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors and new branch circuit homeruns for compliance with requirements.

C. Test Reports: Prepare a written report to record the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Grounding systems and equipment.

1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
   1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solder less compression -type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
3.1 APPLICATIONS

A. Conductor: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
   1. Feeders and branch circuits.
   2. Lighting circuits.
   3. Receptacle circuits.
   5. Three-phase motor and appliance branch circuits.
   6. Flexible raceway runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.
   1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
   2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

C. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:
   1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
   2. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.6 SIZE OF GROUND WIRE

A. As required by National Electric Code. Where ground wire is exposed to physical damage protect with rigid non-ferrous conduit as permitted by applicable code.

3.7 GROUND CONNECTION OF PIPING

A. Metal internal piping shall be grounded, as a part of this contract.

3.8 CONNECTION TO THE POWER GROUND BUS

A. Furnish and install connections in accordance with the codes; including but not limited to:
   1. Raceway system
   2. Electrically operated equipment and devices.

B. No device or equipment shall be connected for electrical service which has a neutral conductor connected to a grounding conductor or to the frame within the device or equipment.
3.9 METHOD OF CONNECTIONS

A. Make all ground connections and ground cable splices by thermal welding or copper compression set type connectors U.L. listed for grounding purposes. Grounding lugs, where provided as standard manufacturer's items on equipment furnished, may be used.

3.10 EXPANSION FITTINGS

A. In conduit runs requiring an expansion fitting, a bonding jumper shall be installed around the fitting to maintain continuous ground continuity.

3.11 TESTING

A. Conform to Section 26 01 26 - Acceptance Testing of Electrical Systems

3.12 GROUND CABLE CROSSING EXPANSION JOINTS

A. Ground cables crossing expansion joints or similar separations in structures or paved areas shall be protected from damage by means of suitable approved devices or methods of installation which will provide the necessary slack in the cable across the joint to permit movement. Stranded or other approved flexible copper run or jumper shall be used across such separations.

3.13 PANELBOARD BONDING

A. Provide a bonding conductor not smaller than #10 AWG between the ground bus in the normal and emergency panels and/or two or more emergency panelboards fed from separate transfer switches, serving the same individual patient vicinity in accordance with NEC 517.14.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.

1.2 REFERENCES


C. IBC: International Building Code. 2009 and adopted and amended by The AHJ.


E. MFMA-3: Metal Framing Manufacturers Association's Metal Framing Standards Publication.


H. OSHPD: Office of Statewide Health Planning and Development.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.
1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
      h. Or Approved Equal.

   2. Finishes:
      a. Plated Coatings: Zinc Plated. Fitting and accessories - zinc plated

   3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Hilti Inc.
         2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
         3) MKT Fastening, LLC.
         4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
         5) Or Approved Equal.

   2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.
6) Or Approved Equal.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.

PART 3 - EXECUTION

3.1 SUPPORT INSTALLATION -GENERAL

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts or use expansion anchor fasteners.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
   6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
   7. To Light Steel: Sheet metal screws.
   8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.2 HANGERS AND SUPPORTS FOR RACEWAYS

A. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 3/8 inch (10 mm) in diameter.
B. Suspended ceiling systems: Do not attach raceways to ceiling suspension system hangers.

C. Raceways 3/4" (20mm) and smaller serving equipment located within ceiling cavity or mounted on or supported by the ceiling grid system may be supported by dedicated #12 ga. galvanized, soft annealed mild steel wire hangers. Two raceways maximum per hanger. Attach raceways to wires with clips manufactured for the purpose.

D. Raceways 1" and larger: Provide lay-in pipe hangers on 1/4" (6mm) or larger all threaded rods attached to metal ceiling inserts or to structural members at not greater than spacing noted above and within 12" (300mm) of each change in direction.

E. Multiple Raceways or Cables: When more than two raceways will use the same routing, group together on a channel trapeze support system supported by threaded rods attached to metal ceiling inserts or structural members. Size supports for multiple raceways for 25% future capacity. Trapeze shall be sized in accordance with SMACNA Guidelines with conduit weight taken to be as listed for same size pipe filled of water.
   1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.3 VERTICAL CABLE SUPPORTS

A. Provide cable support for vertical cable runs as required by NFPA 70.

3.4 SUPPORT FOR LIGHT FIXTURES

A. Provide support system designed by registered engineer for all light fixtures over 50 pounds.

B. Recessed mounted type fixtures less than 20 pounds installed in lay-in ceiling: Provide four support clips, Caddy #515 or similar, (one each corner) which lock light fixture to ceiling tees after light fixture is installed. In addition, provide for each light fixture two #14 earthquake chains or #12 wires secured located at diagonally opposite fixture corners and attached to structural members above suspended ceiling.

C. Recessed mounted type fixtures less than 50 pounds installed in lay-in ceiling: Provide four support clips, Caddy #515 or similar, (one each corner) which lock light fixture to ceiling tees after light fixture is installed. In addition, provide for each light fixture four #14 earthquake chains or #12 wires (one in each corner) installed taut and secured to structural members above suspended ceiling.

D. Recessed mounted type fixtures installed in plaster or gypsum ceiling. Provide support chains or wires similar to lay-in ceiling requirements except also provide plaster frame compatible with light fixture. Attach support wires/chains to plaster frame.

E. Surface mounted type fixtures less than 50 pounds installed on suspended ceilings: Provide metal carrying channels above suspended ceiling spanning between ceiling support channels. Attached fixture through ceiling to carrying channels. In addition, provide for each light fixture four #14 earthquake chains or #12 wires installed taut from metal carrying channels to structural members above suspended ceiling.

F. Surface mounted type fixtures less than 20 pounds installed on suspended ceilings: Provide support frame above suspended ceiling. Attached fixture through ceiling to support frame. In addition, provide for each light fixture two #14 earthquake chains or #12 wires secured located at diagonally opposite fixture corners of plaster frame secured to structural members above suspended ceiling.
G. Surface mounted type fixtures less than 50 pounds designed to be supported from fixture junction box:
   1. Provide hanger bars between structural members. Attach junction box directly to hanger bars.
   2. Attach heavy formed steel straps to the outlet box by means of threaded stems with locknuts, or directly to the outlet box where the light fixture is specifically so designed. Support junction box from structure with 1/4" threaded rod.

H. Pendant mounted type fixtures less than 50 pounds:
   1. For fixtures with rigid pendants, provide swivel ball aligners at canopy.
   2. Where mounted below suspended ceiling, support fixture from structural members above ceiling by means of minimum 1/4" threaded stems with locknuts.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes raceways, fittings, boxes, enclosures and cabinets for electrical wiring.

B. Related Sections
   1. Section 26 05 29 - Hangers and Supports for Electrical Systems
   2. Section 27 05 29 - Hangers and Supports for Communication Systems

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.3 REFERENCES

A. American National Standards Institute (ANSI)
B. National Electrical Manufacturers Association (NEMA)
C. Underwriters Laboratories, Inc. (UL)
D. National Fire Protection Association (NFPA)

1.4 ACTION SUBMITTALS

A. Product Data: For wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
   1. AFC Cable Systems, Inc.
   2. Alflex Inc.
   3. Allied Tube & Conduit; a Tyco International Ltd. Co.
   4. Anamet Electrical, Inc.; Anaconda Metal Hose.
   5. Electri-Flex Company.
   7. Maverick Tube Corporation.
  10. Or Approved Equal.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
   1. Comply with NEMA RN 1.
   2. Coating Thickness: 0.040 inch (1 mm), minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Fittings for EMT:
      a. Material: Steel.
      b. Type: Setscrew. Die Cast fittings are not acceptable.
   2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for
      environmental conditions where installed, and including flexible external bonding jumper.
   3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm),
      with overlapping sleeves protecting threaded joints.

H. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having
   jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect
   threaded conduit joints from corrosion and to enhance their conductivity.

2.2 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways shall be listed and labeled as defined in NFPA 70, by a
   qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Prime
   coated, ready for field painting.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the
      following
      a. Thomas & Betts Corporation.
      c. Wiremold Company (The); Electrical Sales Division.
      d. Or Approved Equal.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the
   following
   1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
   2. EGS/Appleton Electric.
   7. RACO; a Hubbell Company.
   10. Spring City Electrical Manufacturing Company.
B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Metal Floor Boxes:
   1. Material: Sheet metal.
   2. Type: Fully adjustable.
   3. Shape: Rectangular.

F. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, round.
   1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

L. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

M. Gangable boxes are allowed.

N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

O. Cabinets:
   1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.
PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Comply with the following indoor applications: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed, Not Subject to Severe Physical Damage: EMT.
   3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   4. Damp or Wet Locations: GRC.
   5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in damp or wet locations.

B. Minimum Raceway Size: 1/2-inch (16-mm) trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
   3. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10. Cast metal fittings are not acceptable.
   4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm) of enclosures to which attached.

I. Raceways Embedded in Slabs:
1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

J. Stub-ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

O. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Q. Surface Raceways:
1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

R. Expansion-Joint Fittings:
1. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
2. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

S. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
T. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

U. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

V. Locate boxes so that cover or plate will not span different building finishes.

W. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

X. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Y. Set metal floor boxes level and flush with finished floor surface.

Z. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07 Section 07 84 00 "Firestopping."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Equipment identification nameplates.
   2. Identification for conductors, cables AC and MC cables
   3. Identification for raceways.
   4. Warning labels and signs.
   5. Instruction signs.
   6. Receptacle Identification Labels
   7. Miscellaneous identification products.

1.2 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A13.1 "Scheme for Identification of Piping Systems"


1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.


D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Note that equipment names and room numbers shown on the Contract Drawings may not be final names and numbers. Confirm all final naming prior to label manufacture.
C. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

D. Coordinate installation of identifying devices with location of access panels and doors.

E. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT NAMEPLATES

A. Materials:
   1. Engraved plastic laminate - three-layer laminated plastic with punched or drilled holes for screw mounting

B. Dimension
   1. Nameplate minimum of 1 3/4" high by 5" wide.
   2. Lettering height for panel or equipment identifier @ 1/4".
   3. Lettering height for remaining lines @ 1/8" high with 1/8" spacing between lines.
   5. Emergency System: White letters on red background.
   7. Critical Branch System - White letters on red background.
   8. Equipment Branch System – White letters on red background.
   9. Optional Standby Branch System - White letters on red background

C. Panelboard Nameplates
   1. Provide engraved plastic nameplate for each new panelboard with the following information:

   Line 1: Panelboard Name
   
   Line 2: Source from which panel is fed (e.g. Fed From SWBD 4N2A)
   
   Line 3: Transfer switch from which panel is fed (if applicable)
   
   Line 4: Amps, voltage, phase and wire

D. Disconnects, Starters, Combination Starters and Other Devices
   1. Provide phenolic nameplate for each device with the following information:

   Line 1: Load served
   
   Line 2: Panelboard and circuit number from which device is fed
   
   Line 3: Fuse size or breaker size as applicable

2.2 CONDUCTOR AND CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each conductor and cable size.
2.3 WARNING LABELS AND SIGNS


B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

2.4 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
   3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. In Spaces Handling Environmental Air: Plenum rated.

G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.
3.2 **EQUIPMENT IDENTIFICATION:**

A. On each unit of equipment, install unique designation nameplate that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual.

B. In addition to equipment listed in Part 2 provide nameplates for:
   1. Access doors for concealed electrical devices
   2. Enclosed over-current protective devices
   3. Electrical cabinets, enclosures and terminal cabinets

C. Confirm all final naming prior to label manufacture.

D. Labeling Instructions:
   1. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label.
   2. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   3. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

3.3 **CIRCUIT CONDUCTOR IDENTIFICATION**

A. Power-Circuit Conductor Identification, 600 V or Less:
   1. For conductors in pull and junction boxes, use color-coding conductor tape to identify the phase.
   2. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for branch-circuit conductors.
      a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
      b. Colors for 208/120-V Circuits:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral: White
         5) Equipment Ground: Green
         6) Isolated Ground: Green with yellow tracer
      c. Colors for 480/277-V Circuits:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
         4) Neutral: Gray
         5) Equipment Ground: Green
         6) Isolated Ground: Green with yellow tracer
   d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

B. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

3.4 RACEWAY IDENTIFICATION

A. Junction Box Color Coding

1. Color Code all junction and pull boxes installed in accessible ceiling spaces and exposed in unfinished areas using spray paint on the box and entire cover in the following manner:

<table>
<thead>
<tr>
<th>System</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>480 Volt Power</td>
<td>Brown</td>
</tr>
<tr>
<td>277 volt lighting</td>
<td>Yellow</td>
</tr>
<tr>
<td>120/208 volt</td>
<td>Unpainted</td>
</tr>
<tr>
<td>Emergency Power</td>
<td>Orange</td>
</tr>
<tr>
<td>Fire Alarm</td>
<td>Red</td>
</tr>
<tr>
<td>Telephone</td>
<td>Black</td>
</tr>
<tr>
<td>Nurse Call</td>
<td>Light Blue</td>
</tr>
<tr>
<td>Public Address</td>
<td>Silver</td>
</tr>
<tr>
<td>Television</td>
<td>Gold</td>
</tr>
<tr>
<td>Access Control</td>
<td>Gray</td>
</tr>
</tbody>
</table>

2. Use black felt tip marker following painting to indicate the circuit numbers in 1” (25mm) high letters contained within.

3.5 WARNING SIGNS

A. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
   a. Power transfer switches.
   b. Controls with external control power connections.

END OF SECTION
ELECTRICAL PANEL BOARD SCHEDULE

8A SECTION 2 (Page 2)

8B (Page 3)

8L (Page 4)

8YA (Page 5)
<table>
<thead>
<tr>
<th>#</th>
<th>Description</th>
<th>Load</th>
<th>CB *</th>
<th>A B C</th>
<th>CB *</th>
<th>Load</th>
<th>Description</th>
<th>#</th>
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<th>NEC Demand Factor</th>
<th>Demand KVA</th>
<th>Demand Amps</th>
<th>NEC Feeder Factors</th>
<th>NEC Feed Amps</th>
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* Circuit Breaker Code
G = GFCI
H = HID Rated
S = Shunt Trip
C = HACR Rated
D = Switching Duty
A = AFCI

# = see note

Notes:

**NOTE 1: PROVIDE NEW CIRCUIT BREAKER**

- **Project #:**
- **File:** R:\client\HMC\PANELS LOAD INFO\HMC Panels - Most Recent.PNL
- **Notes:**
- **Recorded Demand:**
  - **Demand KVA:** 138.25
  - **Demand Amps:** 384

---

HMC PANEL SCHEDULES

Shpnl3ph.rpt
3/25/2020

R:\client\HMC\PANELS LOAD INFO\HMC Panels - Most Recent.PNL
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<th>#</th>
<th>Description</th>
<th>Load</th>
<th>CB *</th>
<th>A</th>
<th>B</th>
<th>C</th>
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<td>CB</td>
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<td>Equip 8EH CORR A WATER FOUNTAIN</td>
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<td>G</td>
<td>*</td>
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Revised circuits marked † Existing circuits marked ‡

### Notes
General Electric Type NLAB Style 5

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<th>Load Type</th>
<th>Conn KVA</th>
<th>NEC Demand Factor</th>
<th>Demand KVA</th>
<th>Demand Amps</th>
<th>NEC Feeder Factors</th>
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* Recorded Demand calculated as 22.52kVA x 100% S.A.F. x 100% O.A.F.

27.02 75 Amps 27.02 75
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Revised circuits marked ‡ Existing circuits marked †

Notes: General Electric Type NHB Style 2, 100A, 100A Neutral, GE TED Breakers

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* Recorded Demand calculated as 28.89kVA x 100% S.A.F. x 100% O.A.F.

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Load Type | Conn KVA | NEC Demand Factor | Demand KVA | Demand Amps | NEC Feeder Factors | NEC Feed Amps
---|----------|-------------------|------------|-------------|-------------------|-----------------|
Recept    | 3.42     | 10 KVA @ 100%, rest @ 50% | 3.42       | 9           | x 100%            | 9               |
Equip     | 2.77     | x 100%             | 2.77       | 8           | x 100%            | 8               |
Recorded Demand | 5.93 | x 100%             | 5.93       | 16          | x 125%            | 21              |

* Recorded Demand calculated as 5.93kVA x 100% S.A.F. x 100% O.A.F.
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following lighting control devices:
   1. Indoor occupancy sensors

B. Related Sections include the following:
   1. Section 26 05 19 Copper Conductors and Cables
   2. Section 26 27 26 Wiring Devices for light switches and wall-box dimmers
   3. Section 26 51 19 Interior Lighting

1.2 DEFINITIONS

A. LED: Light-Emitting Diode.

B. PIR: Passive Infrared.

C. PDT: Passive Dual Technology.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 26 05 00 - Common Work Results For Electrical.

B. Product Data: Provide clearly marked and legible data sheets for each item of equipment being installed on the project. This shall include each major replaceable component that is part of a larger assembly. Data sheets should clearly indicate:
   1. Equipment manufacturer, make, model number, size, nameplate data, etc.
   2. Dimensional and performance data for specific unit provided as appropriate
   3. Required environmental operating parameters
   4. UL, FM and ETL listing and category
   5. Manufacturer contact information including address, telephone number, facsimile number, email address, web site address and contact person or persons.
   6. Local manufacturer's representative contact information including address, telephone number, facsimile number, email address, web site address and contact person or persons.

C. Shop Drawings: Show installation details for occupancy and light-level sensors.
   1. Lighting plan showing location, orientation, and coverage area of each sensor. This plan shall take into consideration the size and use of each space as well as the specific capabilities of submitted manufacturer's equipment to provide proper coverage to the areas of control.
   2. Interconnection diagrams showing field-installed wiring.

D. Label List: Submit list of proposed text for all labels prior to manufacturing for review and approval by Owner's representative.

E. Warranty: Submit a copy of product warranty that complies with contract document requirements. Where these requirements exceed manufacturers' standard warranty include cost of extended warranty in contract price.
F. Maintenance Requirements: Submit maintenance requirements manual or guidelines. This document should detail the requirements necessary to comply with the warranty. This is required for the submittal process and is in addition to the O&M requirements.

G. Samples: Provide sample devices and finishes plus other samples when requested, as part of the submittal process.

H. Commissioning Checklist: Submit a copy of the proposed commissioning checklist to be utilized for this project.

I. Commissioning Results: Submit a copy of the completed commissioning documents.

1.4 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate with system manufacturer to provide equipment which will most effectively control lighting within designated spaces. Contractor and equipment manufacturer are responsible for providing equipment which takes into consideration the size and occupant use of the space, and any other limiting factors in the field to properly control these areas.

1.5 QUALITY ASSURANCE

A. Qualifications
   1. Manufacturer shall have been in the business of manufacturing and providing service for lighting control equipment for similar capabilities and size, under the same name and ownership, for a minimum of three years preceding bid date of the project.
   2. All components and assemblies shall be factory pre-tested prior to installation.
   3. Factory trained technicians shall be on site for start-up, commissioning and training.
   4. Factory trained technicians shall be available for telephone support twenty-four (24) hours a day, seven (7) days a week.

B. Regulatory Requirements

1.6 WARRANTY

A. Manufacturer's Warranty: The manufacturer shall provide a written warranty agreeing to provide parts to replace any portion of the lighting control system equipment that fails due to material or workmanship for a period of twelve months from warranty commencement.

B. Warranty Commencement: Warranty shall begin at the point of substantial completion of the system installation, which is defined as the date when commissioning and owner training has been completed and the owner obtains beneficial use of the system.

C. Warranty Replacement Parts: The manufacturer shall be able to ship replacement parts within 24 hours for any component that that fails due to material or workmanship during the warranty period.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the contract documents, provide products from one of the following manufacturers:
   1. Hubbell
   2. Leviton
   3. Lithonia Lighting
   4. Pass & Seymour/ Legrand
   5. SensorSwitch
   6. Watt Stopper (The)
   7. Or approved equal.

2.2 INDOOR OCCUPANCY SENSORS

A. General Operation
   1. The Occupancy Sensor system shall sense the presence of human activity within the desired space and fully control the on/off function of the loads automatically, set to MANUAL ON, AUTO OFF for vacancy sensing. Sensors shall turn on the load within 2 feet of entrance and shall not initiate "on" outside of entrance. Sensors shall be dual technology type.
   2. Sensing technologies shall be completely passive in nature, in that the occupancy sensor system shall not emit or interfere with any other electronic device, or human characteristic. Acceptable known technologies are Passive Infrared (PIR), or Micro phonic.
   3. Upon detection of human activity by the detector, a Time Delay shall be initiated to maintain the light on for a field adjustable pre-set period.
   4. Mounting
      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
      c. Time Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
   5. Line Voltage Sensors
      a. Sensor shall be a self-contained dual voltage device capable of directly switching loads upon detection of human activity.
      b. Sensor must be rated for 800 watts at 120 VAC, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/6 hp motors or rated for 1000 watts at 277 VAC, suitable for fluorescent light fixtures with magnetic or electronic ballasts, or 1/3 hp motors minimum. Sensor shall be capable of parallel wiring for 3-way switching applications.
      c. Sensor Time Delay shall be factory set for typical applications, and field adjustable from 30 seconds to 20 minutes. Sensor must provide a green LED motion indicator.
   6. Low Voltage Sensor
      a. Sensors must be designed to work in conjunction with remote power packs, relays, or other control systems. Sensors must operate with a Class 2, low voltage wiring strategy. Sensors must be capable of being parallel wired for multi-sensor applications.
      b. Sensor must provide a transistor output, returning the voltage input rectified to DC, to control remote power packs, relays, or other control systems. Sensor must have optional single pole, double throw signal relay capable of being wired open
on occupancy, or closed on occupancy. Sensor Time Delay shall be factory set for typical applications, and field adjusted during commissioning.

7. System components shall be selected to provide full coverage of the intended area in the manner intended. This design should use any variety of sensors to accomplish this task, and shall be designed based on field conditions present at the time of installation.

B. Ceiling Occupancy Sensors
1. General
   a. Sensor shall be circular ceiling mounted device, mounted to a single gang enclosure.
   b. Time delay shall be set during commissioning and field adjustable.
   c. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
   d. Bypass Switch: Override the "on" function in case of sensor failure.
   e. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s). Detection Coverage
      1) Small Room: Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
      2) Standard Room: Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
      3) Large Room: Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
      4) Corridor: Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).

2. Passive Infrared (PIR) Technology
   a. PIR sensing, incorporating a combination of heat and movement sensing to detect occupancy in the area of coverage.
   b. PIR sensing must utilize a high-density Fresnel domed lens, providing a circular view pattern of 360 degrees.
   c. Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in.

3. Dual Technology (DT)
   a. Sensing must incorporate PIR with Ultrasonic. Both PIR and Ultrasonic motion sensing shall initiate an ON condition and either technology sending motion shall keep the ON state.

2.3 POWER PACKS AND SLAVE PACKS

A. Power Packs and Slave Packs must be designed to power and accept signals from remote Low Voltage Sensors, or other control devices, and directly switch the line voltage of the desired load controlled.

B. Power Packs shall accept 120, 240, or 277 VAC utilizing a dual tap transformer.

C. Power Pack and Slave Pack relay switching shall not require more than 3 milliamps of current at 15 to 30 VDC.

D. Power Pack and Slave Pack relay switching shall be performed with a mechanical relay in parallel with an AC Semiconductor to allow relay contacts to switch under a no-load condition. Switching capacity shall be 20 amps of all types of loads: Incandescent, Electronic Ballast, Magnetic, or Motor.
E. Power Packs shall be available in combination 2-Pole units capable of switching two independent loads, 20 amps each.

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG, complying with Section 26 05 19 - Copper Conductors and Cables.

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 22 AWG, complying with Section 26 05 19 - Copper Conductors and Cables.

C. Class 1 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 18 AWG, complying with Section 26 05 19 - Copper Conductors and Cables.

D. Install unshielded, twisted-pair cable for control and signal transmission conductors, complying with Section 26 05 19 - Copper Conductors and Cables.

E. Cabling which is not installed in conduit or raceway shall be plenum rated.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Install sensors in accordance with manufacturer's instructions. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Section 26 05 19 - Copper Conductors and Cables.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Section 26 05 53 - Identification For Electrical Systems.

B. Label time switches and contactors with a unique designation.
3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. After installing time switches and sensors, and after electrical circuitry has been
      energized, adjust and test for compliance with requirements.
   2. Operational Test: Verify actuation of each sensor and adjust time delays.

B. Remove and replace lighting control devices where test results indicate that they do not
   comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine
   compliance of replaced or additional work with specified requirements.

3.5 SYSTEM STARTUP AND COMMISSIONING

A. Commissioning shall take place prior to demonstration of system to Owner. After the system
   has been installed the Contractor shall provide manufacturer's recommended commissioning
   with factory trained and authorized technicians on-site, to:
   1. Verify that the contractor has properly installed and interconnected all necessary
      components.
   2. Verify correct operation of all system components.
   3. Verify that all switch and contact inputs are in compliance with contract requirements.
   4. Occupancy sensors: Ensure that each sensor is correctly placed and oriented to provide
      the intended function. Adjust sensor location if unanticipated obstructions are present
      that impede the proper operation of the device.
   5. Occupancy Sensors: Adjust sensitivity and time delay of the occupancy sensor and test
      to ensure it provides appropriate response. Set initial time delay for 15 minutes. Set to
      MANUAL ON, AUTO OFF for vacancy sensing.
   6. Dual Technology Type Occupancy Sensors: If interferences occur, disable either PIR or
      ultrasonic technology as appropriate for application.
   7. Submit completed verification checklist.

3.6 OWNER'S INSTRUCTIONS AND SYSTEM DEMONSTRATION

A. System Demonstration
   1. Schedule demonstration a minimum of two-weeks prior to system turn over and
      substantial completion. Schedule with owner's representative and electrical engineer.
   2. Demonstrate complete system operation and contract compliance to designated owner's
      representative and engineer to prove system is functional and ready for comprehensive
      training.

B. System Instruction
   1. The Contractor shall after one week (minimum) written notification to Architect conduct an
      instruction session during which all maintenance and operational aspects of the system
      will be described and demonstrated to personnel selected by the Owner. The session
      shall be conducted by a Contractor's representative thoroughly familiar with the
      characteristics of the system. O & M manual information regarding the system shall be
      turned over to the Architect prior to scheduling the instruction session.
   2. Training shall utilize the following draft documents:
      b. Contractor's record drawings
   3. The training effort shall validate the O&M Manual and record drawing documentation.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. SVR: Suppressed voltage rating.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 26 05 00 - Common Work Results For Electrical.

B. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

C. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   a. Verify space available with equipment sizes and code required working clearances prior to submitting shop drawings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   6. Include wiring diagrams for power, signal, and control wiring.

D. Field Quality-Control Reports:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Panelboard Schedules: For installation in panelboards.

F. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
B. **Product Selection for Restricted Space:** Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. **Electrical Components, Devices, and Accessories:** Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.5 **COORDINATION**

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.6 **WARRANTY**

A. Provide certified letter from manufacturer indicating availability of replacement parts for a minimum period of ten (10) years.

**PART 2 - PRODUCTS**

2.1 **MANUFACTURER**

A. Square D. No substitutions.

2.2 **GENERAL REQUIREMENTS FOR DISTRIBUTION, LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS**

A. Enclosures: Flush or surface-mounted cabinets, as indicated on drawings or panel schedules.
   1. Rated for environmental conditions at installed location.
   2. Indoor Dry and Clean Locations: NEMA 250, Type 1.
   3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Key identically.
   4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
   5. Where two cabinets are located adjacent to each other in finished areas, provide matching trim, same height.
   6. Where remote controlled switch or contactor is mounted in panelboard, mount on same frame as panelboard interior, with dedicated access door and key lock.
   7. Finishes:
      a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

B. **Incoming Mains Location:** Top or bottom, as determined by contractor unless noted otherwise.
C. Phase, Neutral, and Ground Buses:
   2. Panelboards shall have full ampacity bussing throughout and shall be full size in regard to number of possible pole spaces. Bussing shall be identified with phases reading left to right.
   3. Neutral bus shall be mounted independently of equipment ground bus, and in no case shall neutral bus be used as equipment ground bus, or vice versa.
   4. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box and located on back of panelboard. Shall have lug or lugs from equipment grounding conductor from switchboard or distribution board and screw type terminals for connection of equipment green ground wire in same quantity as number of poles in panel.
   5. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.

D. Conductor Connectors: Suitable for use with conductor material and sizes.
   2. Main and Neutral Lugs: Compression type.
   3. Ground Lugs and Bus-Configured Terminators: Mechanical type, UL listed for both steel and aluminum.
   4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
   5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
   6. Gutter-Tap Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
   7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

F. Panelboards rated for 400 amps and above shall accept 225 amp frame circuit breakers.

G. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

   1. Minimum interrupting ratings shall be 14,000 (RMS Symmetrical) at 480/277V and 10,000 (RMS Symmetrical) at 208/120V unless noted otherwise on panel schedule.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replaceable electronic trip; and the following field-adjustable settings:
   4. Instantaneous trip.
      a. Long- and short-time pickup levels.
      b. Long- and short-time time adjustments.
      c. Ground-fault pickup level, time delay, and I²t response.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
   8. Standard frame sizes, trip ratings, and number of poles.
      a. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
      b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
      c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
      d. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

B. Circuit breakers shall be the same manufacturer as panelboard.

C. Where spare is indicated, panelboard shall be provided with the specified branch circuit breaker, full ampacity bussing and mounting hardware. Where space is indicated, panelboard shall be provided with full ampacity bussing and mounting hardware to accommodate future installation of branch circuit breaker.

2.4 NAMEPLATES

A. Engraved nameplates per Section 26 05 53 - Identification for Electrical Systems permanently attached to panelboard front. Include panel name with 1/4" letters, area served, voltage, phase and wire (e.g., 2N1, 208Y/120, 3 phase, 4 wire, 480Y/277, 3 phase, 4 wire) in 1/8 inch characters. When project has more than one switchboard include switchboard fed from (e.g., Fed from SWBD. 4BP).

B. Nameplate color: Normal system - white letters on black.

C. Emergency system - white letters on red.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. Install panelboards and accessories according to NECA 407.

B. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Panelboards installed recessed in fire rated walls shall be adequately boxed or backed with fire rated material and shall be approved by Fire Marshal. The final construction shall equal or exceed fire rating of the wall.

E. Locate in dedicated spaces. Coordinate project construction so piping, ducts, etc. are routed around dedicated spaces above and in front of panelboards per code.

F. Verify space available with equipment sizes and code required working clearances prior to installation.

G. Install overcurrent protective devices and controllers not already factory installed.

H. Install filler plates in unused spaces.

I. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.

J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

K. Comply with NECA 1.

3.3 WIRING

A. Conform to applicable sections of these specifications and NEMA PB 1.1. Conductors and terminations per Section 26 05 19 Low Voltage Electrical Power Conductors and Cables. Coverplates in open knockouts.

B. Panelboards shall be wired and connected after installation at locations shown. Pre-wiring off site and splicing of branch circuit in wireway above or below panelboard is not permitted.

3.4 CIRCUIT INDEX AND LABELS

A. Typed circuit index with odd circuits on left, even circuits on right, listing each circuit by number with complete load designation, (i.e. Receptacle room , lights room , etc.). Room names/numbers per actual room identification assigned by owner at project completion (assigned room numbers may differ from drawings). Mount inside door with transparent protective cover. Provide number labels on circuit breakers to match index.

B. Install nameplate as per Part 2.

3.5 GROUNDING

A. Provide per Section 26 05 26 - Grounding and Bonding for Electrical Systems.
3.6 CABINET PAINTING

A. Cabinets furnished prime painted: Field paint to match wall color. (See Division 9 Painting).

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Perform the following infrared scan tests and inspections and prepare reports:
   4. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
      a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
      b. Instruments and Equipment:
          1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.8 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

3.9 CLEANING

A. Prior to final inspection, clean panelboard interiors, adjust trims, covers, hinges and locks and refinish marred or scratched covers to original conditions. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.10 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
   A. This section includes switches, receptacles, dimmers, and device plates.

1.2 REFERENCES
   A. National Electrical Manufacturers Association (NEMA).
   B. Underwriters Laboratories (UL).

1.3 DEFINITIONS
   A. EMI: Electromagnetic interference.
   B. GFCI: Ground-fault circuit interrupter.
   C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
   D. RFI: Radio-frequency interference.
   E. TVSS: Transient voltage surge suppressor.
   F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS
   A. Coordination:
   B. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.5 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

1.6 INFORMATIONAL SUBMITTALS
   A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For wiring devices to include in all manufacturers’ packing-label warnings and instruction manuals that include labeling conditions.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers’ Names: Shortened versions (shown in parentheses) of the following manufacturers’ names are used in other Part 2 articles:
   1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
   2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
   5. Watt Stopper.
   6. Or Approved Equal.

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Hubbell; SNAP8300IA, SNAP8300RA and connection kit SNAP6R2.

B. USB Hospital-Grade, Decorator Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Hubbell; SNAP8300USB1 and connection kit.
      2. Two USB ports 3A, 5V DC, Type A, Class 2.0.
      3. Green LED indicator to show USB power available.
      4. Tamper-Resistant decorator duplex receptacle.

C. Tamper-Resistant Hospital-Grade Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Hubbell; SNAP8300ITRA and connection kit.
      b. Description: Labeled shall comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.
D. **Ground Fault Circuit Interrupter Receptacles (GFCI):** Heavy Duty Hospital grade, NEMA 5-20R configuration, duplex receptacle with 4 - 6 milliamps leakage current trip level. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Hubbell; GFRST83SNAPI and connection kit.
   2. Tamper resistant.

2.4 **TOGGLE SWITCHES**

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Single Pole:
         1) Cooper; AH1221.
         2) Hubbell; HBL1221.
         3) Leviton; 1221-2.
         4) Pass & Seymour; CSB20AC1.
         5) Or approved equal.
      b. Three Way:
         1) Cooper; AH1223.
         2) Hubbell; HBL1223.
         3) Leviton; 1223-2.
         4) Pass & Seymour; CSB20AC3.
         5) Or approved equal.

2.5 **WALL-BOX DIMMERS**

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. **LED Lamp Dimmer Switches:** Modular; compatible with dimmer ballasts and drivers; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 10 percent of full brightness. Dimmer shall fit in a standard rectangular decora screw less wall plate and gang with other stand-ard switches and receptacles utilizing standard decora screw less style faceplates. Manufacturer: Lutron Diva Series 0-10V DVSTVWH or approved equal.

2.6 **COLOR**

A. Ivory for receptacle faces except as follows;
   1. Red for emergency circuits.

2.7 **WALL PLATES**

A. Single and combination types shall match corresponding wiring devices.

B. **Plate-Securing Screws:** Metal with head color to match plate finish.

C. **Material for Finished Spaces:** 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stain-less steel.
D. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.

2.8 FINISHES

A. Device Color: Wiring device catalog numbers in section text do not designate device color.

B. Wiring Devices Connected to Normal Power System: Ivory unless otherwise indicated or required by NFPA 70 or device listing.

C. Wiring Devices Connected to Emergency Power System: Red.

D. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Existing Conductors:
   1. Cut back and pigtail or replace all damaged conductors.
   2. Straighten conductors that remain and remove corrosion and foreign matter.
   3. Pigtauling existing conductors is permitted, provided the outlet box is large enough.

E. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
   5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No.
   12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold de-
   vice-mounting screws in yokes, allowing metal-to-metal contact.

F. Receptacle Orientation:
   1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted
      receptacles to the right.
   2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral
      blade at the top.

G. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and re-mount
   outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

H. Dimmers:
   1. Install dimmers within terms of their listing.
   2. Install unshared neutral conductors online and load side of dimmers according to
      manufacturers’ device listing conditions in the written instructions.

I. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical
   and with grounding terminal of receptacles on top. Group adjacent switches un-der single,
   multi-gang wall plates.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is
   not required.

3.3 IDENTIFICATION

A. Comply with Division 26 Section 26 05 53 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or
   engraved machine printing with black filled lettering on face of plate, and durable wire markers
   or tags inside outlet boxes.

C. Engrave emergency receptacle device plates with "EMERGENCY" above the receptacle with
   the panelboard and circuit number supplying them engraved below the receptacle. Engraving
   shall be approximately 3/16" high, red filled characters.

D. Engrave normal receptacle coverplates in Critical Care Areas as defined in the NEC, with the
   circuit number supplying them below the receptacle with 3/16" high, black filled letters.

E. For all receptacles other than 15 and 20 amp, 120 volts, engrave coverplate or provide separate
   nameplate with ampere rating, voltage and phase.

F. The electrical Contractor shall be responsible to have faceplates on all Owner furnished
   equipment and equipment furnished under other divisions engraved with circuit number, and
   "EMERGENCY" (where applies) as specified in this section. This includes but is not limited to:
   headwalls, gas columns and booms, patient consoles, medical rail systems, custom casework
   with electrical devices, etc.
3.4 ENGRAVING

A. Engrave coverplates on all Owner furnished equipment and equipment furnished under other divisions with circuit number, panelboard and “emergency” (where applies) as specified in this section. This includes but is not limited to: headwalls, gas columns and booms, patient consoles, medical rail systems, custom casework with electrical devices, etc.

3.5 DIMMERS

A. Install wall box dimmers to achieve circuit rating after de-rating for ganging as required by manufacturer.

B. Do not share neutral conductor on load side of dimmers.

3.6 CLEANING

A. Remove excess plaster from interior of outlet boxes.

B. Clean devices and coverplates after painting is complete. Replace stained or improperly painted devices or coverplates.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections.
   1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
   2. Test Instruments: Use instruments that comply with UL 1436.
   3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Receptacle Polarity Test: Test every receptacle installed or reconnected under this contract with a receptacle circuit tester. Tester shall test for open ground, reverse polarity, open hot, open neutral, hot and ground reversed, hot or neutral and hot open. Rewire receptacles with faults and retest. Submit statement of completed testing signed by the electrician that performed the test.
   6. Ground-Fault Receptacle Circuit Interrupter Tests: Test each receptacle or branch circuit breaker having ground-fault circuit protection to assure that the ground-fault circuit interrupter will not operate when subjected to a ground-fault current of less than 4 milliamperes and will operate when subjected to a ground-fault current exceeding 6 milliamperes. Perform testing using an instrument specifically designed and manufactured for testing ground-fault circuit interrupters. Apply the test to the receptacle. "TEST" button operation will not be acceptable as a substitute for this test. Replace receptacles that do not shutoff power with 7/1000 of an ampere within 1/40th of a second and retest.
   7. Using the test plug, verify that the device and its outlet box are securely mounted.
   8. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
C. Test straight-blade hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Molded-case circuit breakers (MCCBs).
   2. Enclosures.

B. Provide all disconnects required by code for equipment furnished under this and other Divisions of these specifications unless disconnects are integral with equipment and acceptable to the authority having jurisdiction.

1.2 REFERENCES

A. National Electrical Manufacturers Association (NEMA)

B. Underwriters Laboratories (UL)

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 26 05 00 - Common Work Results For Electrical.

B. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

C. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

D. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper/Bussman
   2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   5. Square D; a brand of Schneider Electric.
   6. Or Approved Equal

2.2 MOLDED-CASE CIRCUIT BREAKERS

A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.


C. Features and Accessories:
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.

2.4 NAMEPLATES

A. Provide nameplates per Section 26 05 53 - Identification For Electrical Systems.

B. Provide permanently attached nameplates (with mechanical fasteners) constructed of plastic (black on white) laminated material engraved through black surface material to white sublayer. Exception: Emergency distribution system component labeling - white letters on red background.

C. Include the following information: Load name, voltage and phase and fuse size and type (when applicable).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers level and plumb according to manufacturer’s written instructions.

B. Securely mount adjacent to equipment on wall or acceptable mounting frame. Disconnect switches shall be mounted independent from the equipment they serve. Disconnects supported only by raceway are not acceptable.

C. Wiring space within Disconnects, Fused Switches or Enclosed Circuit Breakers shall not be used for splices.

D. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. Where manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

F. Install fuses in fusible devices.

G. Comply with NECA 1.
3.3 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

3.4 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 - Identification For Electrical Systems.
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Perform the following infrared scan tests and inspections and prepare reports:
      a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
      b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
      c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Interior lighting fixtures, lamps, and drivers.
   2. Lighting fixture supports.

B. Related Requirements:
   1. Section 262726 "Wiring Devices" for manual wall-box dimmers and switches.

C. Substitutions:
   1. Bidders requesting approval to provide products other than those specifically listed in the Light Fixture Schedule shall submit requests in writing to the Architect and Lighting Designer ten days prior to the close of the bid period. Approval will be in the form of an addendum to the specifications issued to all registered plan holders. No requests for substitution will be considered after this date.
   2. Substitution request shall include all information required under paragraph 1.5 SUBMITTALS. Requests for approval shall be accompanied by a working fixture sample (including lamps and a cord and plug). Provide the name of at least one installation where each proposed substitute has been installed for at least six months along with the name and phone number of the Architect, Owners representative and the Lighting Designer of Record. If required by the Architect, the proposed substitutes must be installed at the bidder's expense in a location selected by the Architect.

1.3 REFERENCES

A. National Electrical Manufacturer’s Association (NEMA) LE5-1993:
   1. Procedure for determining Luminaire efficiency ratings.

B. Underwriters Laboratories, Inc. (UL):
   UL 496: Edison Base Lampholders
   UL 676: Underwater Lighting Fixtures
   UL 1012 Power Units Other Than Class 2
   UL 1310 Class 2 Power Units
   UL 1574: Track Lighting Systems
   UL 1598 Luminaires

1.4 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."
D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. LER: Luminaire efficacy rating

G. Lumen: Measured output of lamp and luminaire, or both.

H. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.5 SYSTEM DESCRIPTION

A. Light fixture schedule series numbers are a design series reference and do not necessarily represent the exact catalog number, size, voltage, wattage, type of lamp, driver, finish trim, ceiling type, mounting hardware, ceiling trim or special requirements as specified hereinafter or as required by the particular installations. Provide complete fixtures to correspond with the number of lamps, wattage and/or size specified.

B. If there are discrepancies between fixture illustrations and the written description in the fixture schedule, the written description in the fixture schedule shall take precedence.

C. Light fixture voltage shall match voltage of circuit serving the light fixture.

1.6 SUBMITTALS

A. Product Data: For each type of product.
   1. Arrange in order of luminaire designation.
   2. Include data on features, accessories, and finishes.
   3. Include physical description and dimensions of luminaires.
   4. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
   5. Photometric data and adjustment factors based on laboratory tests, complying with IES LM-79 and IES LM-80.
      a. Manufacturers’ Certified Data: Photometric data certified by manufacturer’s laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
      b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.
   1. Include plans, elevations, sections, and mounting and attachment details.
   2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.

C. Sustainable Design Submittals:
   1. Product Data: Indicating luminaire is certified by ENERGY STAR, Design Lights Consortium.

D. Samples: For each lighting fixture if indicated in the Lighting Fixture Schedule. If indicated, each sample shall include the following:
   1. Lamps, LED boards and drivers, installed
   2. Cords and plugs
1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
   1. Provide a list of all lamp types used on Project; use ANSI and manufacturers’ codes.
   2. Provide cut sheets of all fixtures and control devices.
   3. Provide instruction manuals for all control systems.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer’s laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Comply with NFPA 70.

G. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

H. Mockups: Provide lighting fixtures for room or module mockups if required in Architect’s documents, complete with power and controls.
   1. Obtain Architect’s approval of luminaires in mockups before starting installations.
   2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Special warranty 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.  
   1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event.

C. Ambient Temperature: 41 to 104 deg F (5 to 40 deg C), 5 to 104 deg F (Minus 15 to plus 40 deg C).  
   1. Relative Humidity: Zero to 95 percent.

2.2 GENERAL MATERIAL REQUIREMENTS

A. Metal Parts:  
   1. Free of burrs and sharp corners and edges.  
   2. Sheet metal components shall be steel unless otherwise indicated.  
   3. Form and support to prevent warping and sagging.

B. Steel:  
   1. ASTM A36/A36M for carbon structural steel.  
   2. ASTM A568/A568M for sheet steel.

C. Stainless Steel:  
   1. Manufacturer's standard grade.  
   2. Manufacturer's standard type, ASTM A240/240M.

D. Galvanized Steel: ASTM A653/A653M.

E. Aluminum: ASTM B209.

F. Finish ferrous mounting hardware and accessories to prevent corrosion and discoloration to adjacent materials.

G. For vapor tight installations, painted finishes of fixtures and accessories shall be weather resistant enamel using proper primers or galvanized and bonderized epoxy, so that the entire assembly is completely corrosion resistant for the service intended. Where aluminum parts come into contact with bronze or steel parts, apply a coating material to both surfaces to prevent corrosion.

H. Fixtures shall be free of light leaks and designed to provide sufficient ventilation of electronic parts to provide the photometric performance required. Drivers shall be adequately vented.

I. All sheet metal work shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal. Intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion
after assembly. Finish exposed edges so no sharp or ragged edges are exposed. All miters shall be in accurate alignment with abutting intersecting members.

J. For fixtures with replaceable lamps: lampholders shall hold lamps securely against vibrations and maintenance handling.

K. Reflector Cones:
   1. Provide minimum 45° lamp and lamp image cut-off to light source. No visible lamp flashing in the cone.
   2. Plastic materials shall not be used for reflector cones, unless noted otherwise in the Light Fixture Schedule.
   3. Reflector cones shall not be riveted or welded to housing and shall be removable without tools. Retention devices shall not deform the cone in any manner. Trim shall be flush with finished ceiling without gaps or light leaks. Where the flange trim is separate from the cone, it shall have the same finish as the cone.
   4. Reflector cones shall be of uniform gauge, not less than 0.032-inch thick, high purity aluminum Alcoa 3002 alloy, free of spin marks or other defects.
   5. Manufacture reflector under the Alzak process. Refer to fixture schedule for cone color and specular or diffuse finish requirements. Submit one sample of each cone type for review when required in the fixture schedule.

L. For adjustable fixtures, provide positive locking devices to fix aiming angle. Fixture shall be capable of being relamped without adjusting aiming angle.

M. Fixtures recessed in suspended ceilings where the space above the ceiling is either an air supply or return plenum shall conform to NEC Article 300-22.

N. Safety: Provide safety devices for removable fixture elements (cones, reflectors, lenses, etc.) to support removable elements when not in normal operating position. Safety devices shall be detachable if necessary and shall not interfere with fixture performance, maintenance or the seating of any fixture element, and not be visible during normal fixture operation.

O. Fixture Finish: Visible surfaces. Powder coated paint or natural aluminum as specified in Light Fixture Schedule. Color and finish as selected by architect. Concealed parts, (lamp holders, yokes, brackets, etc.) matte black.

P. Off-state Power: Luminaires shall not draw power in the off state. Exception: Luminaires with integral occupancy, motion, photo-controls or individually addressable fixtures with external control and intelligence are exempt from this requirement. The power draw for such luminaires shall not exceed 0.5 watts when in the off state.

2.3 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved samples and if they can be and are assembled or installed to minimize contrast.

2.4 WIRING

A. Wiring shall be as required by code for fixture wiring.

B. Flexible cord wiring between fixture components or to electrical receptacle and not in wire-ways shall have a minimum temperature rating of 105°C.
C. Cords shall be fitted with proper strain reliefs and watertight entries where required by application.

D. No internal wiring shall be visible at normal viewing angles, i.e. above 45° from vertical.

2.5 POWER SUPPLIES

A. Minimum power factor 90%.

B. Minimum operating temperature of -20°C.

C. Output operating frequency shall be minimum 120 Hz.

D. Power supply shall meet FCC requirements for non-consumer use.

E. Sound rating: Class A.


2.6 LAMPS (for fixtures with replaceable lamps)

A. Each lamp type in the Project shall be manufactured by the same manufacturer.
   1. Minimum CRI of 80 with an R9 of 50 or higher unless otherwise specified in the Light Fixture Schedule.
   2. Color temperature variation shall not exceed +/- 100 degrees Kelvin at installation, and +/- 200 degrees Kelvin over the life of the module.
   3. LED modules/arrays shall deliver at least 70% of initial lumens, when installed in-situ, for a minimum of 35,000 hours.

2.7 SOCKETS

A. Porcelain for medium screw base. For other lamp types, as required by base type.

B. Housings:
   1. 1/8-inch (3.175-mm) minimum unless otherwise indicated.

2.8 LUMINAIRE SUPPORT

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68mm).

D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

2.9 SPARE PARTS

A. Provide two spare fixtures of each type in the Project.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Provide mounting accessories and trims for wall and ceiling construction types shown in Finish Schedule and on Drawings.

C. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

D. For fixtures with replaceable lamps, install lamps in each luminaire.

E. Remote Mounting of Drivers: Distance between the driver and fixture not to exceed that recommended by driver manufacturer. Verify requirements for maximum distance between driver and luminaire with driver manufacturers.

F. Verify weight and mounting method of fixtures and provide suitable supports. Fixture mounting assemblies to comply with local seismic codes and regulations.

G. Refer to architectural reflected ceiling plans for coordination of lighting fixture locations with mechanical and fire safety equipment. Where conflicts occur, consult with Architect prior to installing any of the systems.

H. For fire rated ceilings and walls, provide rated enclosure for recessed light fixture, or consult with Architect and Lighting Designer to specify fixture suitable for use in rated ceiling or wall.

I. Install fixtures with vent holes free of air blocking obstacles.

J. Lighting fixtures located in recessed ceilings with a fire resistive rating of 1-hour or more to be enclosed in an approved fire-resistive rated box equal to that of the ceiling.

K. Adjust aperture rings on all recessed fixtures to be flush with the finished ceiling.

L. Adjust variable position lampholders for proper lamp position prior to fixture installation.
M. Blemished, damaged or unsatisfactory fixtures or accessories to be replaced with new.

N. For pendant mounted fixtures, mounting height is from finished ceiling to top of pendant light fixture. For wall mounted fixtures, center on outlet box unless otherwise noted. Verify mounting provisions and other requirements prior to order of light fixtures.

O. In accessible suspended ceilings, provide 72” flexible conduit wiring connection (flexible tubing not permitted) from a rigidly supported junction box.

P. All finishes shall be unmarred upon project completion. Repair or replace damaged finishes.

Q. Replace all burned out or inoperative lamps and LED boards at the end of the construction prior to Owner occupancy. LED boards with visibly different color LEDs will be considered inoperative and require replacement.

3.4 DIFFUSERS AND ENCLOSURES

A. Remove protective plastic covers from lighting fixture diffusers only after construction work, painting and clean-up are completed. Remove all dirty lamps, reflectors and diffusers; clean and reinstall. When cleaning “Alzak” reflectors, use a manufacturer recommended cleaning solution. Reflectors damaged or impregnated with fingerprints shall be replaced at no cost to Owner.

B. Whether surface mounted or recessed, remove all construction dirt and dust from heat sink fins to ensure proper dissipation of heat.

3.5 DOWNLIGHT/ACCENT/WALLWASH LIGHT FIXTURE SUPPORT

A. Recessed Type: Mount in frames suitable for the ceiling, with recessed portion of the fixture securely supported from the ceiling framing. Bottom of light fixture to be flush with adjacent ceiling. Fixture trim shall totally conceal ceiling opening. Provide two #14 earthquake chains or #12 wires when fixture is supported by ceiling suspension system.

B. Provide access as required for driver. Provide earthquake chains when light fixture is supported by the ceiling suspension system. For remote drivers, isolate driver from structure.

3.6 TROFFER AND LINEAR TYPE LIGHT FIXTURE SUPPORT

A. Recessed type: For light fixtures supported by the ceiling suspension system, provide four Caddy #515 support clips (one each corner) which lock light fixture to ceiling tees after light fixture is installed. In addition, provide for each light fixture two #14 earthquake chains or #12 wires secured at diagonally opposite fixture corners (for fixtures weighing less than 56 pounds) to structural members above suspended ceiling. For plaster or gypsum board ceilings provide plaster frame compatible with light fixture. Contractor shall coordinate fixture trim with ceiling type.

3.7 CEILING AND WALL LIGHT FIXTURE SUPPORT

A. Where ceiling and/or wall are of insufficient strength to support weight of lighting fixtures installed, provide additional framing to support as required.

B. Comply with requirements in Section 260519 "Copper Conductors and Cables" for wiring connections.
3.8 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.10 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 260923 "Lighting Control Devices."

3.11 ADJUSTING

A. Focus all adjustable light fixtures under the direction of the Lighting Designer during a scheduled period of time prior to the completion of the project, after normal business hours if required. Include all equipment and personnel expenses (including overtime) required for adjustment.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
   1. Adjust aimable luminaires in the presence of Lighting Designer.
PART 1 - GENERAL

1.1 SUMMARY

A. This section includes general requirements for all Division 27 work and is supplemental and in addition to the requirements of Division 01.

B. It is the intention of this Division of the Specifications and the Contract Drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and fully operational condition all equipment, materials, devices and necessary appurtenances to provide a complete communication system. Provide all materials, appliances and apparatus not specifically mentioned herein or shown on the drawings, but which are necessary to make a complete, fully operational installation of all communications systems shown on the contract drawings or described herein. Connect equipment and devices furnished and installed under other Divisions of this specification (or the Owner) under this Division.

C. Workmanship shall be of the best quality and competent and experienced technicians shall be employed and shall be under the supervision of a competent and experienced foreman.

D. The drawings and specifications are complementary and what is called for (or shown) in either is required to be provided as if called for in both. Where conflicting information occurs within the drawings and specifications or between the drawings and specifications, the more expensive alternative shall be used as a basis for bidding and construction.

1.2 WORK IN OTHER DIVISIONS

A. See all other specifications for other work which includes but is not limited to:
   1. Electrical Wiring and Pathways
   2. Equipment Wiring
   3. Fire Protection
   4. Mechanical Control Wiring
   5. Mechanical Equipment
   6. Painting, Refinishing and Finishes
   7. Temporary Power
   8. Emergency Power

1.3 CODES, PERMITS, INSPECTION FEES

A. The following codes and standards are referenced in the Division 27 specifications. Perform all work and provide materials and equipment in accordance with the latest referenced codes and standards of the following organizations:
   1. American National Standards Institute (ANSI)
   2. National Electrical Manufacturer's Association (NEMA)
   3. National Fire Protection Association (NFPA)
   4. Underwriter's Laboratories (UL)
   5. American Society for Testing and Materials (ASTM)
   6. BICSI (Telecommunications Association)
   8. Insulated Cable Engineers Association (ICEA)
   9. Institute of Electrical and Electronic Engineers (IEEE)
   10. Federal Communications Commission Rules and Regulations (FCC)
   11. National Electrical Code (NFPA Article 70) (NEC)
13. Occupational Safety and Health Administration (OSHA)
14. Telecommunications Industry Association (TIA)
15. Uniform Building Code (UBC)

B. Install the communications systems based on the following:
   - NFPA National Electrical Code as adopted and amended by the Local Jurisdiction.
   - IBC International Building Code as adopted and amended by the Local Jurisdiction.

C. Communications Specific:
   1. ANSI/TIA-455: Fiber Optic Test Standards Series
   2. ANSI/TIA-526: Optical Fiber Systems Test Procedures
   3. ANSI/TIA-568-D: Commercial Building Telecommunications Cabling Standard
   4. ANSI/TIA-569-D: Commercial Building Standard for Telecommunications Pathways and Spaces
   5. ANSI/TIA-606-B: Administration Standard for Commercial Telecommunications Infrastructure
   6. ANSI/TIA-STD-607-C: Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
   7. ANSI/TIA-758-B: Customer-owned Outside Plant Telecommunications Infrastructure Standard
   8. ANSI/TIA-1179: Healthcare Facility Telecommunications Infrastructure Standard
   9. ANSI/TIA-942-B: Telecommunications Infrastructure Standard for Data Centers
   10. ANSI/TIA: Technical Service Bulletins (TSBs related to the above TIA/EIA standards)
   11. IEEE 802.11 Wireless Local Area Network Standard, including the IEEE 802.11a, 802.11b, 802.11g, and 802.11n standards
   15. BICSI: BICSI Telecommunications Cabling Installation Manual
   16. NEC: NFPA 70
   17. NFPA 78: Lightning Protection Code
   18. FCC Part 68: Connection of Terminal Equipment to Telephone Network.
   19. FCC Part 76.611: CFR Title 47 Radiation Leakage Standards

D. The referenced codes establish a minimum level of requirements. Where provision of the various codes conflict with each other, the more stringent provision shall govern. If any conflict occurs between referenced codes and this specification, the codes are to govern. Compliance with code requirements shall not be construed as relieving the Contractor from complying with any requirements of the drawings or specifications which may be in excess of requirements of the governing codes and rules and not contrary to same.

E. Obtain and pay for all licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. Arrange for inspection of work by the inspectors and give the inspectors all necessary assistance in their work of inspection.

1.4 COORDINATION

A. Coordinate work with other trades doing work on the project. Examine all drawings and specifications of other trades for construction details and coordination. Make every reasonable effort to provide timely notice of work affecting other trades to prevent conflicts or interference.
as to space requirements, dimensions, openings, block-outs, sleeving or other matters which will cause delays or necessitate work-around methods.

B. Obtain submittals and shop drawings of all equipment with electrical connections furnished under other divisions of the specification and by the Owner. Provide all wiring in accordance with specific equipment requirements. Immediately advise the Architect of any changes which may affect the contract price.

C. Special attention is called to the following items. Coordinate all conflicts prior to installation:
   1. Location of grilles, pipes, sprinkler heads, ducts and other mechanical equipment so that all communications outlets and equipment are clear from and in proper relation to these items.
   2. Location of cabinets, counters and doors so that communications outlets, and equipment are clear from and in proper relation to these items.
   3. Recessing and concealing communications materials in CMU walls, concrete construction and precast construction.
   4. In every telecommunication room with either active or passive equipment the Contractor shall monitor the work of all trades to assure that the space and clearance requirements of code are met.
   5. Review specifications for other Divisions of the work to determine where other Divisions are requiring communication connections. Verify provisions shown on contract drawings by examining shop drawing submittals of other Divisions prior to submission to the Owner. Do not proceed with ordering of supporting equipment, until characteristics are verified. Proceed with rough only after verification of shop drawings.

D. Digital format copies of bid drawings will be furnished to the successful bidder. Augment bid documents with additional information to ensure coordination between trades. Provide digital format communications systems drawings showing all ceiling devices, fixtures, raceways and cable tray locations and routing to mechanical contractor to be used for coordination drawings provided by mechanical contractor. Include dimensions and elevations of devices, fixtures, raceway and cable tray.

E. Furnish, install and place in satisfactory condition all raceways, boxes, conductors and connections and all other materials required for the electrical systems shown or noted in the contract documents to be complete, fully operational and fully tested upon completion of the project. Raceways, boxes and ground connections are shown diagrammatically only and indicate the general character and approximate location. The layout does not necessarily show the total number of raceways or boxes for the circuits required, nor are the locations of indicated runs intended to show the actual routing of the raceways. Where routings of major raceways and telecommunication pathways are indicated on plan sheets, the routing information supplements the information on diagrams. If no routing information is shown, route the systems in a manner that will coordinate with new and existing infrastructure and the work of other trades.

F. Consult the architectural drawings for the exact height and location of all electrical equipment not specified herein or shown on the drawings. Make any minor changes (less than 6'-6" horizontal) in the location of the raceways, outlets, boxes, devices, wiring, etc., from those shown on the drawings without extra charge, where coordination requires or if so directed by the Architect before rough-in.

G. Provide inserts or sleeves for outlet boxes, conductors, cables and/or raceways as required. Coordinate the installation thereof with other trades.
H. The Contractor will not be paid for relocation of work, cuttings, patching and finishing required for work requiring reinstallation due to lack of coordination prior to installation.

1.5 WARRANTY

A. Refer to Section Division 01.

1.6 CORRECTION OF WORK

A. Within one year after the date of Substantial Completion of the work, the Contractor shall correct any work found to be not in conformance with the Contract Documents promptly after written notice from the Owner to do so.

1.7 SUBMITTALS AND SHOP DRAWINGS

A. Comply with the requirements of Division 1.

1.8 PROJECT CLOSE-OUT

A. Comply with the requirements of Division 1.

1.9 ELECTRICAL EQUIPMENT OPERATION AND MAINTENANCE (O&M) MANUALS

A. Provide O&M manuals required in Section Division 1.

1.10 RECORD DRAWINGS

A. Continually record the actual electrical system(s) installation on a set of prints kept readily available at the project during construction. These prints shall be used for this purpose alone.
1. Mark record prints with red erasable pencil. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown.
2. Accurately locate with exact dimensions all underground and under slab raceways and stub-outs.
3. Note changes of directions and locations, by dimensions and elevations, as utilities are actually installed.
4. Include addenda items and revisions made during construction.
5. Erase conditions not constructed or "X-out" and annotate "not constructed" to clearly convey the actual "as constructed" condition.
6. Organize record drawings sheets in manageable sets, bind and print suitable titles, dates and other identification on the cover of each set.

B. Transmit the record drawing set in the specified format to the Architect at the completion of the work. Final payment to the contractor will not be authorized until these prints have been submitted to and accepted by the Architect.

1.11 ABBREVIATIONS AND DEFINITIONS

A. When the following abbreviations and definitions are used in relation to the work for Division 26 they shall have the following meanings:

<table>
<thead>
<tr>
<th>Item</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>AHJ</td>
<td>Authority Having Jurisdiction.</td>
</tr>
<tr>
<td>Boxes</td>
<td>Outlet, Junction or Pull Boxes.</td>
</tr>
<tr>
<td>Code</td>
<td>All applicable codes currently enforced at project location.</td>
</tr>
</tbody>
</table>
Compression: Compressed using a leverage powered (hydraulic or equivalent) crimping tool.

Connection: All materials and labor required for equipment to be fully operational.

Exterior Location: Outside of or penetrating the outer surfaces of the building weather protective membrane.

Fully Operational: Tested, approved, and operating to the satisfaction of the AHJ, manufacturer and contract documents.

Install: To enter or attach permanently into the project and make fully operational.

Mfr.: Manufacturer.

NEC: National Electrical Code, National Fire Protection Association, Publication #70.

NIC: Not in Contract.

Noted: Shown or specified in the contract documents.

Provide: Furnish and install.

Required: As required by code, AHJ, contract documents, or manufacturer for the installation to be fully operational.

Shown: As indicated on the drawings or details.

Wiring: Raceway, conductors and connections.

Accepted/Acceptable: Work or materials conforming with the intent of the project, and in general, conforming to the pertinent information in the Construction Documents.

Approved/Approval: The written approval of the Engineer.

Accessible: Easy access: Access attained without requiring extensive removal of other materials to gain access.

Accessible Ceiling: Acoustical tile hanging ceilings ("Hard-lid" ceilings [concealed spine or sheetrock/gypsum ceilings], even when provided with access panels, are not considered an Accessible Ceiling.)

Agreement: The contractual agreement between the Owner and the Contractor.

Communications: A communications Cabling System combined with a Communications Raceway System.

Concealed: Hidden from sight in interstitial building spaces, chases, furred spaces, shafts, crawl spaces, etc.

Construction Documents: Collective term for the entire set of bound or unbound material describing the construction and services required, including all Drawings, Specifications, addenda issued prior to execution of the contract, and modifications issued after Execution of the Contract (such as change orders, construction change directives, supplemental instructions, etc.).

The Contractor: The party responsible for providing the system(s) as indicated herein.

Drawings: The graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including (but not limited to) plans, elevations, sections, details, schedules and/or diagrams.

Engineer/Consultant: The party responsible for producing the communications system(s) Construction Documents.

Exposed: Not concealed (see above) and not installed underground.

Final Completion: The date when the Engineer confirms in writing that the Contractor has completed the work in accordance with the
Construction Documents, including completion of all punch list items, cleanup work and delivery of all required guarantees, warranties, licenses, releases and other required deliverables.

**Furnish**
To purchase, supply, and deliver to the project materials in new and operable condition, ready for installation.

**Governing Requirements**
Collective term for regulations, laws, ordinances, codes, rules, standards, requirements, and guidelines that govern the installation and inspection of the work defined in the Contract Documents. See “Part 1 – General, 1.8 Governing Requirements” herein.

**Governing Authorities**
Entities or their representatives charged with formation and/or enforcement of Governing Requirements, such as the Authority Having Jurisdiction (AHJ).

**Install**
To place in final position in fully operable, tested condition.

**Inside Plant (ISP)**
Infrastructure within a building; includes raceways, cabling, termination components and racks/cabinets.

**Or Equal**
Materials approved for use by the Engineer and which are dimensionally suitable and operationally identical to the specified item.

**Outside Plant (OSP)**
Infrastructure exterior to a building.

**Owner**
The Owner and the Owner's designated representative(s).

**The Project**
The total construction of which the Work performed under the Contract Documents may be the whole or a part, and which may include construction by the Owner and/or separate contractors.

**Substantial Completion**
The date when all work required by the Construction Documents shall be complete (subject to the final punch list to be prepared by the Engineer) and on which the applicable jurisdictional authorities have issued a temporary certification of occupancy.

**Section**
An individual section of the Specifications.

**Shown on Drawings**
Noted, indicated, scheduled, detailed, or any other written reference made on the Drawings.

**Specifications**
The portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work and performance of related services.

**Specification Section(s)**
One or more sections of the Specifications.

**Structured Cabling System (SCS)**
Alternative term for Communications Cabling System

**The Work**
The construction and services required by the Contract Documents, whether completed or partially completed, and all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor’s obligations. The Work may constitute the whole or a part of the Project.
PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment installed shall have been tested and listed by Underwriters Laboratories or other approved testing organization and shall be so labeled unless otherwise permitted by the Authority Having Jurisdiction (Inspector).

B. All materials to be new, free from defects and not less than quality herein specified. Materials shall be designated to ensure satisfactory operation and operational life in the environmental conditions which will prevail where they are being installed.

C. Each type of materials furnished shall be of the same make, be standard products of manufacturers regularly engaged in production of such materials and be the manufacturer's latest standard design.

D. All materials, equipment and systems furnished that include provisions for storing, displaying, reporting, interfacing, inputting, or functioning using date specific information shall perform properly in all respects regardless of the century. Any interface to other new or existing materials, equipment or systems shall function properly both regarding information sent and received.

2.2 SUBSTITUTION OF MATERIALS

A. Comply with the requirements of Division 1.

PART 3 - EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft. Handle all equipment carefully to prevent damage, breakage, denting, and scoring of finishes. Do not install damaged equipment.

B. Store products subject to damage by the elements above ground, undercover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instruction.

3.2 CUTTING BUILDING CONSTRUCTION

A. Obtain permission from the Architect and coordinate with other trades prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills or concrete saws except where space limitations prevent the use of such tools.

B. All construction materials damaged or cut into during the installation of this work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.
3.3 SHUTDOWN

A. All shutdowns will be during owner coordinated off hours and be approved by the owner prior to commencing work. Typical off hours are defined as 9:00 PM to 5:00 AM Monday through Friday and all-day Saturday and Sunday.

3.4 FIRESTOPPING

A. Apply firestopping to communications penetrations of fire rated floor and wall assemblies to maintain fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 “Firestopping”.

3.5 PAINTING

A. Items furnished under this Division that are scratched or marred in shipment or installation shall be refinished with touchup paint selected to match installed equipment finish.

3.6 EQUIPMENT CONNECTION

A. For equipment furnished under this or other Divisions of the specifications, or by Owner, provide complete all electrical connections necessary to serve such equipment and provide required control connections to all equipment so that the equipment is fully operational upon completion of the project. Provide disconnect switch as required by code whenever an equipment connection is shown on the drawings.

B. Investigate existing equipment to be relocated and provide new connections as required.

C. Obtain rough-in requirements for equipment furnished under other divisions of this specification prior to roughing-in. Review shop drawings and submittals of other Divisions to determine requirements.

3.7 CLEAN UP

A. Comply with requirements of Division 1.

3.8 TESTING AND DEMONSTRATION

A. Demonstrate that all communications equipment operates as specified and in accordance with manufacturer's instructions. Perform functional tests in the presence of the Architect, Owner or Engineer. Provide all instruments, manufacturer's operating instructions and personnel required to conduct the tests. Repair or replace any communications equipment that fails to operate as specified and or in accordance with manufacturer's requirements.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes discrete J-Hooks, slings and related accessories for supporting low voltage cable bundles above accessible ceilings and in interstitial spaces.

1.2 REFERENCES

A. American National Standards Institute (ANSI)/ Telecommunications Industry Association (TIA)
   1. ANSI/TIA 568-D.1 Commercial Building Telecommunications Cabling Standard
   2. ANSI/TIA 569-D Commercial Building Standard for Telecommunications Pathways and Spaces
   ANSI/NFPA 70 National Electrical Code

B. Underwriter's Laboratories, Inc. (UL)
   1. UL 2043 Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
   2. UL 2239 Conduit, Tubing and Cable Support Hardware
   3. UL 62275 Cable ties for electrical installations

1.3 DEFINITIONS

UTP Unshielded twisted pair
Pathway A series of supports and accessories for placement of low voltage systems cables
Main Pathway A low voltage systems pathway where the cable count exceeds 24 cables

1.4 SUBMITTALS

A. Provide submittal information in accordance with Section 27 05 00 - Common Work Results for Communications and supplementary requirements described in this specification.

B. Product Data: Submit product data on all cable support devices and accessories. Indicate materials, finishes, load ratings, dimensions, listings, approvals and attachment methods.

C. Closeout Submittals
   1. Provide complete copy of approved submittal documentation with the O&M Manuals.
   2. As-built Drawings: Provide marked up as-built drawings of main pathways

1.5 QUALITY ASSURANCE

A. Low voltage system cable supports, and accessories shall be listed to Underwriter's Laboratories, Inc Standard 2239.

B. Low voltage system cable supports, and accessories shall have the manufacturers name and part number stamped on the part for identification.
1.6  COORDINATION

A. 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 Engineer.

PART 2 - PRODUCTS

2.1  WIDE BASE CABLE SUPPORTS

A. J hooks complying with ANSI/TIA 568-D.1 and 569-D 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" width and flared edges where cables enter and leave support. 2 inch diameter loop for (80) 4-pair UTP or 2 strand fiber optic cable or inner duct. 4 inch diameter loop for (300) 4-pair UTP or 2 strand fiber optic cable or inner duct.

B. Accessories: Provide applicable accessories to independently support "J" hooks from structure. This includes 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.

C. Cable Retainers: Provide cable retainers at each "J" hook

D. Finish
1. Dry Locations, Above Lay-in Ceiling, Below Raised Floor - galvanized
2. Wet and Damp Locations: stainless steel

E. Manufacturer:
1. ERICO Caddy CableCat™ series
2. Chatsworth RapidTrak™ series
3. Or Approved Equal.

2.2  SOFT CABLE SLING SUPPORTS

A. Adjustable sling cable supports suitable for plenums and complying with ANSI/TIA 568-D.1 and 569-A structured cabling system requirements.  4 inch diameter loop for (220) 4-pair UTP or 2-strand fiber optic cables or inner duct.  6 inch diameter loop for (425) 4-pair UTP or 2-strand fiber optic cables or inner duct.

B. Accessories: Provide applicable accessories to independently support slings from structure. This includes fasteners and clamps for connecting to walls, beams, rods, ceiling tee bars, dedicated support wires and C and Z Purlins as required for specific construction

C. Material
1. Construction: Polyethylene strands woven and laminated, reinforced seams, connected steel mounting and fastening hardware.
2. Suitable for plenum location installation

D. Manufacturer,
1. ERICO Caddy CableCat™ 425 series
2. Or Approved Equal.
PART 3 - EXECUTION

3.1 INSTALLATION

A. All low voltage systems cables shall be supported. Provide supports along entire pathway.

B. Space supports a maximum of 48 inches apart and at each change of direction of the cables.

C. Hang cable supports from 3/8" all thread rods, dedicated #8 galvanized ceiling drop wire or wall brackets connected directly to structure. Do not support from the ceiling grid or ceiling wire system.

D. The Contractor shall coordinate pathways with all other trades to achieve efficient utilization of available space, complete accessibility to allow maintenance of cable plant and economical future adds moves and changes.

E. Install support wires, brackets or rods to route cables parallel and perpendicular to building lines.

F. Provide multiple hooks or slings at each hanger location as required by cable count and cable segregation requirements.

G. Fill supports with cabling to 50% or less of the manufacturer's recommended fill. Provide multiple supports where required cable count exceeds 50% fill.

H. Group cabling in separate supports by the following systems:
   - Voice/Data
   - CCTV/CATV/Video Systems/ Radio and Satellite Systems
   - Audio
   - Building Automation, Lighting Control Systems

   When total cable count to a small group of work stations or offices is less than 24, the cables may be installed grouped in a single support of appropriate size.

I. Interface with Other Work: Coordinate installation of supports with mechanical ductwork, piping and sprinkler system piping so that supports remain accessible after installation.

J. Install low voltage cable support system above accessible ceilings and below accessible raised floor systems only.

K. Elevation of Cable Supports: Contractor shall coordinate the allocation of ceiling space and the mounting elevations of various systems to allow maintenance and accessibility for future modifications. Low voltage system cable supports shall be as close to the ceiling as possible while allowing ceiling tiles to be removed. Supports shall be located to avoid interference with maintenance access to other equipment.

L. Cable installation and supports shall comply with applicable provisions of ANSI/TIA 569-D and ANSI/NFPA 70.

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Related Sections
   1. Section 26 05 33 - Raceways and Boxes for Electrical Systems

B. Other References
   - NSI/TIA-569 D Commercial Building Standard for Telecommunications Pathways and Spaces
   - NSI/TIA-607 C Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

1.2 DESCRIPTION

A. Provide raceway systems for the installation of the telephone cables and computer wiring. Installation shall include raceways, outlet boxes, plaster rings, outlet box cover plates and terminal back boards.

PART 2 - PRODUCTS

2.1 WALL OUTLETS

A. Shall consist of a 4-11/16" square, 2-1/8" deep (minimum) box, with knockouts for 3/4", 1", and 1-1/4" conduits, as manufactured by Steel City, OZ/Gedney or equal.

B. Surface wall outlets shall be 4" square, 2-3/4" deep (minimum) and shall match and be manufactured by the surface metal raceway manufacturer.

C. Unless otherwise noted.

2.2 OUTLET DEVICE RING

A. Coordinate device ring requirements to meet owner’s requirements.

2.3 DEVICE PLATES

A. Provide device cover plates for all unwired or "future" outlets. Plates shall match device plates specified in Section 26 27 26 - Wiring Devices except with no device openings.

2.4 PULL WIRE

A. Shall be plastic having not less than 200-pound tensile strength.

PART 3 - EXECUTION

3.1 WALL OUTLETS IN UNINSULATED INTERIOR WALLS WITH ACCESSIBLE CEILINGS

A. Provide an individual conduit from each communications outlet to an accessible location at cable tray or to a telephone terminal backboard.
3.2 WALL OUTLETS IN UNINSULATED INTERIOR WALLS WITH NON-ACCESSIBLE CEILINGS, EXTERIOR WALLS OR INSULATED INTERIOR WALLS
   A. Provide an individual conduit from each communications outlet to an accessible location at cable tray.

3.3 WALL OUTLETs IN INTERIOR WALLS EXTENDED INTO THE INTERSTITIAL SPACE
   A. Provide an individual conduit from each communications outlet to an aggregated common location in the interstitial space.

3.4 CONDUIT SIZING TABLE
   A. Provide conduits for communications outlets sized as follows:

<table>
<thead>
<tr>
<th>Outlet Type</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Phones</td>
<td>1&quot;</td>
</tr>
<tr>
<td>Wall Outlets (except wall phones)</td>
<td>1&quot;</td>
</tr>
<tr>
<td>Single Gang Floor Mounted Outlets/Boxes</td>
<td>1&quot;</td>
</tr>
<tr>
<td>Multiple Gang Recessed Floor Outlets/Boxes</td>
<td>1-1/4&quot;</td>
</tr>
</tbody>
</table>

3.5 RACEWAYS
   A. Shall conform to specification Section 26 05 33 - Raceways and Boxes for Electrical Systems with the additional requirement that no length of run shall exceed 100 feet and shall not contain more than two 90-degree bends or the equivalent without a code size pull box. Provide pull boxes where necessary to comply with these requirements. Locate pull boxes in straight runs only, not as a replacement for an elbow.
   B. Conduits with an internal diameter of two inches or less shall have a bend radius at least 6 times the internal conduit diameter. Conduits greater than two inches shall have a bend radius at least 10 times the internal conduit diameter.
   C. Provide an insulated bushing on all conduits terminated in a cabinet and/or pullboxes.
   D. Terminate conduits stubbed out above accessible ceiling space so that the conduit is parallel with the ceiling and provide an insulating bushing.
   E. Terminate conduit at cable trays at an accessible location within 6" of tray with an insulated bushing and provide bonding jumper or terminate conduit to the cable tray with an insulated bushing.

3.6 PULL BOXES
   A. Pull boxes shall be sized per the following table:
### PULL BOX SIZING (inches)

<table>
<thead>
<tr>
<th>Conduit Trade Size</th>
<th>Width</th>
<th>Length</th>
<th>Depth</th>
<th>Width increase for additional conduit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>16</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>1-1/4</td>
<td>6</td>
<td>20</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>1-1/2</td>
<td>8</td>
<td>27</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>36</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2-1/2</td>
<td>10</td>
<td>42</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>48</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3-1/2</td>
<td>12</td>
<td>54</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>60</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

#### 3.7 PULL CORDS

A. 200 pound tensile strength rated nylon type pull cord shall be included in all raceways over 10 feet long. Leave not less than 12 inches of slack at each end of the pull wire. Secure and tie off at both ends.

#### 3.8 GROUNDING

A. **Pathway Bonding:**
   1. Bond all metal pathways (conduits, cable tray, and cable runway) to closest telecommunications grounding point.

B. **Telecom Grounding/Bonding Conductor Sizing:**
   
   - **Maximum Length**
   - **Wire Size (AWG)**
   - 4m (13ft)  — 6
   - 6m (20 ft) — 4
   - 8m (26 ft) — 3
   - 10m (33 ft) — 2
   - 13m (41 ft) — 1
   - 16m (52 ft) — 1/0
   - 20m (66 ft) — 2/0
   - Over 20m (66 ft) — 3/0

C. Label each grounding and bonding conductor as follows: "IF THIS CONNECTOR OR CABLE IS LOOSE OR REMOVED, PLEASE CALL THE BUILDING TELECOMMUNICATIONS MANAGER."

D. Refer to Section 26 05 26 - Grounding and Bonding for Electrical Systems, for additional grounding requirements.

#### 3.9 REMODEL SPACES

A. Remove in active and abandoned communications systems conductors that serve spaces remodeled, only after receiving approval from the Owner.

B. Notify Owner in writing when active communications systems conductors serving occupied spaces and must be relocated due to the remodel.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
A. Section includes installation of additional devices to the existing audiovisual/voice nurse-call system.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment cabinets and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Cabling Diagrams: Single-line block diagrams showing cabling interconnection of all components for this specific equipment. Include cable type for each interconnection.
   3. Station Installation Details: For built-in equipment, dimensioned and to scale.

1.3 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified Installer.
B. Field quality-control reports.
C. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For nurse-call equipment to include operation, and maintenance manuals.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
B. Electrical Components, Devices, and Accessories: Listed and labeled according to UL 1069 as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 AUDIOVISUAL/VOICE NURSE-CALL SYSTEM
A. Manufacturer: Provide Rauland Responder 5 system as supplied by Electrocom.
B. Operational Requirements:
   1. General: Maintain all functions and operations of existing system.
   2. Call Priority: Maintain call priority levels of existing system.
   3. Rauland-Borg Corporation
   4. Emergency-Call Station Calls:
      a. Lights call-placed lamp and corridor dome light and flashes zone light.
b. Duty station tone pulses and annunciator light flashes.
c. When master station acknowledges the call by touch screen or switch, the tone stops but lights continue to flash until the call is canceled at the initiating point.

5. Annunciation:
   a. At the master station, a programmable tone announces an incoming call; an annunciator light or digital display identifies the calling station and indicates the priority of the call.
   b. Call type indications include alarm assist, bath, bed, code, communication fault, cord out, door, emergency, and fire.
   c. Memory lamps or lighted displays identify stations selected for outgoing calls.

C. Duty Stations: Audible call-tone signal device, speaker/microphone with 2-inch (50-mm) dynamic cone, monitor lamp, reset switch, routine-call lamp, emergency-call lamp, and call push button; assembled under a single faceplate.

D. Master Station:
   1. Speaker/microphone unit with operating controls.
   2. Indicator lamps with legends or by digital display designate identification and priority of calling stations and called stations.

2.2 SYSTEM COMPONENTS

A. Code Blue Station:
   1. Consists of a sliding, chemical-resistant, ABS blue fascia marked with the word "CODE" in bold letters.
   2. Capable of being activated with nylon pull cord or by sliding the face of the unit downwards.
   3. Activation of the station shall illuminate a reassurance digital display on the face of the unit in addition to notifying the master station.
   4. Water resistant and able to withstand routine cleaning and chemical disinfectants.
   5. Uses magnetic reed switch technology for reliability and corrosion resistance.
   6. Mounts on a single-gang electrical box wire to the respective patient station or input controller.

B. Staff, Emergency Station:
   1. Consists of a sliding, chemical-resistant, ABS red fascia marked with the word "EMERGENCY" in bold letters.
   2. Capable of being activated with nylon pull cord or by sliding the face of the unit downwards.
   3. Activation of the station shall illuminate a reassurance digital display on the face of the unit in addition to notifying the master station.
   4. Mounts on a single-gang electrical box wire to the input controller.

C. Corridor Dome Lights and Zone Lights:
   1. Three-lamp signal lights.
   2. Lamps: Front replaceable without tools, low voltage with rated life of 7500 hours. Barriers are such that only one color is displayed at a time.
   3. Lenses: Heat-resistant, shatterproof, translucent polymer that will not deform, discolor, or craze when exposed to hospital cleaning agents.
   4. Filters: Two per unit, amber and red.

D. Cable:
   1. Conductors: Jacketed single and multiple, twisted-pair copper cables.
   2. Sizes and Types: As recommended by equipment manufacturer.
3. Cable for Use in Plenums: Listed and labeled for plenum installation.

E. Grounding Components: Comply with requirements in Division 26 Section 26 05 26 "Grounding and Bonding for Electrical Systems."

2.3 CONDUCTORS AND CABLES

A. Audio Cables:
   1. Conductors: Jacketed, twisted-pair and twisted-multipair, untinned solid copper. Sizes as recommended by system manufacturer, but no smaller than No. 22 AWG.
   2. Insulation: Thermoplastic, not less than 1/32 inch (0.8 mm) thick.
   3. Shielding: For speaker/microphone leads and elsewhere where recommended by manufacturer; No. 34 AWG, tinned, soft-copper strands formed into a braid or equivalent foil.
   4. Minimum Shielding Coverage on Conductors: 60 percent.
   5. Plenum Cable: Listed and labeled for plenum installation.

B. Data Cable and Hardware: Category 6 UTP and UTP hardware. Comply with Owner requirements.

C. Power Conductors and Cables: Copper, solid, No. 20 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

D. Grounding Conductors and Cables: Copper, stranded, No. 16 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wiring Method:
   1. Install cables in raceways except within consoles, cabinets, desks, and counters.
      a. Install plenum cable in environmental air spaces, including plenum ceilings.
      b. Conceal raceway and cables except in unfinished spaces.
   2. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
      a. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

B. Install cables without damaging conductors, shield, or jacket.

C. Do not bend cables, while handling or installing, to radii smaller than as recommended by manufacturer.

D. Pull cables without exceeding cable manufacturer’s recommended pulling tensions.
   1. Pull cables simultaneously if more than one is being installed in same raceway.
   2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
   3. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips, that will not damage media or raceway.

E. Install exposed raceways and cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours. Secure and support cables by straps, staples, or similar fittings designed and installed so as not to damage cables. Secure cable at intervals.
not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, or fittings.

F. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

G. Separation of Wires: Separate speaker/microphone, line-level, speaker-level, and power-wiring runs. Run in separate raceways or, if exposed or in same enclosure, provide 12-inch (300-mm) minimum separation between conductors to speaker/microphones and adjacent parallel power and telephone wiring. Provide separation as recommended by equipment manufacturer for other conductors.

H. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Install terminal cabinets where there are splices, taps, or terminations for eight or more conductors.

I. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks if required.

J. Equipment Identification:
   1. Comply with requirements in Division 26 Section 26 05 53 "Identification for Electrical Systems" for equipment labels and signs and labeling installation requirements.
   2. Label stations, controls, and indications using approved consistent nomenclature.

3.2 EXISTING SYSTEMS

A. Examine existing systems for proper operation, compatibility with new equipment, and deficiencies. If discrepancies or impairments to successful connection and operation of interconnected equipment are found, report them and do not proceed with installation until directed. Schedule existing systems examination so there is reasonable time to resolve problems without delaying construction.

3.3 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other signal impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding except at connection to main building ground bus.

C. Grounding Provisions: Comply with requirements in Division 26 Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:
   1. Schedule tests a minimum of seven days in advance.
   2. Report: Submit a written record of test results.
   3. Operational Test: Perform an operational system test and demonstrate proper operations, adjustment, and sensitivity of each station. Perform tests that include
originating station-to-station and "All Call" messages and pages at each nurse-call station. Verify proper routing, volume levels, and freedom from noise and distortion. Test each available message path from each station on the system.

C. Retesting: Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify, by the system test, that the total system meets these Specifications and complies with applicable standards. Report results in writing.

D. Inspection: Verify that units and controls are properly labeled, and interconnecting wires and terminals are identified.

E. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel and caregiver staff to adjust, operate, and maintain nurse-call equipment.

B. Provide training to Owner personnel so that system alarms can be acknowledged and cleared by Owner personnel. If off-site training is required, the cost of transporting and housing the Owner's personnel for that training shall be included in the costs proposed.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. System smoke detectors.

1.2 DEFINITIONS

A. LED: Light-emitting diode.


1.3 SYSTEM DESCRIPTION

A. Extension and alteration of existing Notifier addressable fire alarm system.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

B. System shall comply with local fire code, building code, mechanical code, electrical code, rules and interpretations as required by the Authority Having Jurisdiction.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

C. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
   1. Include voltage drop calculations for notification appliance circuits.
   2. Include battery-size calculations.
   3. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
   4. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

D. General Submittal Requirements:
   1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
   2. Shop Drawings shall be prepared by persons with the following qualifications:
      a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified fire-alarm technician, Level III minimum.
c. Licensed or certified by authorities having jurisdiction.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

C. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data", include the following:
   1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
   2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
   3. Record copy of site-specific software.
   4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
      a. Frequency of testing of installed components.
      b. Frequency of inspection of installed components.
      c. Requirements and recommendations related to results of maintenance.
      d. Manufacturer's user training manuals.
   5. Manufacturer's required maintenance related to system warranty requirements.
   6. Abbreviated operating instructions for mounting at fire-alarm control unit.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
1.9 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
1. Notify Construction Manager no fewer than ten business days in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Construction Manager’s written permission.

1.10 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide equipment to match building's existing Notifier 3030 system.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Maintain the existing Fire-alarm signal initiation and responses (alarm, supervisory and trouble conditions).

2.3 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:
1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

B. Photoelectric Smoke Detectors:
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
3. Primary status:
   a. Device type.
   b. Present average value.
   c. Present sensitivity selected.
   d. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.

2.4 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

B. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
   1. Rated Light Output:
      a. 15/30/75/110 cd, selectable in the field.
   2. Mounting: Wall mounted unless otherwise indicated.
   3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
   4. Flashing shall be in a temporal pattern, synchronized with other units.
   5. Strobe Leads: Factory connected to screw terminals.

2.5 SURVIVABLE CIRCUITS

A. Where required by applicable codes and standards provide survivable circuits using one or more of the following methods:
   1. Fire Alarm Circuit Integrity (CI) Cable, 2-hour fire rated per UL 1724.
   3. Installation in a 2-hour rated shaft or enclosure.
   4. Installation in a 2-hour rated stairwell in a building fully sprinklered in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
   1. Connect new equipment to existing control panel in existing part of the building.
   2. Connect new equipment to existing monitoring equipment at the supervising station.
3. Expand, modify, and supplement existing control monitoring equipment as necessary to extend existing control monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.

C. Smoke-Detector Spacing:
1. Comply with NFPA 72.
2. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
3. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.

D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

E. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

F. Visible Alarm-Indicating Devices: Install wall mounted devices such that the bottom of the lens is not less than 80 inches above the finished floor. Ceiling mount devices allowed where shown and shall be approved for ceiling application. More than two visible notification devices in the same room or adjacent space within the field of view shall flash in synchronization. Synchronization of devices not in the same field of view is allowed. In corridors where there are more than two devices in any field of view, they shall be spaced a minimum of 55’ apart or they shall flash in synchronization.

G. Survivable Circuits:
1. A single notification appliance circuit shall not serve more than one notification zone.
2. Failure of equipment or a fault on one or more insulation wiring conductors of one notification appliance circuit shall not result in functional loss of any other notification appliance circuit.
3. Notification appliance circuits and any other circuits necessary for the operation of the notification appliance circuits shall be protected from the point at which they exit the control unit until the point that they enter the notification zone that they serve using one or more of the following methods:
   a. A 2-hour rated cable assembly
   b. A 2-hour rated shaft or enclosure
   c. A 2-hour rated stairwell in a building fully sprinklered in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems

3.2 WIRE

A. Non-Power-Limited Circuits: Conductors shall be 600-V rated, 75 deg C, color-coded insulation.
1. Low-Voltage Circuits: No. 16 AWG, minimum, stranded copper (maximum of seven strands).
2. Line-Voltage Circuits: No. 12 AWG, minimum, solid or stranded copper.

B. Power-Limited Circuits: NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.
3.3 RACEWAYS, OUTLETS AND JUNCTION BOXES

A. Shall conform to specification Section 26 05 33 "Raceways and Boxes for Electrical Systems".

B. Provide 5" square by 2-2/7" deep outlet boxes with plaster ring for all flush mounted notification appliances.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section 26 05 53 "Identification for Electrical Systems."

3.5 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.6 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

2. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.

   a. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.


4. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.

5. Test audible appliances for the private operating mode according to manufacturer's written instructions.

6. Test visible appliances for the public operating mode according to manufacturer's written instructions.


E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION