PROJECT MANUAL

NORTH MEDFORD H.S. HUMANITIES RESTROOM 100% Construction Documents

MEDFORD SCHOOL DISTRICT 549C 815 OAKDALE AVE MEDFORD, OR 97501



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JACKSON COUNTY SCHOOL DISTRICT 549C, aka MEDFORD SCHOOL DISTRICT 549C GENERAL CONDITIONS FOR PUBLIC IMPROVEMENT CONTRACTS ("General Conditions")

SECTION A

GENERAL PROVISIONS

A.1 DEFINITION OF TERMS

To the extent used in the Contract Documents, the following terms shall be as defined below:

ARCHITECT/ENGINEER means the Person appointed by the Owner to make drawings and specifications and, to provide contract administration of the Work contemplated by the Contract to the extent provided herein or by supplemental instruction of Owner (under which Owner may delegate responsibilities of the Owner's Authorized Representative to the Architect/ Engineer), in accordance with ORS Chapter 671 (Architects) or ORS Chapter 672 (Engineers) and administrative rules adopted thereunder.

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

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

<u>CONTRACT</u> means the written agreement between the Owner and the Contractor comprised of the Contract Documents which describe the Work to be done and the obligations between the parties.

<u>CONTRACT DOCUMENTS</u> means the Solicitation Document and addenda thereto, the Contract, these General Conditions, Supplemental General Conditions, if any, the accepted Offer, Plans, Specifications, amendments and Change Orders.

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

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

CONTRACT TIME means any incremental period of time allowed under the Contract to complete any portion of the Work as reflected in the project schedule.

<u>CONTRACTOR</u> means the Person awarded the Contract for the Work contemplated.

DAYS are calendar days, including weekdays, weekends and holidays, unless otherwise specified.

DIRECT COSTS means, unless otherwise provided in the Contract Documents, the cost of materials, including sales tax, cost of delivery; cost of labor, including social security, old age and unemployment insurance, and fringe benefits required by agreement or custom; worker's compensation insurance; project specific insurance (including, without limitation, Builder's Risk Insurance and Builder's Risk Installation Floater); bond premiums, rental cost of equipment, and machinery required for execution of the work; and the additional costs of field personnel directly attributable to the Work.

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

FORCE MAJEURE means an act, event or occurrence caused by fire, riot, war, acts of God, nature, sovereign, or public enemy, strikes, freight embargoes or any other act, event or occurrence that is beyond the control of the party to this Contract who is asserting Force Majeure.

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

OFFER means (a) a bid in connection with an invitation to bid, and/or (b) a proposal in connection with a request for proposals.

OFFEROR means (a) a bidder in connection with an invitation to bid, and/or (b) a proposer in connection with a request for proposals.

OVERHEAD means those items which may be included in the Contractor's markup (general and administrative expense and profit) and that shall not be charged as Direct Cost of the Work, including without limitation such Overhead expenses as wages or salary of personnel above the level of foreman (i.e., superintendents and project managers), expenses of Con-tractor's offices at the job site (e.g. job trailer) including expenses of personnel staffing the job site office, and Commercial General Liability Insurance and Automobile Liability Insurance.

OWNER means Jackson County School District 549c, aka Medford School District 549C.

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

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

PLANS means the drawings which show the location, type, dimensions, and details of the Work to be done under the Contract.

PUNCHLIST means the list of Work yet to be completed or deficiencies which need to be corrected in order to achieve Final Completion of the Contract. **RECORD DOCUMENT** means the as-built Plans, Specifications, testing and inspection records, product data, samples, manufacturer and distributor/supplier warranties evidencing transfer to Owner, operational and maintenance manuals, shop drawings, Change Orders, correspondence, certificate(s) of occupancy, and other documents listed in Subsection B.9.1 of these General Conditions, recording all Services performed.

SOLICITATION DOCUMENT means an invitation to bid or request for proposal or request for quotes.

SPECIFICATION means any description of the physical or functional characteristics of the Work, or of the nature of a supply, service or construction item. Specifications may include a description of any requirement for inspecting, testing or preparing a supply, service or construction item for delivery and the

quantities or qualities of materials to be furnished under the Contract. Specifications generally will state the results or products to be obtained and may, on occasion, describe the method and manner of doing the work to be performed. Specifications may be incorporated by reference and/or may be attached to the Contract.

<u>SUBCONTRACTOR</u> means a Person having a direct contract with the Contractor, or another Subcontractor, to perform one or more items of the Work. <u>SUBSTANTIAL COMPLETION</u> means the date when the Owner accepts in writing the construction, alteration or repair of the improvement to real property or any designated portion thereof as having reached that state of completion when it may be used or occupied for its intended purpose. Substantial Completion of facilities with operating systems occurs only after thirty (30) continuous Days of successful, trouble-free operation of the operating systems as provided in Section K.4.2.

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

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

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

A.2 SCOPE OF WORK

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

A.3 INTERPRETATION OF CONTRACT DOCUMENTS

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

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

- 2. The Supplemental General Conditions;
- 3. The Contract;
- 4. The General Conditions;
- 5. The Plans and Specifications;
- 6. The Solicitation Document and any addenda thereto;
- 7. The accepted Offer.
- A.3.2 In the case of an inconsistency between Plans and Specifications or within either document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Owner or Owner's Authorized Representative's interpretation in writing.
- A.3.3 If the Contractor finds discrepancies in, or omissions from the Contract Documents, or if the Contractor is in doubt as to their meaning, the Contractor shall at once notify the Owner or Owner's Authorized Representative. Matters concerning performance under, and interpretation of requirements of, the Contract Documents will be decided by the Owner's Authorized Representative, who may delegate that duty in some instances to the Architect/Engineer. Responses to Contractor's requests for interpretation of Contract Documents will be made in writing by Owner's Authorized Representative upon or otherwise with reasonable promptness.

Interpretations and decisions of the Owner's Authorized Representative (or Architect/Engineer) will be consistent with the intent of and reasonably inferable from the Contract Documents. Contractor shall not proceed without direction in writing from the Owner's Authorized Representative (or Architect/Engineer).

A.3.4 References to standard specifications, manuals, codes of any technical society, organization or association, to the laws, regulations, or policies of any governmental authority (including but not limited to any policies adopted by Owner's board), whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, laws, regulations or policies in effect in the jurisdiction where the project is occurring on the first published date of the Solicitation Document, except as may be otherwise specifically stated.

A.4 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE

- A.4.1 It is understood that the Contractor, before submitting an Offer, has made a careful examination of the Contract Documents; has become fully informed as to the quality and quantity of materials and the character of the Work required; and has made a careful examination of the location and conditions of the Work and the sources of supply for materials. The Owner will in no case be responsible for any loss or for any unanticipated costs that may be suffered by the Contractor as a result of the Contractor's failure to acquire full information in advance in regard to all conditions pertaining to the Work. No oral agreement or conversation with any officer, agent, or personnel of the Owner, or with the Architect/ Engineer either before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.
- A.4.2 Should the Plans or Specifications fail to particularly describe the materials, kind of goods, or details of construction of any aspect of the Work, Contractor shall have the duty to make inquiry of the Owner and Architect/Engineer as to what is required prior to performance of the Work. Absent Specifications to the contrary, the materials or processes that would normally be used to produce first quality finished Work shall be considered a part of the Contract requirements.
- A.4.3 Any design errors or omissions noted by the Contractor shall be reported promptly to the Owner's Authorized Representative, including without limitation, any nonconformity with applicable laws, statutes, ordinances, building codes, rules and regulations.
- A.4.4 If the Contractor believes that additional cost or Contract Time is involved because of clarifications or instructions issued by the Owner's Authorized Representative (or Architect/Engineer) in response to the Contractor's notices or requests for information, the Contractor must submit a written request to the Owner's Authorized Representative, setting forth the nature and specific extent of the request, including all time and cost impacts against the Contract as soon as possible, but no later than thirty (30) Days after receipt by Contractor of the clarifications or instructions issued. If the Owner's Authorized Representative denies Contractor's request for additional compensation, additional Contract Time, or other relief that Contractor believes results from the clarifications or instructions, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process. If the Contractor fails to perform the obligations of Sections A.4.1 to A.4.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations.

A.5 INDEPENDENT CONTRACTOR STATUS

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

A.6 RETIREMENT SYSTEM STATUS AND TAXES

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

A.7 GOVERNMENT EMPLOYMENT STATUS

- A.7.1 If this payment is to be charged against federal funds, Contractor represents and warrants that it is not currently employed by the Federal Government. This does not preclude the Contractor from holding another contract with the Federal Government.
- A.7.2 Contractor represents and warrants that Contractor is not an employee of Owner or the State of Oregon for purposes of performing Work under this Contract.

SECTION B ADMINISTRATION OF THE CONTRACT

B.1 OWNER'S ADMINISTRATION OF THE CONTRACT

- B.1.1 The Owner's Authorized Representative will provide administration of the Contract as described in the Contract Documents (1) during construction (2) until final payment is due and (3) during the one-year period for correction of Work. The Owner's Authorized Representative will act on behalf of the Owner to the extent provided in the Contract Documents, unless modified in writing in accordance with other provisions of the Contract. In performing these tasks, the Owner's Authorized Representative way rely on the Architect/ Engineer or other consultants to perform some or all of these tasks.
- B.1.2 The Owner's Authorized Representative will not make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Owner's Authorized Representative will neither have control over or charge of, nor be responsible for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work.
- B.1.3 Except as otherwise provided in the Contract Documents or when direct communications have been specifically authorized, the Owner and Contractor shall endeavor to communicate with each other through the Owner's Authorized Representative or designee about matters arising out of or relating to the Contract. Communications by and with the Architect/Engineer's consultants shall be through the Architect/Engineer. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner's Authorized Representative.
- B.1.4 Based upon the Architect/Engineer's evaluations of the Contractor's Application for Payment, or unless otherwise stipulated by the Owner's Authorized Representative, the Architect/Engineer will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

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

- B.2.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures.
- B.2.2 The Contractor is responsible to protect and maintain the Work during the course of construction and to mitigate any adverse impacts to the project, including those caused by authorized changes, which may affect cost, schedule, or quality.
- B.2.3 The Contractor is responsible for the actions of all its personnel, laborers, suppliers, and Subcontractors on the project. The Contractor shall enforce strict discipline and good order among Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of persons who are unfit or unskilled for the tasks assigned to them.

B.3 MATERIALS AND WORKMANSHIP

- B.3.1 The intent of the Contract Documents is to provide for the construction and completion in every detail of the Work described. All Work shall be performed in a professional manner and unless the means or methods of performing a task are specified elsewhere in the Contract Documents, Contractor shall employ methods that are generally accepted and used by the industry, in accordance with industry standards.
- B.3.2 The Contractor is responsible to perform the Work as required by the Contract Documents. Defective Work shall be corrected at the Contractor's expense.
- B.3.3 Work done and materials furnished shall be subject to inspection and/or observation and testing by the Owner's Authorized Representative to determine if they conform to the Contract Documents. Inspection of the Work by the Owner's Authorized Representative does not relieve the Contractor of responsibility for the Work in accordance with the Contract Documents.
- B.3.4 Contractor shall furnish adequate facilities, as required, for the Owner's Authorized Representative to have safe access to the Work including without limitation walkways, railings, ladders, tunnels, and platforms. Producers, suppliers, and fabricators shall also provide proper facilities and access to their facilities.
- B.3.5 The Contractor shall furnish Samples of materials for testing by the Owner's Authorized Representative and include the cost of the Samples in the Contract Price.

B.4 PERMITS

Contractor shall obtain and pay for all necessary permits and licenses, except for those specifically excluded in any Supplemental General Conditions, for the construction of the Work, for temporary obstructions, enclosures, opening of streets for pipes, walls, utilities, environmental Work, etc., as required for the project. Contractor shall be responsible for all violations of the law, in connection with the construction or caused by obstructing streets, sidewalks or

otherwise. Contractor shall give all requisite notices to public authorities. The Contractor shall pay all royalties and license fees. The Contractor shall defend all suits or claims for infringement of any patent or other proprietary rights and save harmless and blameless from loss, on account thereof, the Owner and its directors, officers, agents and employees.

B.5 COMPLIANCE WITH GOVERNMENT LAWS AND REGULATIONS

- B.5.1 Contractor shall comply with all federal, state and local laws, codes, regulations and ordinances applicable to the Work and the Contract. Failure to comply with such requirements shall constitute a breach of Contract and shall be grounds for Contract termination. Without limiting the generality of the foregoing, Contractor expressly agrees to comply with the following as applicable: i) Title VI and VII of Civil Rights Act of 1964, as amended; (ii) Section 503 and 504 of the Rehabilitation Act of 1973, as amended; (iii) the Health Insurance Portability and Accountability Act of 1996; (iv) the Americans with Disabilities Act of 1990, as amended; (v) ORS Chapter 659A; as amended (vi) all regulations and administrative rules established pursuant to the foregoing laws; and (vii) all other applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations. Owner's performance under the Contract is conditioned upon Contractor's compliance with the provisions of ORS 279C.505, 279C.510, 279C.515, 279C.520, and 279C.530, which are incorporated by reference herein.
- B.5.2 Contractor shall comply with all applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations; and
 - (a) Contractor shall not discriminate against Disadvantaged, Minority, Women or Emerging Small Business enterprises, as those terms are defined in ORS 200.005, or a business enterprise that is owned or controlled by or that employs a disabled veteran, as that term is defined in ORS 408.225, in the awarding of subcontracts.
 - (b) Contractor shall maintain, in current and valid form, all licenses and certificates required by law, regulation, or this Contract when performing the Work.
- B.5.3 Unless contrary to federal law, Contractor shall certify that it shall not accept a bid from Subcontractors to perform Work as described in ORS 701.005 under this Contract unless such Subcontractors are registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 at the time they submit their bids to the Contractor.
- B.5.4 Unless contrary to federal law, Contractor shall certify that each landscape contractor, as defined in ORS 671.520(2), performing Work under this Contract holds a valid landscape contractor's license issued pursuant to ORS 671.560.
- B.5.5 The following notice is applicable to Contractors who perform excavation Work. ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through OAR 952-001-0090. You may obtain copies of the rules by calling the center at (503)2321987.
- B.5.6 Failure to comply with any or all of the requirements of B.5.1 through B.5.5 shall be a breach of Contract and constitute grounds for Contract termination. Damages or costs resulting from such noncompliance shall be the responsibility of Contractor.

B.6 SUPERINTENDENCE

If required by Owner, Contractor shall keep on the site, during the progress of the Work, a competent superintendent and any necessary assistants who shall be satisfactory to the Owner and who shall represent the Contractor on the site. Directions given to the superintendent by the Owner's Authorized Representative shall be confirmed in writing to the Contractor.

B.7 INSPECTION

- B.7.1 Owner's Authorized Representative shall have access to the Work at all times.
- B.7.2 Inspection of the Work will be made by the Owner's Authorized Representative at its discretion. The Owner's Authorized Representative will have authority to reject Work that does not conform to the Contract Documents. Any Work found to be not in conformance with the Contract Documents, in the discretion of the Owner's Authorized Representative, shall be removed and replaced at the Contractor's expense.
- B.7.3 Contractor shall make or obtain at the appropriate time all tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work. The Contractor shall give the Owner's Authorized Representative timely notice of when and where tests and inspections are to be made so that the Owner's Authorized Representative may be present for such procedures. Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contract or and promptly delivered to the Owner's Authorized Representative.
- B.7.4 As required by the Contract Documents, Work done or material used without inspection or testing by the Owner's Authorized Representative may be ordered removed at the Contractor's expense.
- B.7.5 If directed to do so any time before the Work is accepted, the Contractor shall uncover portions of the completed Work for inspection. After inspection, the Contractor shall restore such portions of Work to the standard required by the Contract. If the Work uncovered is unacceptable or was done without sufficient notice to the Owner's Authorized Representative, the uncovering and restoration shall be done at the Contractor's expense. If the Work uncovered is acceptable and was done with sufficient notice to the Owner's Authorized Representative, the uncovering and restoration shall be done at the Contractor's expense. If the Work uncovered is acceptable and was done with sufficient notice to the Owner's Authorized Representative, the uncovering and restoration will be paid for as a Change Order.
- B.7.6 If any testing or inspection reveals failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Owner's Authorized Representative's and Architect/Engineer's services and expenses, shall be at the Contractor's expense.
- B.7.7 When the United States government participates in the cost of the Work, or the Owner has an agreement with other public or private organizations, or if any portion of the Work is being performed for a third party or in close proximity to third party facilities, representatives of these organizations have the right to inspect the Work affecting their interests or property. Their right to inspect shall not make them a party to the Contract and shall not interfere with the rights of the parties of the Contract. Instructions or orders of such parties shall be transmitted to the Contractor, through the Owner's Authorized Representative.

B.8 SEVERABILITY

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

B.9 ACCESS TO RECORDS

- B.9.1 Contractor shall keep, at all times on the Work site, one record copy of the complete Contract Documents, including the Plans, Specifications, Change Orders and addenda, in good order and marked currently to record field changes and selections made during construction, and one record copy of Shop Drawings, Product Data, Samples and similar submittals, and shall at all times give the Owner's Authorized Representative access thereto.
- B.9.2 Contractor shall retain and the Owner and its duly authorized representatives shall have access to, for a period not less than ten (10) years, all Record Documents, financial and accounting records, and other books, documents, papers and records of Contractor which are pertinent to the Contract including records pertaining to Overhead and indirect costs, for the purpose of making audit, examination, excerpts and transcripts. If for any reason, any part of the Contract is involved in litigation, Contractor shall retain all such records until all litigation is resolved. The Owner and/or its agents shall continue to be provided full access to the records during litigation.

B.10 WAIVER

Failure of the Owner to enforce any provision of this Contract shall not constitute a waiver or relinquishment by the Owner of the right to such performance in the future nor of the right to enforce any other provision of this Contract.

B.11 SUBCONTRACTS AND ASSIGNMENT

- B.11.1 Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound by the terms and conditions of these General Conditions, and to assume toward the Contractor all of the obligations and responsibilities which the Contractor assumes toward the Owner thereunder, unless (1) the same are clearly inapplicable to the subcontract at issue because of legal requirements or industry practices, or (2) specific exceptions are requested by Contractor and approved in writing by Owner. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with sub-subcontractors at any level.
- B.11.2 At Owner's request, Contractor shall submit to Owner prior to their execution either Contractor's form of subcontract, or the subcontract to be executed with any particular Subcontractor. If Owner disapproves such form, Contractor shall not execute the form until the matters disapproved are resolved to Owner's satisfaction. Owner's review, comment upon or approval of any such form shall not relieve Contractor of its obligations under this Agreement or be deemed a waiver of such obligations of Contractor.
- B.11.3 Contractor shall not assign, sell, or transfer its rights, or delegate its responsibilities under this Contract, in whole or in part, without the prior written approval of the Owner. No such written approval shall relieve Contractor of any obligations of this Contract, and any transferee shall be considered the agent of the Contractor and bound to perform in accordance with the Contract Documents. Contractor shall remain liable as between the original parties to the Contract as if no assignment had occurred.

B.12 SUCCESSORS IN INTEREST

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

B.13 OWNER'S RIGHT TO DO WORK

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

B.14 OTHER CONTRACTS

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

B.15 GOVERNING LAW

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

B.16 LITIGATION

Any Claim between Owner and Contractor that arises from or relates to this Contract and that is not resolved through the Claims Review Process in Section D.3 shall be brought and conducted solely and exclusively within the Circuit Court of Jackson County for the State of Oregon; provided, however, if a Claim must be brought in a federal forum, then it shall be brought and conducted solely and exclusively within the United States District Court for the District of Oregon located in Medford, Oregon. In no event shall this section be construed as a waiver by Owner of any form of defense or immunity, whether governmental immunity or otherwise, from any claim or from the jurisdiction of any court. CONTRACTOR BY EXECUTION OF THIS CONTRACT HEREBY CONSENTS TO THE IN PERSONAM JURISDICTION OF THE COURTS REFERENCED IN THIS SECTION B.16.

B.17 ALLOWANCES

- B.17.1 The Contractor shall include in the Contract Price all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct.
- B.17.2 Unless otherwise provided in the Contract Documents:
 - (a) when finally reconciled, allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
 - (b) Contractor's costs for unloading and handling at the site, labor, installation costs, Overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Price but not in the allowances;
 - (c) whenever costs are more than or less than allowances, the Contract Price shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (i) the difference between actual costs and the allowances under Section B.17.2(a) and (2) changes in Contractor's costs under Section B.17.2(b).
 - (d) Unless Owner requests otherwise, Contractor shall provide to Owner a proposed fixed price for any allowance work prior to its performance.

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

N.M.H.S. Humanities Restroom

- B.18.1 The Contractor shall prepare and keep current, for the Architect's/ Engineer's approval (or for the approval of Owner's Authorized Representative if approval authority has not been delegated to the Architect/Engineer), a schedule and list of submittals which is coordinated with the Contractor's construction schedule and allows the Architect/Engineer reasonable time to review submittals. Owner reserves the right to finally approve the schedule and list of submittals. Submittals include, without limitation, Shop Drawings, Product Data, and Samples which are described below:
 - (a) Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor (including any sub-subcontractor), manufacturer, supplier or distributor to illustrate some portion of the Work.
 - (b) Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.
 - (c) Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.
- B.18.2 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents. The way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review of submittals by the Architect/Engineer is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, or for approval of safety precautions or, unless otherwise specifically stated by the Architect/Engineer, of any construction means, methods, techniques, sequences or procedures, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect/Engineer's review of the Contractor's submittals shall not relieve the Contract Documents. The Architect/Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component. Informational submittals upon which the Architect/Engineer is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect/Engineer without action.
- B.18.3 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect/Engineer Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents by the Architect/Engineer without action.
- B.18.4 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.
- B.18.5 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect/Engineer.
- B.18.6 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect/Engineer's review or approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submittal and (i) the Architect/Engineer has given written approval to the specific deviation as a minor change in the Work, or (ii) a Change Order has been executed by Owner authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect/Engineer's review or approval thereof.
- B.18.7 In the event that Owner elects not to have the obligations and duties described under this Section B.18 performed by the Architect/Engineer, or in the event no Architect/Engineer is employed by Owner on the project, all obligations and duties assigned to the Architect/Engineer hereunder shall be performed by the Owner's Authorized Representative.

B.19 SUBSTITUTIONS

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

B.20 USE OF PLANS AND SPECIFICATIONS

Plans, Specifications and related Contract Documents furnished to Contractor by Owner or Owner's Architect/Engineer shall be used solely for the performance of the Work under this Contract. Contractor and its Subcontractors and suppliers are authorized to use and reproduce applicable portions of such documents appropriate to the execution of the Work, but shall not claim any ownership or other interest in them beyond the scope of this Contract, and such interest shall attach. Unless otherwise indicated, all common law, statutory and other reserved rights, in addition to copyrights, are retained by Owner.

B.21 FUNDS AVAILABLE AND AUTHORIZED

Owner reasonably believes at the time of entering into this Contract that sufficient funds are available and authorized for expenditure to finance the cost of this Contract within the Owner's appropriation or limitation. Contractor understands and agrees that, to the extent that sufficient funds are not available and authorized for expenditure to finance the cost of this Contract, Owner's payment of amounts under this Contract attributable to Services performed after the last day of the current fiscal period for which funds have been allocated is contingent on Owner receiving appropriations, limitations or other expenditure authority sufficient to allow Owner, in the exercise of its reasonable administrative discretion, to continue to make payments under this Contract.

B.22 NO THIRD PARTY BENEFICIARIES

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

SECTION C WAGES AND LABOR

C.1 MINIMUM WAGE RATES ON PUBLIC WORKS

Contractor shall comply fully with the provisions of ORS 279C.800 through 279C.870. Documents establishing those conditions, as determined by the Commissioner of the Bureau of Labor and Industries (BOLI), are included as attachments to or are incorporated by reference in the Contract Documents. Contractor shall pay workers at not less than the specified minimum hourly rate of wage, and shall include that requirement in all subcontracts.

C.2 PAYROLL CERTIFICATION; ADDITIONAL RETAINAGE; FEE REQUIREMENTS

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

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

- C.2.2 Pursuant to ORS 279C.845(7), the Owner shall retain 25 percent of any amount earned by the Contractor on this public works project until the Contractor has filed the certified statements required by section C.2.1. The Owner shall pay to the Contractor the amount retained under this subsection within 14 days after the Contractor files the required certified statements, regardless of whether a Subcontractor has failed to file certified statements.
- C.2.3 Pursuant to ORS 279C.845(8), the Contractor shall retain 25 percent of any amount earned by a first-tier Subcontractor on this public works project until the first-tier Subcontractor has filed with the Owner the certified statements required by C.2.1. Before paying any amount retained under this subsection, the Contractor shall verify that the first-tier Subcontractor has filed the certified statement. Within 14 days after the first-tier Subcontractor files the required certified statement the Contractor shall pay the first-tier Subcontractor any amount retained under this subsection.
- C.2.4 In accordance with statutory requirements, and administrative rules promulgated by the Commissioner of the Bureau of Labor and Industries, the fee required by ORS 279C.825(1) will be paid by Owner to the Commissioner.

C.3 PROMPT PAYMENT AND CONTRACT CONDITIONS

- C.3.1 Pursuant to ORS 279C.505 and as a condition to Owner's performance hereunder, the Contractor shall:
 - C.3.1.1 Make payment promptly, as due, to all persons supplying to Contractor labor or materials for the prosecution of the Work provided for in this Contract.
 - C.3.1.2 Pay all contributions or amounts due the State Industrial Accident Fund from such Contractor or Subcontractor incurred in the performance of the Contract
 - C.3.1.3 Not permit any lien or claim to be filed or prosecuted against the Owner on account of any labor or material furnished. Contractor will not assign any claims that Contractor has against Owner, or assign any sums due by Owner, to Subcontractors, suppliers, or manufacturers, and will not make any agreement or act in any way to give Subcontractors a claim or standing to make a claim against the Owner.
 - C.3.1.4 Pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.
 - C.3.1.5 Demonstrate that an employee drug testing program is in place as follows:
 - (a) Contractor represents and warrants that Contractor has in place at the time of the execution of this Contract, and shall maintain during the term of this Contract, a Qualifying Employee Drug Testing Program for its employees that includes, at a minimum, the following:
 - (1) A written employee drug testing policy,
 - (2) Required drug testing for all new Subject Employees or, alternatively, required testing of all Subject Employees every 12 months on a random selection basis, and
 - (3) Required testing of a Subject Employee when the Contractor has reasonable cause to believe the Subject Employee is under the influence of drugs.

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

- (b) Contractor shall require each Subcontractor providing labor for the project to:
 - (1) Demonstrate to the Contractor that it has a Qualifying Employee Drug Testing Program for the Subcontractor's Subject Employees, and represent and warrant to the Contractor that the Qualifying Employee Drug Testing Program is in place at the time of subcontract execution and will continue in full force and effect for the duration of the subcontract, or
 - Require that the Subcontractor's Subject Employees participate in the Contractor's Qualifying Employee Drug Testing Program for the duration of the subcontract.
- C.3.2 Pursuant to ORS 279C.515, and as a condition to Owner's performance hereunder, Contractor agrees:
 - If Contractor fails, neglects or refuses to pay promptly a person's claim for labor or services that the person provides to the Contractor or a Subcontractor in connection with the project as such claim becomes due, the proper officer that represents the Owner may pay the amount of the claim and charge the amount of the payment against funds due or to become due Contractor under this Contract. Paying a claim in this manner shall not relieve the Contractor or the Contractor's surety from obligation with respect to an unpaid claim. C.3.2.1
 - C.3.2.2 If the Contractor or a first-tier Subcontractor fails, neglects or refuses to pay a person that provides labor or materials in connection with the public contract for a public improvement within thirty (30) Days after receiving payment from Owner or a contractor, the contractor or first-tier Subcontractor owes the person the amount due plus interest charges that begin at the end of the 10-Day period within which payment is due under ORS 279C.580(3) and that end upon final payment, unless payment is subject to a good faith dispute as defined in ORS 279C.580. The rate of interest on the amount due is nine percent per annum. The amount of interest may not be waived.
 - C.3.2.3 If the Contractor or a Subcontractor fails, neglects or refuses to pay a person that provides labor or materials in connection with the Contract, the person may file a complaint with the Construction Contractors Board, unless payment is subject to a good faith dispute as defined in ORS 279C.580. Every contract related to this Contract must contain a similar clause.

- Pursuant to ORS 279C.580, Contractor shall include in each subcontract for property or services the Contractor enters into with a first-tier C.3.3 Subcontractor, including a material supplier, for the purpose of performing a construction contract:
 - (a) A payment clause that obligates the Contractor to pay the first-tier Subcontractor for satisfactory performance under the subcontract within ten (10) Days out of amounts the Owner pays to the Contractor under the Contract;
 - (b) A clause that requires the Contractor to provide the first-tier Subcontractor with a standard form that the first-tier Subcontractor may use as an application for payment or as another method by which the Subcontractor may claim a payment due from the Contractor;
 - (c) A clause that requires the Contractor, except as otherwise provided in this paragraph, to use the same form and regular administrative procedures for processing payments during the entire term of the subcontract. The Contractor may change the form or the regular administrative procedures the Contractor uses for processing payments if the Contractor:
 - (1) Notifies the Subcontractor in writing at least 45 days before the date on which the Contractor makes the change; and
 - (2) Includes with the written notice a copy of the new or changed form or a description of the new or changed procedure.
 - (2) includes with the written notice a copy of the new or changed form or a description of the new or changed procedure.
 (d) An interest penalty clause that obligates the Contractor, if the Contractor does not pay the first-tier Subcontractor within thirty (30) Days after receiving payment from Owner, to pay the first-tier Subcontractor an interest penalty on amounts due in each payment the Contractor does not make in accordance with the payment clause included in the subcontract under paragraph (a) of this subsection. Contractor or first-tier Subcontractor is not obligated to pay an interest penalty if the only reason that the Contractor or first-tier Subcontractor when payment was due is that the Contractor or first-tier Subcontractor did not receive payment from Owner or Contractor when payment was due. The interest penalty applies to the period that begins on the day after the required payment date and that ends on the date on which the amount due is paid; and is computed at the rate specified in ORS 279C.515(2).
 - (e) A clause which requires each of Contractor's Subcontractors to include, in each of their contracts with lower-tier Subcontractors or suppliers, provisions to the effect that the first- tier Subcontractor shall pay its lower-tier Subcontractors and suppliers in accordance with the provisions of paragraphs (a) through (d) above and requiring each of their Subcontractors and suppliers to include such clauses in their subcontracts and supply contracts.
 - C.3.4 All employers, including Contractor, that employ subject workers who work under this contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. Contractor shall ensure that each of its Subcontractors complies with these requirements.

C 4 PAYMENT FOR MEDICAL CARE

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

C.5 HOURS OF LABOR

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

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

- (a) For all overtime in excess of eight (8) hours a day or forty (40) hours in any one week when the work week is five consecutive Days, Monday through Friday; or
- (b) For all overtime in excess of ten (10) hours a day or forty (40) hours in any one week when the work week is four consecutive Days, Monday through Friday; and
- (c) For all Work performed on Saturday and on any legal holiday specified in ORS 279C.540.

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

This Section C.5 shall not excuse Contractor from completion of the Work within the time required under this Contract.

SECTION D CHANGES IN THE WORK

D.1 CHANGES IN WORK

- The terms of this Contract shall not be waived, altered, modified, supplemented or amended in any manner whatsoever without prior written approval of the Owner's Authorized Representative, and then only in a manner consistent with the Change Order provisions of this Section D.1 and after any necessary approvals required by public contracting laws have been obtained. Otherwise, a formal contract amendment is required, which shall not be effective until its execution by the parties to this Contract and all approvals required by public contracting laws have been obtained. D.1.1 obtained
- It is mutually agreed that changes in Plans, quantities, or details of construction are inherent in the nature of construction and may be necessary or desirable during the course of construction. Within the general scope of this Contract, the Owner's Authorized Representative may at any time, without notice to the sureties and without impairing the Contract, require changes consistent with this Section D.1. All Change Order Work shall D12 be executed under the conditions of the Contract Documents. Such changes may include, but are not limited to:
 - (a) Modification of specifications and design.
 - (b) Increases or decreases in quantities.
 - (c) Increases or decreases to the amount of Work.
 - (d) Addition or elimination of any Work item.
 - (e) Change in the duration of the project.
 - (f) Acceleration or delay in performance of Work.
 - (g) Deductive changes.

Deductive changes are those that reduce the scope of the Work, and shall be made by mutual agreement whenever feasible, as determined by Owner. In cases of suspension or partial termination under Section J, Owner reserves the right to unilaterally impose a deductive change and to self-perform such Work, for which the provisions of B.13 (Owner's Right to Do Work) shall then apply.

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

- D.1.3 The Owner and Contractor agree that Change Order Work shall be administered and compensated according to the following:
 - (a) Unit pricing may be utilized at the Owner's option when unit prices or solicitation alternates were provided that established the cost for additional Work, and a binding obligation exists under the Contract on the parties covering the terms and conditions of the additional Work.
 (b) If the Owner elects not to utilize unit pricing, or in the event that unit pricing is not available or appropriate, fixed pricing may be used for Change Order Work. In fixed pricing the basis of payments or total price shall be agreed upon in writing between the parties to the Contract, and shall be established before the Work is done whenever feasible. The mark-ups set forth in D.1.3(c) shall be utilized by the parties as a guide in establishing fixed pricing, and will not be exceeded by Owner without adequate justification. Cost and price data relating to Change Orders shall be supplied by Contractor to Owner upon request, but Owner shall be under no obligation to make such requests.
 - (c) In the event that unit pricing and fixed pricing are not utilized, then Change Order Work shall be performed on a cost reimbursement basis for Direct Costs. Such Work shall be compensated on the basis of the actual, reasonable and allowable cost of labor, equipment, and material furnished on the Work performed. In addition, the following markups shall be added to the Subcontractor's Direct Costs as full compensation for profit, Overhead and other indirect costs for Work directly performed with the Subcontractor's own forces:

On Labor	15%
On Equipment	10%
On Materials	10%

When Change Order Work under D.1.3(c) is invoiced by an authorized Subcontractor at any level, each ascending tier Subcontractor or Contractor will be allowed a 5% supplemental mark-up on each piece of subcontract Work covered by such Change Order.

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

- D.1.4 Any necessary adjustment of Contract Time that may be required as a result of a Change Order must be agreed upon by the parties before the start of the Change Order Work unless Owner's Authorized Representative authorizes Contractor to start the Work before agreement on Contract Time adjustment. Contractor shall submit any request for additional compensation (and additional Contract Time if Contractor was authorized to start Work before an adjustment of Contract Time was approved) as soon as possible but no later than thirty (30) Days after receipt of the Change Order. If Contractor's request for additional compensation or adjustment of Contract Time is not made within the thirty (30) day time limit, Contractor's requests pertaining to that Change Order are barred. The thirty (30) day time limit for making requests shall not be extended for any reason, including without limitation Contractor's claimed inability to determine the amount of additional compensation or adjustment of Contract Time, unless an extension is granted in writing by Owner. If the Owner's Authorized Representative denies Contractor's request for additional compensation may proceed to file a Claim under Section D.3, Claims Review Process. No other reimbursement, compensation, or payment will be made, except as provided in Section D.1.5 for impact claims.
- D.1.5 If any Change Order Work under Section D.1.3 causes an increase or decrease in the Contractor's cost of, or the Contract Time required for the performance of, any other part of the Work under this Contract, the Contractor must submit a written request to the Owner's Authorized Representative, setting forth the nature and specific extent of the request, including all time and cost impacts against the Contract as soon as possible, but no later than thirty (30) Days after receipt of the Change Order by Contractor.

The thirty (30) day time limit applies to claims of Subcontractors, suppliers, or manufacturers that may be affected by the Change Order and that request additional compensation or an extension of Contract Time to perform; Contractor has responsibility for contacting its Subcontractors, suppliers, or manufacturers within the thirty (30) day time limit, and including their requests with Contractor's requests. If the request involves Work to be completed by Subcontractors, or materials to be furnished by suppliers or manufacturers, such requests shall be submitted to the Contractor in writing with full analysis and justification for the compensation and additional Contract Time requested. The Contractor will analyze and evaluate the ments of the requests submitted by Subcontractors, suppliers, and manufacturers to Contractor prior to including those requests and contractor's analysis and evaluation of those requests with Contractor's requests for additional compensation or Contract Time that Contractor submits to the Owner's Authorized Representative. Failure of Subcontractors, suppliers, manufacturers or others to submit their requests to Contractor's requests or others to submit their requests submitted to Owner's Authorized Representative and the Owner will not consider direct requests or claims from Subcontractors, suppliers, manufacturers or others and the Owner will not consider direct requests or claims under this section does not give any person, not a party to the Contract. The consideration of such this claims process, in litigation, or in any dispute resolution process.

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

- D.1.6 No request or Claim by the Contractor for additional costs or an extension of Contract Time shall be allowed if made after receipt of final payment application under this Contract. Contractor agrees to submit its final payment application within ninety (90) days after Substantial Completion, unless written extension is granted by Owner. Contractor shall not delay final payment application for any reason, including without limitation nonpayment of Subcontractors, suppliers, manufacturers or others not a party to this Contract, or lack of resolution of a dispute with Owner or any other person of matters arising out of or relating to the Contract. If Contractor fails to submit its final payment application within ninety (90) days after Substantial Completion, and Contractor has not obtained written extension by Owner, all requests or Claims for additional costs or an extension of Contract Time shall be waived.
- D.1.7 It is understood that changes in the Work are inherent in construction of this type. The number of changes, the scope of those changes, and the effect they have on the progress of the original Work cannot be defined at this time. The Contractor is notified that numerous changes may be required and that there will be no compensation made to the Contractor directly related to the number of changes. Each change will be evaluated for extension of Contract Time and increase or decrease in compensation based on its own merit.

D.2 DELAYS

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

- Avoidable Delays include any delays other than Unavoidable Delays, and include delays that otherwise would be considered Unavoidable D.2.1.1 Delays but that:
 - (a) Could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors.
 - (b) Affect only a portion of the Work and do not necessarily prevent or delay the prosecution of other parts of the Work nor the completion of the whole Work within the Contract Time.
 - Do not impact activities on the accepted critical path schedule.
 - Are associated with the reasonable interference of other contractors employed by the Owner that do not necessarily prevent the completion of the whole Work within the Contract Time.
- D.2.1.2 Unavoidable Delays include delays other than Avoidable Delays that are:
 - (a) Caused by any actions of the Owner, Owner's Authorized Representative, or any other employee or agent of the Owner, or by separate contractor employed by the Owner.
 - (b) Caused by any site conditions which differ materially from what was represented in the Contract Documents or from conditions that would normally be expected to exist and be inherent to the construction activities defined in the Contract Documents. The Contractor shall notify the Owner's Authorized Representative immediately of differing site conditions before the area has been disturbed. The Owner's Authorized Representative will investigate the area and make a determination as to whether or not the conditions differ materially from either the conditions stated in the Contract Documents or those which could reasonably be expected in execution of this particular Contract. If Contractor and the Owner's Authorized Representative agree that a differing site condition exists, any additional compensation or additional Contract Time will be determined based on the process set forth in Section D.1.5 for Change Order Work. If the Owner's Authorized Representative disagrees that a differing site condition exists and denies Contractor's request for additional compensation or Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process.
 - (c) Caused by Force Majeure acts, events or occurrences that could not have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors.
 - (d) Caused by adverse weather conditions. Any adverse weather conditions must be substantiated by documentary evidence that weather conditions were abnormal for the specific time period claimed, could not have been anticipated by the Contractor, and adversely impacted the project in a manner that could not be avoided by rescheduling the Work or by implementing measures to protect against the weather so that the Work could proceed. A rain, windstorm, high water, or other natural phenomenon for the specific locality of the Work, which might reasonably have been anticipated from the previous 10-year historical records of the general locality of the Work, shall not be construed as abnormal. The parties agree that rainfall greater than the following levels cannot be reasonably anticipated:
 - (i) Daily rainfall equal to, or greater than, 0.50 inch during a month when the monthly rainfall exceeds the normal monthly average by twenty-five percent (25 %) or more.
 - (ii) daily rainfall equal to, or greater than, 0.75 inch at any time.

The Office of the Environmental Data Service of the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce nearest the project site shall be considered the official agency of record for weather information.

- D.2.2 Except as otherwise provided in ORS 279C.315, Contractor shall not be entitled to additional compensation or additional Contract Time for Avoidable Delays.
- D.2.3 In the event of Unavoidable Delays, based on principles of equitable adjustment, Contractor may be entitled to the following:
 - (a) Contractor may be entitled to additional compensation or additional Contract Time, or both, for Unavoidable Delays described in Section D.2.1.2 (a) and (b).
 - (b) Contractor may be entitled to additional Contract Time for Unavoidable Delays described in Section D.2.1.2(c) and (d).

In the event of any requests for additional contract rime of orbitational Contract Time, or both, as applicable, arising under this Section D.2.3 for Unavoidable Delays, other than requests for additional compensation or additional Contract Time for differing site conditions for which a review process is established under Section D.2.1.2 (b), Contractor shall submit a written notification of the delay to the Owner's Authorized Representative within two (2) Days of the occurrence of the cause of the delay. This written notification shall state the cause of the potential delay, the project components impacted by the delay, and the anticipated additional Contract Time or the additional compensation, or both, as applicable, resulting from the delay. Within seven (7) Days after the cause of the Owner's Authorized Representative, and the anticipated additional Contract Time or the additional compensation, or both, (30) Days after the initial written notification, the Contractor shall submit to the Owner's Authorized Representative, a complete and detailed request for additional compensation or additional Contract Time, or both, as applicable, resulting from the delay.

If the Owner's Authorized Representative denies Contractor's request for additional compensation or adjustment of Contract Time, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process. If Contractor does not timely submit the notices required under this Section D.2., then unless otherwise prohibited by law, Contractor's Claim shall be barred.

D.3 CLAIMS REVIEW PROCESS

- D.3.1 All Contractor Claims shall be referred to the Owner's Authorized Representative for review. Contractor's Claims, including Claims for additional compensation or additional Contract Time, shall be submitted in writing by Contractor to the Owner's Authorized Representative within five (5) Days after a denial of Contractor's initial request for an adjustment of Contract terms, payment of money, extension of Contract Time or other relief, provided that such initial request has been submitted in accordance with the requirements and within the time limits established in these General Conditions. Within thirty (30) Days after the initial Claim, Contractor shall submit to the Owner's Authorized Representative, a complete and detailed description of the Claim (the "Detailed Notice") that includes all information required by Section D.3.2. Unless the Claim is made in accordance with these time requirements, it shall be waived.
- D.3.2 The Detailed Notice of the Claim shall be submitted in writing by Contractor and shall include a detailed, factual statement of the basis of the Claim, pertinent dates, Contract provisions which support or allow the Claim, reference to or copies of any documents which support the Claim, the dollar value of the Claim, and the Contract Time extension requested for the Claim. If the Claim involves Work to be completed by Subcontractors, the Contractor will analyze and evaluate the merits of the Subcontractor claim prior to forwarding it and that analysis and evaluations to the Owner's Authorized Representative. The Owner's Authorized Representative and the Owner will not consider direct claims from Subcontractors, suppliers, manufacturers, or others not a party to this Contract. Contractor agrees that it will make no agreement, covenant, or assignment, nor will it commit any other act that will permit or assist any Subcontractor, supplier, manufacturer, or other to directly or indirectly make a claim against Owner.
- The Owner's Authorized Representative will review all Claims and take one or more of the following preliminary actions within ten (10) Days of receipt of the Detailed Notice of a Claim: (1) request additional supporting information from the Contractor; (2) inform the Contractor and Owner in writing of the time required for adequate review and response; (3) reject the Claim in whole or in part and identify the reasons for rejection; (4) based on principles of equitable adjustment, recommend approval of all or part of the Claim; or (5) propose an alternate resolution. D 3 3

- D.3.4 The Owner's Authorized Representative's decision shall be final and binding on the Contractor unless appealed by written notice to the Owner within fifteen (15) Days of receipt of the decision. The Contractor must present written documentation supporting the Claim within fifteen (15) Days of the notice of appeal. After receiving the appeal documentation, the Owner shall review the materials and render a decision within thirty (30) Days after receiving the appeal documents.
- D.3.5 The decision of the Owner shall be final and binding unless the Contractor delivers to the Owner its requests for mediation, which shall be a nonbinding process, within fifteen (15) Days of the date of the Owner's decision. The mediation process will be considered to have commenced as of the date the Contractor delivers the request. Both parties acknowledge and agree that participation in mediation is a prerequisite to commencement of litigation of any disputes relating to the Contract. Both parties further agree to exercise their best efforts in good faith to resolve all disputes within sixty (60) Days of the commencement of the mediation through the mediation process set forth herein.

In the event that a lawsuit must be filed within this sixty (60) day period in order to preserve a cause of action, the parties agree that notwithstanding the filing, they shall proceed diligently with the mediation to its conclusion prior to actively prosecuting the lawsuit, and shall seek from the Court in which the lawsuit is pending such stays or extensions, including the filing of an answer, as may be necessary to facilitate the mediation process. Further, in the event settlements are reached on any issues through mediation, the parties agree to promptly submit the appropriate motions and orders documenting the settlement to the Court for its signature and filing.

- D.3.6 The mediator shall be an individual mutually acceptable to both parties, but in the absence of agreement each party shall select a temporary mediator and the temporary mediators shall jointly select the permanent mediator. Each party shall pay its own costs for the time and effort involved in mediation. The cost of the mediator shall be split equally between the two parties. Both parties agree to exercise their best effort in good faith to resolve all disputes in mediation. Participation in mediation is a mandatory requirement of both the Owner and the Contractor. The schedule, time and place for mediation will be mutually acceptable, or, failing mutual agreement, shall be a setablished by the mediator. The parties agree to comply with Owner's administrative rules governing the confidentiality of mediator or otherwise require the mediator to produce records, notes or work product, or to testify in any future proceedings as to information disclosed or representations made in the course of mediation, except to the extent disclosure is required by law.
- D.3.7 Owner may at any time and at its discretion issue a construction change directive adding to, modifying or reducing the scope of Work. Contractor and Owner shall negotiate the need for any additional compensation or additional Contract Time related to the change, subject to the procedures for submitting requests or Claims for additional compensation or additional Contract Time established in this Section D. Unless otherwise directed by Owner's Authorized Representative, Contractor shall proceed with the Work while any request or Claim is pending, including but not limited to, a request or Claim for additional compensation or additional Contract Time resulting from Work under a Change Order or construction change directive. Regardless of the review period or the final decision of the Owner's Authorized Representative, the Contractor shall continue to diligently pursue the Work as identified in the Contract Documents. In no case is the Contractor justified or allowed to cease Work without a written stop work order from the Owner's Authorized Representative.

SECTION E PAYMENTS

E.1 SCHEDULE OF VALUES

The Contractor shall submit, at least ten (10) Days prior to submission of its first application for progress payment, a schedule of values ("Schedule of Values") for the contracted Work. This schedule will provide a breakdown of values for the contracted Work and will be the basis for progress payments. The breakdown will demonstrate reasonable, identifiable, and measurable components of the Work. Unless objected to by the Owner's Authorized Representative, this schedule shall be used as the basis for reviewing Contractor's applications for payment. If objected to by Owner's Authorized Representative, Contractor shall revise the schedule of values and resubmit the same for approval of Owner's Authorized Representative.

E.2 APPLICATIONS FOR PAYMENT

E.2.1 Owner shall make progress payments on the Contract monthly as Work progresses. Payments shall be based upon estimates of Work completed and the Schedule of Values. All payments shall be approved by the Owner's Authorized Representative. A progress payment shall not be considered acceptance or approval of any Work or waiver of any defects therein. Owner shall pay to Contractor interest on the progress payment, not including retainage, due the Contractor. The interest shall commence thirty (30) Days after the receipt of invoice ("application for payment") from the Contractor or fifteen (15) Days after the payment is approved by the Owner's Authorized Representative, whichever is the earlier date. The rate of interest shall be two-thirds of one percent (.00667%) per month. Notwithstanding the foregoing, in instances when an application for payment is filled out incorrectly, or when there is any defect or impropriety in any submitted application for payment is defective or improper or the reasons for the dispute. A defective or improper application for payment, if corrected by the Contractor within seven (7) Days of being notified by the Owner, shall not cause a payment to be made later than specified in this section unless interest is also paid. Accrual of interest will be postponed when payment on the principal is delayed because of disagreement between the Owner and the Contractor.

Owner reserves the right, instead of requiring the Contractor to correct or resubmit a defective or improper application for payment, to reject the defective or improper portion of the application for payment and pay the remainder of the application for payment that is correct and proper.

Owner, upon written notice to the Contractor, may elect to make payments to the Contractor only by means of Electronic Funds Transfers (EFT) through Automated Clearing House (ACH) payments. If Owner makes this election, the Contractor will be required to arrange to receive EFT/ACH payments.

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

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

Signed:

- E.2.3 Generally, applications for payment will be accepted only for materials that have been installed. Under special conditions, applications for payment for stored materials will be accepted at Owner's sole discretion. Such a payment, if made, will be subject to the following conditions:
 - (a) The request for stored material shall be submitted at least thirty (30) Days in advance of the application for payment on which it appears. Applications for payment shall be entertained for major equipment, components or expenditures only.
 - (b) The Contractor shall submit applications for payment showing the quantity and cost of the material stored.

- (c) The material shall be stored in a warehouse approved in advance by Owner and, if required by Owner, the warehouse shall be bonded. Owner's Authorized Representative shall be granted the right to access material stored in any warehouse
 - for the purpose of removal or inspection at any time during the Contract Period.
- (d) The Contractor shall name the Owner as co- insured on the insurance policy covering the full value of the property while in the care and custody of the Contractor until it is installed. A certificate noting this coverage shall be issued to the Owner.
- (e) Payments shall be made for materials only. The submitted amount of the application for payment shall be reduced by the cost of transportation and for the cost of an inspector to check the delivery at out of town storage sites. The cost of said inspection shall be borne solely by the Contractor.
- (f) Within sixty (60) Days of the application for payment, the Contractor shall submit evidence of payment covering the material stored.
- (g) Payment for stored materials shall in no way indicate acceptance of the materials or waive any rights under this Contract for the rejection of the Work or materials not in conformance with the Contract Documents.
- (h) All required documentation must be submitted with the respective application for payment.
- E.2.4 The Owner reserves the right to withhold all or part of a payment, or may nullify in whole or part any payment previously made, to such extent as may be necessary in the Owner's opinion to protect the Owner from loss because of:
 - (a) Work that is defective and not remedied, or that has been demonstrated or identified as failing to conform with the Contract Documents,
 - (b) third party claims filed or evidence reasonably indicating that such claims will likely be filed unless security acceptable to the Owner is provided by the Contractor;
 - (c) failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment (in which case Owner may issue checks made payable jointly to Owner and such unpaid persons under this provision, or directly to Subcontractors and suppliers at any level under Section C.3.2.1);
 - (d) reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price;
 - (e) damage to the Owner or another contractor;
 - (f) reasonable evidence that the Work will not be completed within the Contract Time required by the Contract, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
 - (g) failure to carry out the Work in accordance with the Contract Documents; or
 - (h) assessment of liquidated damages, when withholding is made for offset purposes.
- E.2.5 Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:
 - (a) Take that portion of the Contract Price properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Price allocated to that portion of the Work in the Schedule of Values, less retainage as provided in Section E.5. Pending final determination of cost to the Owner of changes in the Work, no amounts for changes in the Work can be included in application for payment until the Contract Price has been adjusted by Change Order;
 - (b) Add that portion of the Contract Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner pursuant to Section E.2.3, suitably stored off the site at a location agreed upon in writing), less retainage as provided in Section E.5;
 - (c) Subtract the aggregate of previous payments made by the Owner; and
 - (d) Subtract any amounts for which the Owner's Authorized Representative has withheld or nullified payment as provided in the Contract Documents.
- E.2.6 Contractor's applications for payment may not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier.
- E.2.7 The Contractor warrants to Owner that title to all Work covered by an application for payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an application for payment all Work for which payments are received from the Owner shall be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.
- E.2.8 If Contractor disputes any determination by Owner's Authorized Representative with regard to any application for payment, Contractor nevertheless shall continue to prosecute expeditiously the Work. No payment made hereunder shall be or be construed to be final acceptance or approval of that portion of the Work to which such partial payment relates or shall relieve Contractor of any of its obligations hereunder.

E.3 PAYROLL CERTIFICATION REQUIREMENT

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

E.4 DUAL PAYMENT SOURCES

Contractor shall not be compensated for Work performed under this Contract from any public body other than Owner.

E.5 RETAINAGE

- E.5.1 Retainage shall be withheld and released in accordance with ORS 279C.550 to 279C.580:
 - E.5.1.1 Owner may reserve as retainage from any progress payment an amount not to exceed five percent of the payment. As Work progresses, Owner may reduce the amount of the retainage and may eliminate retainage on any remaining monthly Contract payments after 50 percent of the Work under the Contract is completed if, in the Owner's opinion, such Work is progressing satisfactorily. Elimination or reduction of retainage shall be allowed only upon written application by the Contractor, which application shall include written approval of Contractor's surety; except that when the Work is 97-1/2 percent completed the Owner may, at its discretion and without application by the Contractor, reduce the retained amount to 100 percent of the value of the Work remaining to be done. Upon receipt of written application by the Contractor, Owner shall respond in writing within a reasonable time.
 - E.5.1.2 In accordance with the provisions of ORS 279C.560 and any applicable administrative rules, unless the Owner finds in writing that accepting a bond, security or other instrument described in options (a) or (c) below poses an extraordinary risk that is not typically associated with the bond, security or instrument, the Owner will approve the Contractor's written request:
 - (a) to be paid amounts which would otherwise have been retained from progress payments where Contractor has deposited acceptable bonds, securities or other instruments of equal value with Owner or in a custodial account or other mutually-agreed account satisfactory to Owner, with an approved bank or trust company to be held in lieu of the cash retainage for the benefit of Owner. Interest or earnings

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on the bonds, securities or other instruments shall accrue to the Contractor. The Contractor shall execute and provide such documentation and instructions respecting the bonds, securities and other instruments as the Owner may require to protect its interests. To be permissible the bonds, securities and other instruments must be:

- (i) Bills, certificates, notes or bonds of the United States.
- (ii) Other obligations of the United States or agencies of the United States.
- (iii) Obligations of a corporation wholly owned by the federal government.
- (iv) Indebtedness of the Federal National Mortgage Association.
- (v) General obligation bonds of the State of Oregon or a political subdivision of the State of Oregon.
- (vi) Irrevocable letters of credit issued by an insured institution, as defined in ORS 706.008.
- (b) that retainage be deposited in an interest-bearing account in a bank, savings bank, trust company or savings association for the benefit of Owner, with interest from such account accruing to the Contractor; or
- (c) that the Contractor be allowed, with the approval of the Owner, to deposit a surety bond for the benefit of Owner, in a form acceptable to Owner, in lieu of all or a portion of funds retained, or to be retained. Such bond and any proceeds therefrom shall be made subject to all claims and liens in the manner and priority as set forth for retainage under ORS 279C.550 to ORS 279C.625.

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

- E.5.1.3 The retainage held by Owner shall be included in and paid to the Contractor as part of the final payment of the Contract Price. The Owner shall pay to Contractor interest at the rate of one and one-half percent per month on the final payment due Contractor, interest to commence thirty (30) Days after the Work under the Contract has been completed and accepted and to run until the date Contractor shall notify Owner in writing when the Contractor considers the Work complete and Owner shall, within fifteen (15) Days after receiving the written notice, either accept the Work or notify the Contractor of Work yet to be performed on the Contract. If Owner does not within the time allowed notify the Contractor of Work yet to be performed on the Interest provided by this subsection shall commence to run thirty (30) Days after the end of the 15-Day period.
- E.5.1.4 In accordance with the provisions of ORS 279C.560, if the Owner accepts bonds, securities or other instruments deposited as provided in paragraphs (a) and (c) of subsection E.5.1.2, the Owner shall reduce the moneys held as retainage in an amount equal to the value of the bonds, securities and other instruments and pay the amount of the reduction to the Contractor in accordance with ORS 279C.570.
- E.5.1.5 Contractor agrees that if Contractor elects to reserve a retainage from any progress payment due to any Subcontractor or supplier, such retainage shall not exceed five percent of the payment, and such retainage withheld from Subcontractors and suppliers shall be subject to the same terms and conditions stated in Subsection E.5 as apply to Owner's retainage from any progress payment due to Contractor. Provided, however, if in accordance with the provisions of ORS 279C.560 the Contractor has deposited bonds, securities or other instruments or has elected to have the Owner deposit accumulated retainage in an interest-bearing account, the Contractor shall comply with the provisions of ORS 701.435 respecting the deposit of bonds, securities or other instruments by Subcontractors and suppliers and the sharing of interest earnings with Subcontractors and suppliers.
- E.5.2 As provided in subsections C.2.2 and C.2.3, additional retainage in the amount of 25% of amounts earned shall be withheld and released in accordance with ORS 279C.845(7) when the Contractor fails to file certified statements as required by section C.2.1.

E.6 FINAL PAYMENT

- E.6.1 Upon completion of all the Work under this Contract, the Contractor shall notify the Owner's Authorized Representative, in writing, that Contractor has completed Contractor's part of the Contract and shall request final payment. Upon receipt of such notice the Owner's Authorized Representative will inspect the Work, and if acceptable, submit to the Owner a recommendation as to acceptance of the completed Work and the final estimate of the amount due the Contractor. If the Work is not acceptable, Owner will notify Contractor within fifteen (15) Days of Contractor's request for final payment. Upon approval of this final estimate by the Owner and compliance by the Contractor with provisions in Section K. 3 AFFIDAVIT/ RELEASE OF LIENS AND CLAIMS, and other provisions as may be applicable, the Owner shall pay to the Contractor all monies due under the provisions of these Contract Documents.
- E.6.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Owner's Authorized Representative (1) a notarized affidavit/release of liens and claims in a form satisfactory to Owner that states that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least thirty (30) Days' prior written notice has been given to the Owner (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.
- E.6.3 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final application for payment.

SECTION F JOB SITE CONDITIONS

F.1 USE OF PREMISES

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

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

F.2.1 Contractor shall maintain continuous and adequate protection of all of the Work from damage, and shall protect the Owner's Authorized Representative, workers and property from injury or loss arising in connection with this Contract. Contractor shall remedy acceptably to the Owner,

N.M.H.S. Humanities Restroom

any damage, injury, or loss, except such as may be directly due to errors in the Contract Documents or caused by authorized representatives or personnel of the Owner. Contractor shall adequately protect adjacent property as provided by law and the Contract Documents.

- F.2.2 Contractor shall take all necessary precautions for the safety of all personnel on the job site, and shall comply with the Contract Documents and all applicable provisions of federal, state and municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the Work is being performed. Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for protection of workers and the public against any hazards created by construction. Contractor shall designate a responsible employee or associate on the Work site, whose duty shall be the prevention of accidents. The name and position of the person designated shall be reported to the Owner's Authorized Representative. The Owner's Authorized Representative has no responsibility for Work site safety. Work site safety is the responsibility of the Contractor.
- F.2.3 Contractor shall not enter upon private property without first obtaining permission from the property owner or its duly authorized representative. Contractor shall be responsible for the preservation of all public and private property along and adjacent to the Work contemplated under the Contract and shall use every precaution necessary to prevent damage thereto. In the event the Contractor damages any property, the Contractor shall at once notify the property owner and make, or arrange to make, full restitution. Contractor shall immediately and in writing, report to the Owner's Authorized Representative, all pertinent facts relating to such property damage and the ultimate disposition of the claim for damage.
- F.2.4 Contractor is responsible for protection of adjacent work areas including impacts brought about by activities, equipment, labor, utilities, and materials on the site.
- F.2.5 Contractor shall at all times direct its activities in such a manner as to minimize adverse effects on the environment. Handling of all materials will be conducted so no release will occur that may pollute or become hazardous.
- F.2.6 In an emergency affecting the safety of life or of the Work or of adjoining property, the Contractor, without special instruction or authorization from the Owner's Authorized Representative, shall act reasonably to prevent threatened loss or injury, and shall so act, without appeal, if instructed by the Owner's Authorized Representative. Any compensation claimed by the Contractor on account of emergency work shall be determined in accordance with Section D.

F.3 CUTTING AND PATCHING

- F.3.1 Contractor shall be responsible for coordinating all cutting, fitting, or patching of the Work to make its several parts come together properly and fit to receive or be received by work of other contractors or Subcontractors shown upon, or reasonably implied by, the Contract Documents.
- F.3.2 Contractor shall be responsible for restoring all cut, fitted, or patched surfaces to an original condition; provided, however, that if a different condition is specified in the Contract Documents, then Contractor shall be responsible for restoring such surfaces to the condition specified in the Contract Documents.

F.4 CLEANING UP

From time to time as may be ordered by the Owner the Contractor shall, at its own expense, clean up and remove all refuse and unused materials of any kind resulting from the Work. If Contractor fails to do so within twenty-four hours after notification by the Owner the work may be done by others and the cost charged to the Contractor and deducted from payment due the Contractor.

F.5 ENVIRONMENTAL CONTAMINATION

- F.5.1 Contractor will be held responsible for and shall indemnify, defend (with counsel of Owner's choice) and hold harmless Owner from and against any costs, expenses, damages, claims, and causes of action, (including attorney fees), or any of them, resulting from all spills, releases, discharges, leaks and disposal of environmental pollution, including storage, transportation, and handling during the performance of the Contract which occur as a result of, or are contributed by, the negligence or actions of Contractor or its personnel, agents, or Subcontractors or any failure to perform in accordance with the Contract Documents (except to the extent otherwise void under ORS 30.140). Nothing in this section F.5.1 shall limit Contractor's responsibility for obtaining insurance coverages required under Section G.3 of these General Conditions, and Contractor shall take no action that would void or impair such coverages
 - F.5.1.1 Contractor agrees to promptly dispose of such spills, releases, discharge or leaks to the satisfaction of Owner and proper regulatory agencies in a manner that complies with applicable federal, state, and local laws and regulations. Cleanup shall be at no cost to the Owner and be performed by properly qualified personnel.
 - F.5.1.2 Contractor shall obtain the Owner's written consent prior to bringing onto the Work site any (i) environmental pollutants or (ii) hazardous substances or materials, as the same or reasonably similar terms are used in any applicable federal, state, or local statutes, rules or ordinances. Notwithstanding such written consent from the Owner, the Contractor, at all times, shall:
 - (a) properly handle, use and dispose of all environmental pollutants and hazardous substances or materials brought onto the Work site, in accordance with all applicable federal, state, or local statutes, rules, or ordinances;
 - (b) be responsible for any and all spills, releases, discharges, or leaks of (or from) environmental pollutants or hazardous substances or materials which Contractor has brought onto the Work site; and
 - (c) promptly clean up, without cost to the Owner, such spills, releases, discharges, or leaks to the Owner's satisfaction and in compliance with all applicable federal, state, or local statutes, rules or ordinances.
- F.5.2 Contractor shall report all reportable quantity releases to applicable federal, state, and local regulatory and emergency response agencies. Reportable quantities are found in 40 CFR Part 302, Table 302.4 for hazardous substances and in OAR 340-142-0050 for all products addressed therein. Upon discovery, regardless of quantity, Contractor must telephonically report all releases to the Owner. A written follow-up report shall be submitted to Owner within 48 hours of the telephonic report. Such written report shall contain, as a minimum:
 - (a) Description of items released (identity, quantity, manifest no., and all other documentation required by law.)
 - (b) Whether amount of items released is EPA/DEQ reportable, and, if so, when it was reported.
 - (c) Exact time and location of release, including a description of the area involved.
 - (d) Containment procedures initiated.
 - (e) Summary of communications about the release Contractor has had with members of the press or State officials other than Owner.
 - (f) Description of cleanup procedures employed or to be employed at the site, including disposal location of spill residue.
 - (g) Personnel injuries, if any, resulting from, or aggravated by, the release.

F.6 ENVIRONMENTAL CLEAN-UP

- F.6.1 Unless disposition of environmental pollution is specifically a part of this Contract, or was caused by the Contractor (reference F.5 Environmental Contamination), Contractor shall immediately notify Owner of any hazardous substance(s) which Contractor discovers or encounters during performance of the Work required by this Contract. "Hazardous substance(s)" means any hazardous, toxic and radioactive materials and those substances defined as "hazardous substances," "hazardous materials," "hazardous wastes," "toxic substances," or other similar designations in any federal, state, or local law, regulation, or ordinance, including without limitation asbestos, polychlorinated biphenyl (PCB), or petroleum, and any substances, materials or wastes regulated in 40 CFR, Part 261 and defined as hazardous in 40 CFR S 261.3. In addition to notifying Owner of any hazardous substance(s) has been discovered or encountered if continued work in such area would present a risk or danger to the health or well-being of Contractor's or any Subcontractor's work force.
- F.6.2 Upon being notified by Contractor of the presence of hazardous substance(s) on the project site, Owner shall arrange for the proper disposition of such hazardous substance(s).

F.7 FORCE MAJEURE

A party to this Contract shall not be held responsible for delay or default due to Force Majeure acts, events or occurrences unless they could have been avoided by the exercise of reasonable care, prudence, foresight, and diligence by that party. The Owner may terminate this Contract upon written notice after determining that delay or default caused by Force Majeure acts, events or occurrences will reasonably prevent successful performance of the Contract.

SECTION G INDEMNITY, BONDING, AND INSURANCE

G.1 RESPONSIBILITY FOR DAMAGES / INDEMNITY

- G.1.1 Contractor shall be responsible for all damage to property, injury to persons, and loss, expense, inconvenience, and delay that may be caused by, or result from, the carrying out of the Work to be done under this Contract, or from any act, omission or neglect of the Contractor, its Subcontractors, personnel, or agents.
- G.1.2 To the fullest extent permitted by law, Contractor shall indemnify, defend (with counsel approved by Owner) and hold harmless the Owner, Owner's Authorized Representative, Architect/Engineer, Architect/Engineer's consultants, and their respective officers, directors, agents, employees, partners, members, stockholders and affiliated companies (collectively "Indemnitees") from and against all liabilities, damages, losses, claims, expenses (including reasonable attorney fees), demands and actions of any nature whatsoever which arise out of, result from or are related to, (a) any damage, injury, loss, expense, inconvenience or delay described in this Section G.1.2, (b) any accident or occurrence which happens or is alleged to have happened in or about the project site or any place where the Work is being performed, or in the vicinity of either, at any time prior to the time the Work is fully completed in all respects, (c) any failure of the Contractor to observe or perform any duty or obligation under the Contract Documents which is to be observed or performed by the Contractor, or any breach of any agreement, representation or warranty of the Contract Documents which is to be observed or performed by the Contract, or any breach of any agreement, representation or warranty of the Contract procure or indirectly employed by them or any one of them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder (except to the extent otherwise void under ORS 30.140), and (e) any lien filed upon the project or bond claim in connection with the Work. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section G.1.2.
- G.1.3 In claims against any person or entity indemnified under this Section G.1.2 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section G.1.2 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

G.2 PERFORMANCE AND PAYMENT SECURITY; PUBLIC WORKS BOND

- G.2.1 When the Contract Price is \$100,000 or more the Contractor shall furnish and maintain in effect at all times during the Contract Period, a performance bond in a sum equal to the Contract Price, and a separate payment bond also in a sum equal to the Contract Price. The bonds may be required if the Contract Price is less than the above thresholds, if required by the Contract Documents.
- G.2.2 Bond forms furnished by the Owner and notarized by awarded Contractor's surety company authorized to do business in Oregon are the only acceptable forms of performance and payment security, unless otherwise specified in the Contract Documents.
- G.2.3 Before execution of the Contract Contractor shall file with the Construction Contractors Board, and maintain in full force and effect, the separate public works bond required by Oregon Laws 2005, Chapter 360, and OAR 839-025-0015, unless otherwise exempt under those provisions. The Contractor shall also include in every subcontract a provision requiring the Subcontractor to have a public works bond filed with the Construction Contractors Board before starting Work, unless otherwise exempt, and shall verify that the Subcontractor has filed a public works bond before permitting the Subcontractor to start Work.

G.3 INSURANCE

- G.3.1 Primary Coverage: Insurance carried by Contractor under this Contract shall be the primary coverage and non-contributory with any other insurance and self- insurance, and the Owner's insurance is excess and solely for damages or losses for which the Owner is responsible. The coverages indicated are minimums unless otherwise specified in the Contract Documents.
- G.3.2 Workers' Compensation: All employers, including Contractor, that employ subject workers who work under this contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. This shall include Employer's Liability Insurance with coverage limits of not less than \$100,000 for each accident. Contractors who perform the Work without the assistance or labor of any employee need not obtain such coverage if the Contractor certifies so in writing. Contractor shall ensure that each of its Subcontractors complies with these requirements. The Contractor shall require proof of such Workers' Compensation by receiving and keeping on file a certificate of insurance from each Subcontractor or anyone else directly employed by either the Contractor or its Subcontractors.
- G.3.3 Builder's Risk Insurance:
 - G.3.3.1 Builder's Risk: During the term of this Contract, for new construction the Contractor shall obtain and keep in effect Builder's Risk insurance on an all risk form, including earthquake and flood, for an amount equal to the full amount of the Contract. Any deductible shall not exceed \$50,000 for each loss, except the earthquake deductible shall not exceed five percent (5%) of total insured value, subject to Earthquake Zones 1 and 2, and flood deductible shall not exceed \$100,000. The policy will include as loss payees the Owner, the Contractor and its Subcontractors as their interests may appear.

- G.3.3.2 Builder's Risk Installation Floater: For other than new construction the Contractor shall obtain and keep in effect during the term of this Contract, a Builder's Risk Installation Floater for coverage of the Contractor's labor, materials and equipment to be used for completion of the Work performed under this Contract. The minimum amount of coverage to be carried shall be equal to the full amount of the Contract. This insurance shall include as loss payees the Owner, the Contractor and its Subcontractors as their interests may appear.
- G.3.3.3 Such insurance shall be maintained until Owner has occupied the facility.
- G.3.3.4 A loss insured under the Builder's Risk insurance shall be adjusted by the Owner and made payable to the Owner for the insureds, as their interests may appear. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner. The Owner shall have power to adjust and settle a loss with insurers.

G.3.4 Liability Insurance:

- G.3.4.1 Commercial General Liability: Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Commercial General Liability Insurance covering bodily injury and property damage in a form satisfactory to Owner and in the amount of not less than \$2,000,000 per occurrence and \$4,000,000 aggregate limit. Said insurance shall include personal injury liability, products and completed operations, and contractual liability coverage for the indemnity provided under this Contract (to the extent contractual liability coverage for the indemnity is available in the marketplace), and shall be issued on an occurrence basis.
- G.3.4.2 Automobile Liability: Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Automobile Liability Insurance covering owned, non-owned and/or hired vehicles, as applicable. The coverage may be written in combination with the Commercial General Liability Insurance. Contractor shall provide proof of insurance of not less than \$4,000,000 combined single limit. Contractor and its Subcontractors shall be responsible for ensuring that all non-owned vehicles maintain adequate Automobile Liability insurance while on site.
- G.3.5 "Tail" Coverage: If any of the required liability insurance is arranged on a "claims made" basis, "tail" coverage will be required at the completion of this Contract for a duration of 24 months or the maximum time period available in the marketplace if less than 24 months. Contractor will be responsible for furnishing certification of "tail" coverage as described or continuous "claims made" liability coverage for 24 months following Final Completion. Continuous "claims made" coverage will be acceptable in lieu of "tail" coverage, provided its retroactive date is on or before the effective date of the Contract. This will be a condition of the final acceptance of Work or services and related warranty (if any).
- G.3.6 Excess/Umbrella Insurance: A combination of primary and excess/ umbrella insurance is acceptable to meet the minimum coverage requirements for Commercial General Liability and Automobile Liability Insurance. In such case, the insurance certificate must include a list of the policies that fall under the excess/umbrella insurance. Sample wording is "The Excess/Umbrella policy is excess over primary Commercial General Liability and primary Automobile Liability Insurance."
- G.3.7 Additional Insured: The liability insurance coverage, except Professional Liability and Workers' Compensation, if included, required for performance of this Contract shall include Owner, its directors, officers, agents and employees, as Additional Insureds but only with respect to the Contractor's activities to be performed under this Contract.
- G.3.8 Certificate(s) of Insurance: As evidence of the insurance coverage required by this Contract, the Contractor shall furnish certificate(s) of insurance to the Owner prior to execution of the Contract. The certificate(s) will specify all of the parties who are Additional Insureds or Loss Payees. Insurance coverage required under this Contract shall be obtained from insurance companies or entities acceptable to the Owner that are allowed to provide such insurance under Oregon law. Eligible insurers include admitted insurers that have been issued a certificate of authority from the Oregon Department of Consumer and Business Services authorizing them to do an insurance business in the state of Oregon, and certain non-admitted surplus lines insurers that satisfy the requirements of applicable Oregon law and are approved by the Owner. The Contractor shall be financially responsible for all deductibles, self-insured retentions and/or self-insurance in excess of \$50,000 shall be approved by the Owner in writing prior execution of the Contract and is subject to Owner's approval. Owner acknowledges that Contractor's deductible for General Liability and Workers' Compensation insurance is \$100,000, and the deductible for Contractor's Professional/Pollution insurance is \$500,000. The Contractor shall immediately notify the Owner's Authorized Representative in writing of any change in insurance coverage.

SECTION H SCHEDULE OF WORK

H.1 CONTRACT PERIOD

- H.1.1 Time is of the essence on this Contract. The Contractor shall at all times carry on the Work diligently, without delay and punctually fulfill all requirements herein. Contractor shall commence Work on the site within fifteen (15) Days of Notice to Proceed, unless directed otherwise.
- H.1.2 Unless specifically extended by Change Order, all Work shall be complete by the date contained in the Contract Documents. The Owner shall have the right to accelerate the completion date of the Work, which may require the use of overtime. Such accelerated Work schedule shall be an acceleration in performance of Work under Section D.1.2 (f) and shall be subject to the Change Order process of Section D.1.
- H.1.3 The Owner shall not waive any rights under the Contract by permitting the Contractor to continue or complete in whole or in part the Work after the date described in Section H.1.2 above.

H.2 SCHEDULE

H.2 SCHEDULE
 H.2.1 Contractor shall provide, by or before the pre-construction conference, a detailed schedule for review and acceptance by the Owner. The submitted schedule must illustrate Work by significant project components, significant labor trades, long lead items, broken down by building and/or floor where applicable. Each schedule item shall account for no greater than 5 % of the monetary value of the project or 5 % of the available Contract Time. Schedules with activities of less than one day or valued at less than 1% of the Contract will be considered too detailed and will not be accepted. Schedules lacking adequate detail, or unreasonably detailed, will be rejected. Included within the schedule are the following: Notice to Proceed, Substantial Completion, and Final Completion. Schedules will be updated monthly and submitted with the monthly payment application. Acceptance of the Schedule by the Owner does not constitute agreement by the Owner, as to the Contract row sequencing, means, methods, or allocated Contract Time. Any positive difference between the Contractor's scheduled completion and the Contract completion date is float owned by the Owner reserves the right to negotiate the float if it is deemed to be in Owner's best interest to do so. In no case shall the Contractor make a request for additional compensation for delays if the Work is completed within the Contract Time but after Contractor's scheduled completion.

H.3 PARTIAL OCCUPANCY OR USE

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H.3.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage, provided such occupancy or use is consented to by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have reasonably accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, insurance or self-insurance, maintenance, heat, utilities, and damage to the Work, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents with respect to such portion of the Work. Approval by the Contractor to partial occupancy or use, the Owner and Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work. Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

SECTION I CORRECTION OF WORK

I.1 CORRECTION OF WORK BEFORE FINAL PAYMENT

The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects, and that the Work will conform to the requirements of the Contract Documents. Work failing to conform to these requirements shall be deemed defective. Contractor shall promptly remove from the premises and replace all defective materials and equipment as determined by the Owner's Authorized Representative, whether incorporated in the Work or not. Removal and replacement shall be without loss or expense to the Owner, and Contractor shall bear the cost of repairing all Work destroyed or damaged by such removal or replacement. Contractor shall be allowed a period of no longer than thirty (30) Days after Substantial Completion for completion of the Work by the Architect/Engineer. Should the Work not be complete, and all corrections made, the costs for all subsequent re-inspections shall be bowner by the Contractor. If Contractor fails to complete the punch list work within the above time period, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) days after demand without affecting Contractor's obligations.

I.2 WARRANTY WORK

Neither the final certificate of payment nor any provision of the Contract Documents shall relieve the Contractor from responsibility for defective Work and, unless a longer period is specified, Contractor shall correct all defects that appear in the Work within a period of one year from the date of issuance of the written notice of Substantial Completion by the Owner except for latent defects which will be remedied by the Contractor at any 1.2.1 time they become apparent.

The Owner shall give Contractor notice of defects with reasonable promptness. Contractor shall perform such warranty work within a reasonable time after Owner's demand. If Contractor fails to complete the warranty work within such period as Owner determines reasonable, or at any time in the event of warranty work consisting of emergency repairs, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) Days after demand without affecting Contractors obligations.

- This provision does not negate guarantees or warranties for periods longer than one year including without limitation such guarantees or warranties required by other sections of the Contract Documents for specific installations, materials, processes, equipment or fixtures. 1.2.2
- In addition to Contractor's warranty, manufacturer's warranties shall pass to the Owner and shall not take effect until affected Work has been accepted in writing by the Owner's Authorized Representative. 123
- The one-year period for correction of Work shall be extended with respect to portions of Work performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work, and shall be extended by corrective Work performed by the Contractor pursuant to this Section, as to the Work corrected. The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner. I.2.5 Nothing contained in this Section I.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the period for correction of Work as described in this Section I.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work. 1.2.4
- If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Price will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made. SECTION J 126 SUSPENSION AND/OR TERMINATION OF THE WORK

J.1 OWNER'S RIGHT TO SUSPEND THE WORK

- J.1.1 The Owner and/or the Owner's Authorized Representative has the authority to suspend portions or all of the Work due to the following causes:
 - (a) Failure of the Contractor to correct unsafe conditions;
 - (b) Failure of the Contractor to carry out any provision of the Contract;
 - (c) Failure of the Contractor to carry out orders;
 - (d) Conditions, in the opinion of the Owner's Authorized Representative, which are unsuitable for performing the Work;
 - (e) Time required to investigate differing site conditions;
 - (f) Any reason considered to be in the public interest.
- The Owner shall notify Contractor and the Contractor's Surety in writing of the effective date and time of the suspension and Owner shall notify Contractor and Contractor's surety in writing to resume Work. J.1.2

J.2 CONTRACTOR'S RESPONSIBILITIES

- During the period of the suspension, Contractor is responsible to continue maintenance at the project just as if the Work were in progress. This includes, but is not limited to, protection of completed Work, maintenance of access, protection of stored materials, temporary facilities, and clean-J.2.1 up
- When the Work is recommenced after the suspension, the Contractor shall replace or renew any Work damaged during the suspension, remove any materials or facilities used as part of temporary maintenance, and complete the project in every respect as though its prosecution had been continuous and without suspension. J.2.2

J.3 COMPENSATION FOR SUSPENSION

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

J.4 OWNER'S RIGHT TO TERMINATE CONTRACT

- J.4.1 The Owner may, without prejudice to any other right or remedy, and after giving Contractor seven (7) Days' written notice and an opportunity to cure, terminate the Contract in whole or in part under the following conditions:
 - (a) If Contractor should voluntarily or involuntarily, seek protection under the United States Bankruptcy Code and Contractor as debtor-inpossession or the Trustee for the estate fails to assume the Contract within a reasonable time;
 - (b) If Contractor should make a general assignment for the benefit of Contractor's creditors;
 - (c) If a receiver should be appointed on account of Contractor's insolvency;
 - (d) If Contractor should repeatedly refuse or fail to supply an adequate number of skilled workers or proper materials to carry on the Work as required by the Contract Documents, or otherwise fail to perform the Work in a timely manner;
 - (e) If Contractor should repeatedly fail to make prompt payment to Subcontractors or for material or labor, or should disregard laws, ordinances or the policies or instructions of the Owner or its Authorized Representative; or
 - (f) If Contractor is otherwise in material breach of any part of the Contract.
- J.4.2 At any time that any of the above occurs, Owner may exercise all rights and remedies available to Owner at law or in equity, and in addition, Owner may take possession of the premises and of all materials and appliances and finish the Work by whatever method it may deem expedient. In such case, the Contractor shall not be entitled to receive further payment until the Work is completed. If the Owner's cost of finishing the Work exceeds the unpaid balance of the Contract Price, Contractor shall pay the difference to the Owner.

J.5 TERMINATION FOR CONVENIENCE

- J.5.1 Owner may terminate the Contract in whole or in part whenever Owner determines that termination of the Contract is in the best interest of the public.
- J.5.2 The Owner will provide the Contractor with seven (7) Days' prior written notice of a termination for public convenience. After such notice, the Contractor shall provide the Owner with immediate and peaceful possession of the premises and materials located on and off the premises for which the Contractor received progress payment under Section E. Compensation for Work terminated by the Owner under this provision will be according to Section E. In no circumstance shall Contractor be entitled to lost profits for Work not performed due to termination.

J.6 ACTION UPON TERMINATION

- J.6.1 Upon receiving a notice of termination, and except as directed otherwise by the Owner, Contractor shall immediately cease placing further subcontracts or orders for materials, services, or facilities. In addition, Contractor shall terminate all subcontracts or orders to the extent they relate to the Work terminated and, with the prior written approval of the Owner, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts and orders.
- J.6.2 As directed by the Owner, Contractor shall upon termination transfer title and deliver to the Owner all Record Documents, information, and other property that, if the Contract had been completed, would have been required to be furnished to the Owner.

SECTION K CONTRACT CLOSE OUT

K.1 RECORD DOCUMENTS

As a condition of final payment (refer also to section E.6), Contractor shall comply with the following: Contractor shall provide to Owner's Authorized Representative, Record Documents of the entire project. Record Documents shall depict the project as constructed and shall reflect each and every change, modification, and deletion made during the construction. Record Documents are part of the Work and shall be provided prior to the Owner's issuance of final payment. Record Documents include all modifications to the Contract Documents unless otherwise directed.

K.2 OPERATION AND MAINTENANCE MANUALS

As part of the Work, Contractor shall submit two completed operation and maintenance manuals ("O & M Manuals") for review by the Owner's Authorized Representative prior to submission of any pay request for more than 75% of the Work. No payments beyond 75% will be made by the Owner until the 0 & M Manuals have been received. The O & M Manuals shall contain a complete set of all submittals, all product data as required by the specifications, training information, phone list of consultants, manufacturers, installer and suppliers, manufacturer's printed data, record and shop drawings, schematic diagrams of systems, appropriate equipment indices, warranties and bonds. The Owner's Authorized Representative shall review and return one O & M Manual for any modifications or additions required. Prior to submission of its final pay request, Contractor shall deliver three (3) complete and approved sets of O & M Manuals to the Owner's Authorized Representative.

K.3 AFFIDAVIT/RELEASE OF LIENS AND CLAIMS

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

K.4 COMPLETION NOTICES

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

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

K.5 TRAINING

As part of the Work, and prior to submission of the request for final payment, the Contractor shall schedule with the Owner's Authorized Representative, training sessions for all equipment and systems, as required in the individual specifications sections. Contractor shall schedule training sessions at least two weeks in advance of the date of training to allow Owner personnel adequate notice.

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

K.6 EXTRA MATERIALS

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

K.7 ENVIRONMENTAL CLEAN-UP

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

K.8 CERTIFICATE OF OCCUPANCY

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

K.9 OTHER CONTRACTOR RESPONSIBILITIES

The Contractor shall be responsible for returning to the Owner all items issued during construction such as keys, security passes, site admittance badges, and all other pertinent items. The Contractor shall be responsible for notifying the appropriate utility companies to transfer utility charges from the Contractor to the Owner. The utility transfer date shall not be before Substantial Completion and may not be until Final Completion, if the Owner does not take beneficial use of the facility and the Contractor's forces continue with the Work.

K.10 SURVIVAL

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

SECTION L LEGAL RELATIONS & RESPONSIBILITIES

L.1 LAWS TO BE OBSERVED

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

L.2 FEDERAL AGENCIES

Agriculture, Department of Forest Service Soil Conservation Service Coast Guard Defense, Department of Army Corps of Engineers Energy, Department of Federal Energy Regulatory Commission Environmental Protection Agency Health and Human Services, Department of Housing and Urban Development, Department of Solar Energy and Energy Conservation Bank Interior, Department of Bureau of Land Management Bureau of Indian Affairs Bureau of Mines Bureau of Reclamation Geological Survey **Minerals Management Service** U.S. Fish and Wildlife Service

Labor, Department of Mine Safety and Health Administration Occupation Safety and Health Administration Transportation, Department of Federal Highway Administration Water Resources Council

L.3 STATE AGENCIES

Administrative Services, Department of Agriculture, Department of Soil and Water Conservation Commission Columbia River Gorge Commission Energy, Department of Environmental Quality, Department of Fish and Wildlife, Department of Forestry, Department of Geology and Mineral Industries, Department of Human Resources, Department of Consumer and Business Services, Department of Land Conservation and Development Commission Parks and Recreation, Department of State Lands, Division of Water Resources Department of

L.4 LOCAL AGENCIES

City Councils County Courts County Commissioner, Board of Design Commissions Historical Preservation Commission Planning Commissions

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SECTION 02 41 00 DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 10 00 Summary: Description of items to be salvaged or removed for re-use by Contractor.
- C. Section 01 50 00 Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 70 00 Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements for submittal procedures.
- B. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
 - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
 - 2. Demolition firm qualifications.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 3 EXECUTION

2.01 DEMOLITION

- A. Remove all item indicated for demolition
- B. Remove other items indicated, for salvage, relocation, and recycling.

2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Use of explosives is not permitted.
 - 3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 4. Provide, erect, and maintain temporary barriers and security devices.
 - 5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 6. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 - 7. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 - 8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.

- C. Protect existing structures and other elements to remain in place and not removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.

2.03 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

2.04 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- C. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
 - 2. Remove items indicated on drawings.
- D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. Verify that abandoned services serve only abandoned facilities before removal.
 - 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
- E. Protect existing work to remain.
 - 1. Prevent movement of structure. Provide shoring and bracing as required.
 - 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch to match new work.

2.05 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 41 00

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SECTION 061000

ROUGH CARPENTRY

PART1 GENERAL

1.01 SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Softwood lumber structural wood decking.
- C. Sheathing.
- D. Roof-mounted curbs.
- E. Roofing nailers.
- F. Preservative treated wood materials.
- G. Miscellaneous framing and sheathing.
- H. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

- A. Section 051200 Structural Steel Framing: Prefabricated beams and columns for support of wood framing.
- B. Section 055000 Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
- C. Section 072500 Weather Barriers: Water-resistive barrier over sheathing.
- D. Section 076200 Sheet Metal Flashing and Trim: Sill flashings.

1.03 REFERENCE STANDARDS

- A. AITC 112 Standard for Tongue-and-Groove Heavy Timber Roof Decking; 1993 and errata.
- B. AWC (WFCM) Wood Frame Construction Manual for One- and Two-Family Dwellings; 2015.
- C. AFPA (WFCM) Wood Frame Construction Manual for One- and Two-Family Dwellings; 2012.
- D. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- E. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- F. AWPA U1 Use Category System: User Specification for Treated Wood; 2017.
- G. PS 2 Performance Standard for Wood-Based Structural-Use Panels; 2010.
- H. PS 20 American Softwood Lumber Standard; 2015.
- I. RIS(GR) Standard Specifications for Grades of California Redwood Lumber; 2000.
- J. SPIB (GR) Grading Rules; 2014.
- K. WCLIB (GR) Standard Grading Rules for West Coast Lumber No. 17; 2015.
- L. WWPA G-5 Western Lumber Grading Rules; 2017.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.

- C. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.
- D. Samples: For rough carpentry members that will be exposed to view, submit two samples, actual size, six inches in length, illustrating wood grain, color, and general appearance.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the exposed products specified in this section with at least three years of documented experience and certified by AITC.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Douglas Fir-Larch, unless otherwise indicated.
 - 2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 - 3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 - 4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
- B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: West Coast Lumber Inspection Bureau; WCLIB (GR).
- B. Grading Agency: Western Wood Products Association; WWPA G-5.
- C. Sizes: Nominal sizes as indicated on drawings, S4S.
- D. Moisture Content: Sdry or MC19.
- E. Stud Framing (2 by 2 through 2 by 6):
 - 1. Species: Douglas Fir-Larch.
 - 2. Grade: No. 2 and as indicated on drawings.
- F. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16:
 - 1. Species and Grades: As indicated on drawings for various locations.
- G. Miscellaneous Framing, Blocking, Nailers, Grounds, Floor sleepers and Furring:1. Lumber: S4S, No. 3 or Utility Grade.

2.03 STRUCTURAL COMPOSITE LUMBER

A. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.

- 1. Columns: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published E (modulus of elasticity): 1,800,000 psi, minimum.
- 2. Beams: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published E (modulus of elasticity): 2,000,000 psi, minimum.
- 3. Manufacturers:
 - a. Boise Cascade Company; : www.bc.com/#sle.
 - b. Substitutions: See Section 016000 Product Requirements.

2.04 EXPOSED BOARDS

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Lumber Decking: Fabricated to AITC 112.
 - 1. Species: Douglas Fir, graded under WCLIB (GR) rules as AITC Select quality.
 - 2. Sze: 2.5 thick, nominal. Other dimensions as indicated on drawings.
 - 3. Pattern: AITC standard beveled V-joint with single tongue and groove.
 - 4. Moisture Content: 19 percent, maximum.
 - 5. Finish: Sanded and prepared for transparent finish specified in Section 099300.
- C. Surfacing: S4S.

2.05 CONSTRUCTION PANELS

- A. Subflooring: Any PS 2 type, rated Sheathing.
 - 1. Bond Classification: Exterior.
 - 2. Span Rating: 48.
 - 3. Performance Category: 1-1/8 PERF CAT.
 - 4. Edge: Tongue and Groove.
- B. Roof Sheathing: Any PS 2 type, rated Structural I Sheathing.
 - 1. Bond Classification: Exterior.
 - 2. Span Rating: 48.
 - 3. Performance Category: 5/8 PERF CAT.
 - 4. Edge: Tongue and Groove.
- C. Wall Sheathing: Any PS 2 type.
 - 1. Bond Classification: Exterior.
 - 2. Grade: Structural I Sheathing.
 - 3. Span Rating: 24.
 - 4. Performance Category: 7/16 PERF CAT.
 - 5. Edge Profile: Square edge.

2.06 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length to achieve full penetration of sheathing substrate.
 - 3. Anchors: Bolt or ballistic fastener for anchorages to steel .
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
 - 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

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- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
- D. Sll Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
- E. Sill Flashing: Asspecified in Section 076200.
- F. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed.
- G. Water-Resistive Barrier: Asspecified in Section 072500.

2.07 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Preservative Treatment:
 - 1. Manufacturers:
 - a. Lonza Group; : www.wolmanizedwood.com/#sle.
 - b. Koppers Performance Chemicals, Inc:
 - www.koppersperformancechemicals.com/#sle.
 - c. Viance, $\amalg C: www.treatedwood.com.$
 - d. Substitutions: See Section 016000 Product Requirements.
 - Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 Ib/cu ft retention.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with roofing, flashing, or waterproofing.
 - d. Treat lumber in contact with masonry or concrete.
 - e. Treat lumber less than 18 inches above grade.
 - f. Treat lumber in other locations as indicated.
 - 3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

PART3 EXECUTION

3.01 PREPARATION

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.
- B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.
- D. Install materials level, plumb, and true to line, and install full length without splices.

3.03 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWI (WFCM) Wood Frame Construction Manual.
- E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members per plan.
- H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fire blocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. 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.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide the following specific 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. Wall paneling and trim.
 - 8. Joints of rigid wall coverings that occur between studs.

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry masonry cap flashings carpentry installation.

- B. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- C. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS

- A. Subflooring: Glue and nail or screw to framing; staples are not permitted.
- B. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. At long edges use sheathing clips where joints occur between roof framing members.
 - 2. Nail panels to framing; staples are not permitted.
- C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails.
 - 1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends as applicable.

3.07 INSTALLATION - BOARD DECKING

- A. Install decking perpendicular to framing members, with ends staggered over firm bearing. On sloped surfaces, lay decking with tongue upward.
- B. Fit butt end deck joints occurring between support members with metal splines to maintain tight, aligned joints.
- C. Engage decking tongue and groove edges.
- D. Secure with fasteners. Side spike planks together, through pre-drilled holes.
- E. Maintain decking joint space of 1/16 inch maximum.

3.08 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
- C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.09 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 017000 Execution and Closeout Requirements -OR- 017419 Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION
SECTION 06 20 00 FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood casings and moldings.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 Rough Carpentry: Support framing, grounds, and concealed blocking.
- C. Section 09 91 13 Exterior Painting: Painting of finish carpentry items.
- D. Section 09 91 23 Interior Painting: Painting of finish carpentry items.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) North American Architectural Woodwork Standards; 2021, with Errata.
- C. BHMA A156.9 Cabinet Hardware; 2020.
- D. PS 1 Structural Plywood; 2023.
- E. PS 20 American Softwood Lumber Standard; 2020.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect from moisture damage.
- B. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Interior Woodwork Items:
 - 1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish, or match existing wood trim species and grade, prepare for stain finish.

2.02 FASTENINGS

A. Adhesive for factory-fabricated units: Manufacturer's recommended adhesive for application.

2.03 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Lumber for Shimming and Blocking: Softwood lumber of indicated species.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.04 HARDWARE

A. Hardware: Comply with BHMA A156.9.

2.05 WOOD TREATMENT

A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.

2.06 SITE FINISHING MATERIALS

A. Field Finishing: See Section 09 91 23.

2.07 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.08 SHOP FINISHING

- A. Apply wood filler in exposed nail and screw indentations.
- B. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.
- C. Verify species and grade of existing wood trim to be matched.

3.02 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 91 13 and 09 91 23.
- C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch (1.6 mm).
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION 06 20 00

SECTION 06 83 16 FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiberglass reinforced plastic panels.
- B. Trim.

1.02 REFERENCE STANDARDS

- A. 9 CFR 416.2 Regulatory Requirements Under the Federal Meat Inspection Act and the Poultry Products Inspection Act, Part 416-Sanitation; current edition.
- B. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- C. ASTM D5319 Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.
- D. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- E. FDA Food Code Chapter 6 Physical Facilities; Current Edition.
- F. FM 4880 Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials; 2022.

1.03 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Samples: Submit two samples 3 by 3 inch (76 x 76 mm) in size illustrating material and surface design of panels.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fiberglass Reinforced Plastic Panels:
 - 1. Crane Composites, Inc: www.cranecomposites.com/#sle.
 - 2. Marlite, Inc: www.marlite.com/#sle.
 - 3. Substitutions: See Section 00 76 00 General Requirements

2.02 PANEL SYSTEMS

- A. Wall Panels:
 - 1. Panel Size: 4 by 8 feet (1.2 by 2.4 m).
 - 2. Panel Thickness: 0.075 inch (1.9 mm).
 - 3. Surface Design: Smooth.
 - 4. Color: White.
 - 5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.03 MATERIALS

- A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
 - 1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
 - 2. Class 1 fire rated when tested in accordance with FM 4880.
 - 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

- 4. Surface Characteristics and Cleanability: Provide products that are smooth, durable, and easily cleanable, in compliance with FDA Food Code, Chapter 6 Physical Facilities.
- B. Trim: Vinyl; color coordinating with panel.
- C. Adhesive: Type recommended by panel manufacturer.
- D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
- C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
- D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
- E. Install panels with manufacturer's recommended gap for panel field and corner joints.
- F. Place trim on panel before fastening edges, as required.
- G. Fill channels in trim with sealant before attaching to panel.
- H. Install trim with adhesive and screws or nails, as required.
- I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
- J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION 06 83 16

SECTION 08 11 13 HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 Door Hardware.
- B. Section 09 91 23 Interior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

- A. ANSI: American National Standards Institute.
- B. HMMA: Hollow Metal Manufacturers Association.
- C. NAAMM: National Association of Architectural Metal Manufacturers.
- D. NFPA: National Fire Protection Association.
- E. SDI: Steel Door Institute.
- F. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.3 Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2019.
- C. ANSI/SDI A250.4 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.
- D. ANSI/SDI A250.8 Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- E. ANSI/SDI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.
- F. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- G. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.
- H. ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- I. ASTM C143/C143M Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- J. ASTM C476 Standard Specification for Grout for Masonry; 2023.
- K. ICC A117.1 Accessible and Usable Buildings and Facilities; 2017.
- L. ITS (DIR) Directory of Listed Products; current edition.
- M. NAAMM HMMA 840 Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.
- N. NAAMM HMMA 861 Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- O. NFPA 80 Standard for Fire Doors and Other Opening Protectives; 2022.
- P. NFPA 105 Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

- Q. NFPA 252 Standard Methods of Fire Tests of Door Assemblies; 2022.
- R. SDI 117 Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.
- S. UL (DIR) Online Certifications Directory; Current Edition.
- T. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- U. UL 1784 Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.05 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements for submittal procedures.
- 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.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.06 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 work of the type specified and with at least three years of documented experience.
- C. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 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.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.02 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Interior Doors, Non-Fire-Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 Full Flush.
 - d. Door Face Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.

- 2. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
- 3. Door Face Sheets: Flush.
- C. Fire-Rated Doors:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 Full Flush.
 - d. Door Face Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.
 - 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 - 3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - a. Attach fire rating label to each fire rated unit.
 - Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
 - a. Maximum Air Leakage: 3.0 cfm/sq ft (0.02 cu m/sec/sq m) of door opening at 0.10 inch w.g. (24.9 Pa) pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
 - b. Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
 - c. Label: Include the "S" label on fire-rating label of door.
 - 5. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
 - 6. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

2.03 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. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
- D. Door Frames, Fire-Rated: Full profile/continuously welded type.
 - 1. Fire Rating: Same as door, labeled.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.

2.04 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.

2.05 ACCESSORIES

- A. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- B. 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.
- C. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 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.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 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.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Install door hardware as specified in Section 08 71 00.
- F. Comply with glazing installation requirements of Section 08 80 00.
- G. Coordinate installation of electrical connections to electrical hardware items.1. Install required conduit in frames prior to grouting.
- H. Touch up damaged factory finishes.

3.04 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 (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION 08 11 13

SECTION 08 71 00 DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for hollow metal doors.
- B. Thresholds.

1.02 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

1.03 REFERENCE STANDARDS

- A. BHMA (CPD) Certified Products Directory; Current Edition.
- B. BHMA A156.1 Standard for Butts and Hinges; 2021.
- C. BHMA A156.2 Bored and Preassembled Locks and Latches; 2022.
- D. BHMA A156.3 Exit Devices; 2020.
- E. BHMA A156.5 Cylinders and Input Devices for Locks; 2020.
- F. BHMA A156.7 Template Hinge Dimensions; 2016.
- G. BHMA A156.13 Mortise Locks & Latches Series 1000; 2022.
- H. BHMA A156.16 Auxiliary Hardware; 2023.
- I. BHMA A156.21 Thresholds; 2019.
- J. BHMA A156.22 Standard for Gasketing; 2021.
- K. BHMA A156.115 Hardware Preparation in Steel Doors and Frames; 2016.
- L. UL (DIR) Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 00 72 00 General Requirements, for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 - 2. Provide complete description for each door listed.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 WARRANTY

- A. See Section 00 72 00 General Requirements for additional warranty requirements.
- B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
 - 1. Locksets and Cylinders: Three years, minimum.
 - 2. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:1. Applicable provisions of federal, state, and local codes.
 - Applicable provisions of lederal, state, and local
 Identified in Door Hardware Schedule.

2.02 HINGES

- A. Manufacturers:
 - 1. Stanley, dormakaba Group; ____: www.stanleyhardwarefordoors.com/#sle.
 - 2. Substitutions: See Section 00 72 00 General Requirements.
- B. Hinges: Comply with BHMA A156.1, Grade 1.
 - 1. Provide hinges on every swinging door.
 - 2. Provide following quantity of butt hinges for each door:
 - a. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.
 - 3. Provide (1) spring hinge per door, adjust so that the doors slowly closes but does not latch.

2.03 EXIT DEVICES

- A. Manufacturers:
 - 1. Von Duprin, an Allegion brand; _____: www.allegion.com/us/#sle.
 - 2. Substitutions: See Section 00 72 00 General Requirements.
- B. Exit Devices: Comply with BHMA A156.3, Grade 1.
 - 1. Lever design to match lockset trim.
 - 2. Provide cylinder with cylinder dogging or locking trim.
 - 3. Provide exit devices properly sized for door width and height.
 - 4. Provide strike as recommended by manufacturer for application indicated.
 - 5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.
 - 6. Provide occupancy indicator for all bathroom doors.

2.04 CYLINDRICAL LOCKS

- A. Manufacturers:
 - 1. Schlage, an Allegion brand; _____: www.allegion.com/us/#sle.
 - 2. Substitutions: See Section 00 72 00 General Requirements.

2.05 MORTISE LOCKS

- A. Manufacturers:
 - 1. Schlage, an Allegion brand; _____: www.allegion.com/us/#sle.
 - 2. Substitutions: See Section 00 72 00 General Requirements.
- B. Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.
 - 1. Latchbolt Throw: 3/4 inch (19 mm), minimum.
 - 2. Deadbolt Throw: 1 inch (25.4 mm), minimum.
 - 3. Backset: 2-3/4 inch (70 mm) unless otherwise indicated.
 - 4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
 - a. Finish: To match lock or latch.

2.06 KICK PLATES

- A. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 - 1. Size: 10 inch (254 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.

2.07 WALL STOPS

- A. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Type: Bumper, concave, wall stop.
 - 2. Material: Aluminum housing with rubber insert.

2.08 THRESHOLDS

- A. Manufacturers:
 - 1. National Guard Products, Inc: www.ngpinc.com/#sle.
 - 2. Substitutions: See Section 00 72 00 General Requirements.
- B. Thresholds: Comply with BHMA A156.21.
 - 1. Provide threshold at interior doors for transition between two different floor types, and over building expansion joints, unless otherwise indicated.
 - 2. Provide threshold at each exterior door, unless otherwise indicated.
 - 3. Type: Flat surface.
 - 4. Material: Aluminum.
 - 5. Threshold Surface: Fluted horizontal grooves across full width.
 - 6. Field cut threshold to profile of frame and width of door sill for tight fit.
 - 7. Provide non-corroding fasteners at exterior locations.

2.09 COAT HOOKS

- A. Coat Hooks: At restroom stalls, provide on room side of door, screw fastened.
- B. Material: Stainless steel.

2.10 SIGNAGE

- A. Signage (Room Name Plates and Numbers): Provide on doors for individuals to easily identify room names and/or numbers.
 - 1. Text Required: "RESTROOM" with symbols and braille text.
 - 2. Material: In plastic with paint used to create necessary text, adhered to door.

2.11 SILENCERS

- A. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
 - 1. Single Door: Provide three on strike jamb of frame.
 - 2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
 - 3. Material: Rubber, gray color.

2.12 FINISHES

A. Finishes: Identified in Door Hardware Schedule.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
 - 1. For Steel Doors and Frames: See Section 08 11 13.
 - 2. Flush Wood Doors: See Section 08 14 16.

3.03 ADJUSTING

- A. Adjust work under provisions of Section 00 72 00 General Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.04 PROTECTION

- A. Protect finished Work under provisions of Section 00 72 00 General Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION 08 71 00

SECTION 09 05 61 COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 1. Resilient flooring.
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
 1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.
- F. Patching compound.
- G. Preparation of new and existing wood-based floors and subfloors for installation of new floor coverings.

1.02 REFERENCE STANDARDS

- A. ASTM C109/C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2023.
- B. ASTM C472 Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.
- C. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- D. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- E. RFCI (RWP) Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.04 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.
 - 4. Copies of specified test methods.
 - 5. Recommendations for remediation of unsatisfactory surfaces.
 - 6. Product data for recommended remedial coating.
 - 7. Submit report to Architect.
 - 8. Submit report not more than two business days after conclusion of testing.

- D. Adhesive Bond and Compatibility Test Report.
- E. Copy of RFCI (RWP).

1.05 QUALITY ASSURANCE

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
- B. 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.
 - 2. Acceptable Testing Agencies:
 - a. Independent Floor Testing & Inspection, Inc. (IFTI): www.ifti.com/#sle.
 - b. Other testing agency approved by Owner.
- C. 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.
- D. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.06 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.

1.07 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 (18 degrees C) or more than 85 degrees F (30 degrees C).
- 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

2.01 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
 - 1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 - 2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

PART 3 EXECUTION

3.01 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. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
 - a. Do not attempt to remove coating or penetrating material.
 - b. Do not abrade surface.
 - 3. Preliminary cleaning.
 - 4. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
 - 5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 6. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 7. Specified remediation, if required.
 - 8. Patching, smoothing, and leveling, as required.
 - 9. Other preparation specified.
 - 10. Adhesive bond and compatibility test.
 - 11. 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.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

- A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 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.

3.04 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 (1.4 kg per 93 square meters) per 24 hours.
- F. Report: Report the information required by the test method.

3.05 INTERNAL RELATIVE HUMIDITY 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 F2170 Procedure A and as follows.
- D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and 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 any test value exceeds 75 percent relative humidity.
- F. Report: Report the information required by the test method.

3.06 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. 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.

3.07 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.

3.08 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.09 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.10 INSTALLATION OF REMEDIAL FLOOR SHEET MEMBRANE

A. Install in accordance with sheet membrane manufacturer's instructions.

3.11 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION 09 05 61

SECTION 09 21 16 GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Acoustic insulation.
- C. Gypsum wallboard.
- D. Joint treatment and accessories.
- E. Textured finish system.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 Rough Carpentry: Building framing and sheathing.
- B. Section 06 10 00 Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 07 92 00 Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.
- D. Section 09 30 00 Tiling: Tile backing board.

1.03 REFERENCE STANDARDS

- A. ASTM C475/C475M Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- B. ASTM C557 Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- C. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- D. ASTM C840 Standard Specification for Application and Finishing of Gypsum Board; 2023.
- E. 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; 2022.
- F. ASTM C1047 Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- G. ASTM C1396/C1396M Standard Specification for Gypsum Board; 2017.
- H. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- I. ASTM E413 Classification for Rating Sound Insulation; 2022.
- J. GA-216 Application and Finishing of Gypsum Panel Products; 2021.

1.04 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide data on gypsum board, accessories, and joint finishing system.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 Construction Waste Management and Disposal for packaging waste requirements.
- B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC as indicated on drawings, calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 BOARD MATERIALS

- A. Manufacturers Gypsum-Based Board:
 - 1. American Gypsum Company: www.americangypsum.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com/#sle.
 - 3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
- 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. Thickness:
 - a. Vertical Surfaces: 5/8 inch (16 mm).
 - b. Ceilings: 5/8 inch (16 mm).
- C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Ceilings, unless otherwise indicated.
 - 2. Thickness: 1/2 inch (13 mm).
 - 3. Edges: Tapered.

2.03 GYPSUM BOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness as required for STC.
- B. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
 - 1. Types: As detailed or required for finished appearance.
- C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
- D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
- E. Textured Finish Materials: Latex-based compound; plain.
- F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- G. Adhesive for Attachment to Wood, ASTM C557 and Metal:

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
- B. Studs: Space studs as indicated.
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations.

- 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.06 JOINT TREATMENT

- A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 2. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
 - 2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.

3.07 TEXTURE FINISH

- A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.
- B. Texture Required: Match existing.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION 09 21 16

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SECTION 09 67 00 FLUID-APPLIED FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-applied flooring.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 07 92 00 Joint Sealants: Sealing joints between fluid-applied flooring and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

A. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2018).

1.04 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available; and _____.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

1.07 FIELD CONDITIONS

- A. Maintain minimum temperature in storage area of 55 degrees F (13 degrees C).
- B. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 FLUID-APPLIED FLOORING SYSTEMS

- A. Fluid-Applied Flooring: Epoxy base coat(s), polyurethane top coat, no aggregate.
 - 1. System Thickness: 40 mils (1 mm), nominal, dry film thickness (DFT).
 - 2. Texture: Smooth.
 - 3. Sheen: High gloss.
 - 4. Color: See schedule.
 - 5. Products:
 - a. Dur-A-Crete ; Dur-A-Flex : www.dur-a-flex.com/products/dur-a-crete/
 - b. Sherwin-Williams Company; Armorseal 100% Solids Epoxy/Polyurethane: www.protective.sherwin-williams.com/#sle.
 - c. Sika Corporation; sikafloor smooth epoxy: www.sikafloorusa.com/#sle.
 - d. Substitutions: See Section 01 60 00 Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.
- B. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Apply primer to surfaces required by flooring manufacturer.

3.03 INSTALLATION - FLOORING

- A. Apply in accordance with manufacturer's instructions.
- B. Apply each coat to minimum thickness required by manufacturer.
- C. Finish to smooth level surface.

3.04 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.
- B. Barricade area to protect flooring until fully cured.

END OF SECTION 09 67 00

SECTION 09 91 13 EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factoryapplied 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, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

- A. ASTM D16 Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.
- B. MPI (APL) Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- C. MPI (APSM) Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.05 SUBMITTALS

- A. See Section 00 76 00 General Requirements, for submittal procedures.
- 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. MPI product number (e.g. MPI #47).
 - 3. 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 (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
- D. Maintenance Data: Submit data including product technical data sheets, care and cleaning instructions, touch-up procedures, and repair of painted and finished surfaces.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 Product Requirements, for additional provisions.

- 2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
- 3. CLEARLY Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Coats: Number of coats specified is minimum number acceptable, if full coverage is not obtained with specified number of coats, apply such additional coats necessary to produce required finish.

1.07 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 (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Paints:
 - 1. Miller Paint: https://www.millerpaint.com/.
- B. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required 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 described explicitly in manufacturer's product instructions.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Exterior Acrylic;
 - a. Products:
 - 1) Miller Paint, Acrimetal Exterior DTM
 - 3. Top Coat Sheen:
 - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

4. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 PRIMERS

A. Primers: Per paint manufacturer's requirements.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Per paint manufacturer's requirements.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 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 for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate; provide total dry film thickness of entire system as recommended by manufacturer.
 - 1. Number of coats and film thickness required are the same regardless of application method.
 - 2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color and appearance.
 - 3. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 91 13

SECTION 09 91 23 INTERIOR PAINTING

PART 1 GENERAL

1.01 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. In finished area, paint shop-prime access panels.
 - a. Finish access panels prior to installation or remove, paint and reinstall panels.
 - 2. 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 factoryapplied primers are not considered factory finished.
 - 2. Electrical wire or data cables.
 - 3. Items indicated to receive other finishes.
 - 4. Items indicated to remain unfinished.
 - 5. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 6. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 7. Floors, unless specifically indicated.
 - 8. Ceramic and other tiles.
 - 9. Glass.
 - 10. Acoustical materials, unless specifically indicated.
 - 11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. ASTM D16 Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.
- C. MPI (APL) Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- D. MPI (APSM) Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- E. SCAQMD 1113 Architectural Coatings; 1977, with Amendment (2016).
- F. SSPC-SP 1 Solvent Cleaning; 2015, with Editorial Revision (2016).

1.05 SUBMITTALS

A. See Section 00 76 00 - General Requirements for submittal procedures.

- 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. MPI product number (e.g., MPI #47).
 - 3. Cross-reference to specified paint system products to be used in project; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
- D. Maintenance Data: Submit data including care and cleaning instructions, touch-up procedures, and repair of painted and finished surfaces.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
 - 3. CLEARLY Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Coats: Number of coats specified is minimum number acceptable, if full coverage is not obtained with specified number of coats, apply such additional coats necessary to produce required finish.

1.07 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 (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 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 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
- B. Paints:
 - 1. Rodda Paint Co: www.roddapaint.com/#sle.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 3. Miller Paint Company: www.millerpaint.com.
- C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

- 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
- 2. 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.
- 3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
- 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.03 PAINT SYSTEMS - INTERIOR

- A. See Interior Finish Schedule on drawings for specified paints.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat Sheen:
 - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
 - 3. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been adequately prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 1. Gypsum Wallboard: 12 percent.

3.02 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. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

3.03 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. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied. Do not recoat until paint has dired to where it feel firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat will not cause the undercoat to life or lose adhesion.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 91 23

SECTION 10 14 00 SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

1.02 RELATED REQUIREMENTS

A. Section 26 51 00 - Interior Lighting: Exit signs required by code.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- C. ICC A117.1 Accessible and Usable Buildings and Facilities; 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- 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. Room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. Room names, numbers, and graphics are to be determined by the Owner prior to fabrication. Request this 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.
- E. Verification Samples: Submit samples showing colors specified.
- F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- G. Manufacturer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Store tape adhesive at normal room temperature.

1.07 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Flat Signs:
 - 1. Inpro: www.inprocorp.com/#sle.

- 2. Mohawk Sign Systems, Inc: www.mohawksign.com/#sle.
- 3. Meyer Architectural Signs & Graphics: www.meyerasg.com.
- 4. ASI Sign System, Inc: www.asisignage.com.
- 5. Substitutions: See Section 01 60 00 Product Requirements.

2.02 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, 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. Corners to have 1/2 inch radius.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and Grade II braille. Braille shall be separated 1/2 inch from the corresponding characters or symbols.
 - 3. All letters, numbers and/or symbols shall contrast with their background, interior units with white characters on a black background. Characters and background shall have a non-glare finish.
 - 4. Character Height: 1 inch (25 mm).
 - 5. Symbol size shall be 4 inches.
 - 6. Sign Height: 8 inches (____ mm), unless otherwise indicated.
 - 7. [Type A] Typical Room Sign: Identify with room names and numbers to be determined later, not those indicated on drawings. Provide one sign at each door opening, except rooms receiving other specified signage below.
 - a. Size: 8" x 4".
 - b. Room Name
 - c. Room Number
 - 8. [Type B-1] Boys and Girls Restroom Sign: Provide one new sign at each door or opening and as indicated on drawings.
 - 9. [Type B-2] Communal Restroom Sign: Provide one new sign at each door or opening and as indicated on drawings.
 - a. Size: 8" x 8"
 - b. Room Name
 - c. International symbol for "men" and "women"
 - 10. [Type C] Maximum Occupancy Sign:
 - a. Size: 10" x 10" minimum.
 - b. "Maximum Occupancy XXX This Room/Area".
 - 1) Location: Multi-Purpose Room
- C. Interior Directional and Informational Signs:
 - 1. Sign Type: Same as room and door signs.
 - 2. Sizes: As indicated on drawings.
 - 3. Allow for 20 signs 4 inches high by 16 inches long.

2.03 SIGN TYPES

- A. Flat Signs: Signage media without frame.
 - 1. Edges: Bevelled.
 - 2. Corners: Radiused.
 - 3. Wall Mounting of One-Sided Signs: Concealed Screws or Adhesive Tape.
- B. Color and Font: Unless otherwise indicated:
 - 1. Character Font: Helvetica, Arial, or other sans serif font.
 - 2. Character Case: Upper case only.
 - 3. Background Color: As selected by Architect from manufacturer's standard range.
 - 4. Character Color: Contrasting color.

2.04 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

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Verify signage location with Architect prior to installation for every sign type indicated herein.
- D. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- E. Mounting Height: 60-inches from floor to center of sign (unless otherwise required).
- F. Mounting Location: Latch side of door, except for signs identified to be located other than next to door.
- G. Mounting exterior signs using mechanical means, with stainless steel tamper proof screws.
- H. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION 10 14 00

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SECTION 10 28 00 TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Under-lavatory pipe supply covers.
- C. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 22 40 00 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM A269/A269M Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).
- C. ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- D. ASTM C1036 Standard Specification for Flat Glass; 2021.
- E. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- F. ASTM F2285 Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. American Specialties, Inc: www.americanspecialties.com/#sle.
 - 2. Bradley Corporation: www.bradleycorp.com/#sle.
 - 3. Bobrick: www. bobrick.com..
 - 4. Substitutions: Section 01 60 00 Product Requirements.
- B. Under-Lavatory Pipe Supply Covers:

2.02 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. Keys: Provide ten keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Adhesive: Two component epoxy type, waterproof.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Double roll, surface mounted, for coreless type rolls.
 1. Products: Owner furnished, contractor installed.
- B. Paper Towel Dispenser: Electric, roll paper type.
 - 1. Product: Owner furnished, contractor installed.
- C. Automated Soap Dispenser: Liquid soap dispenser, wall-mounted, with stainless steel cover and window to gauge soap level.
 - 1. Product: Owner furnished, contractor installed.
- D. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick tempered safety glass; ASTM C1048.
 - 1. Frame: 0.05 inch (1.3 mm)angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 - 2. Products:
 - a. Bobrick, Inc: B-290 2436: www.bobrick.com.
 - b. Substitutions: Section 01 60 00 Product Requirements.
- E. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base.
 - 1. Product: Owner furnished, contractor installed.
- F. Grab Bars: Stainless steel, smooth surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
 - b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.
 - e. Products:
 - 1) Standard Metal Hardware Manufacturing, Ltd; Grab Bars: www.smhardware.com/#sle.
 - 2) Substitutions: Section 01 60 00 Product Requirements.
- G. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
 - 1. Product: Owner furnished, contractor installed.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Specified in 22 40 00 - Plumbing Fixtures.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.
- D. See Section 06 10 00 for installation of blocking in walls.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.
Medford School District North Medford H.S. Humanities Restroom

3.03 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. Grab Bars: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 28 00

SECTION 22 05 00 COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Mechanical sleeve seals.
 - 5. Sleeves.
 - 6. Escutcheons.
 - 7. Plumbing demolition.
 - 8. Supports and anchorages.
 - 9. Flashing.
 - 10. Firestopping relating to plumbing work.
 - 11. Firestopping accessories.

1.02 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire-rated construction.
- G. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. PE: Polyethylene plastic.
 - 4. PVC: Polyvinyl chloride plastic.
- H. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.03 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

- C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
- D. Through Penetration Firestopping Of Fire-Rated Assemblies: UL 1479 or ASTM E814 with 0.10-inch water gauge minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1 hour.
 - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1 hour.
 - 2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1 hour.
 - a. Floor Penetrations within Wall Cavities: T-Rating is not required.
- E. Through Penetration Firestopping Of Non-Fire-Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
 - 1. Non-Combustible Penetrating Items: Non-combustible materials for penetrating items connecting maximum of three stories.
 - 2. Penetrating Items: Materials approved by Authorities Having Jurisdiction for penetrating items connecting maximum of two stories.
- F. Fire-Resistant Joint In Fire-Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire-resistant rating as indicated on Drawings for assembly in which joint is installed.
- G. Fire-Resistant Joints between Floor Slabs and Exterior Walls: ASTM E119 with 0.10-inch water gauge minimum positive pressure differential to achieve fire-resistant rating as indicated on Drawings for floor assembly.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.05 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Section, ACCESS DOORS AND FRAMES.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Refer to Section, PRODUCT REQUIREMENTS for environmental conditions affecting products on site.
- B. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

PART 2 PRODUCTS

2.01 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.02 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. 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 thickness or specific material is 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.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:
 - 1. ABS Piping: ASTM D 2235.
 - 2. CPVC Piping: ASTM F 493.
 - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 4. PVC to ABS Piping Transition: ASTM D 3138.
- I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.03 TRANSITION FITTINGS

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
 - 1. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
 - 2. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
 - 3. Aboveground Pressure Piping: Pipe fitting.
- B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
- C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
- D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
- E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.04 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solderjoint, plain, or weld-neck end connections that match piping system materials.

- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 degrees F.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, fullface- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Separate companion flanges and steel bolts and nuts shall have 150-psig or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 degrees F.
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 degrees F.

2.05 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.06 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.07 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.1. Finish: Polished chrome-plated.
- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

- F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chromeplated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.08 FLASHING

- A. Metal Flashing: 26-gauge-thick galvanized steel.
- B. Metal Counterflashing: 22-gauge-thick galvanized steel.
- C. Lead Flashing:
 - 1. Waterproofing: 5 pounds/square foot sheet lead.
 - 2. Soundproofing: 1 pound/square foot sheet lead.
- D. Flexible Flashing: 47-mil-thick sheet butyl; compatible with roofing.
- E. Caps: Steel, 22-gauge minimum; 16 gauge at fire-resistant elements.

2.09 FIRESTOPPING

- A. Manufacturers:
 - 1. Dow Corning Corp.
 - 2. Hilti Corp.
 - 3. 3M Fire Protection Products
- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 - 1. Silicone Firestopping Elastomeric Firestopping.
 - 2. Foam Firestopping Compounds.
 - 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
 - 4. Fiber Stuffing And Sealant Firestopping: Composite fiber stuffing insulation with silicone elastomer for smoke stopping.
 - 5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
 - 6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
 - 7. Firestop Pillows: Formed mineral fiber pillows.

2.10 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- C. General:
 - 1. Furnish UL-listed products.
 - 2. Select products with rating not less than rating of wall or floor being penetrated.
- D. Non-Rated Surfaces:
 - 1. Stamped-steel, chrome-plated, hinged, split-ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
- E. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop- type wall sleeve.

PART 3 EXECUTION

3.01 PLUMBING DEMOLITION

- A. Refer to Section, CUTTING AND PATCHING and Section, SELECTIVE STRUCTURE DEMOLITION for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.02 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. 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.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. 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.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Sleeves are not required for core-drilled holes.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

- 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Section, SHEET METAL FLASHING AND TRIM for flashing.
- 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Section, JOINT SEALANTS for materials and installation.
- P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- Q. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Section, PENETRATION FIRESTOPPING for materials.
- S. Verify final equipment locations for roughing-in.
- T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.03 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. 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.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. 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.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1, QUALITY ASSURANCE Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
 - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.04 PIPING CONNECTIONS

- A. 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. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.05 INSTALLATION – FLASHING

- A. Provide flexible flashing and metal counterflashing where piping penetrates weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inches minimum clear on sides with 24 inches by 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.
- C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 inches by 36 inches sheet size. Fasten flashing to drain clamp device.
- D. Seal drains watertight to adjacent materials.
- E. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.06 INSTALLATION - FIRESTOPPING

A. Install material at fire-rated construction perimeters and openings containing penetrating sleeves, piping, and other items, requiring firestopping according to manufacturer's instructions to maintain fire ratings per drawings.

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SECTION 22 05 03 PIPES AND TUBES FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes pipe and pipe fittings for the following systems:
 - 1. Domestic water piping, within 5 feet of building.
 - 2. Sanitary sewer piping, within 5 feet of building.
 - 3. Unions and flanges.
 - 4. Bedding and cover materials.

1.02 SUBMITTALS

- A. Refer to Section, SUBMITTAL PROCEDURES for submittal procedures.
- B. Product Data: Submit data on pipe materials and fittings. Submit manufacturers catalog information.

1.03 QUALITY ASSURANCE

- A. Perform work in accordance with ASME B31.9 code for installation of piping systems.
- B. Press copper installation shall be performed by a licensed contractor trained in installation of the specific manufacturer submitted.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section, PRODUCT REQUIREMENTS for transporting, handling, storing, and protecting products requirements.
- B. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

1.06 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.07 COORDINATION

- A. Refer to Section, ADMINISTRATIVE REQUIREMENTS for coordination requirements.
- B. Coordinate installation of buried piping with trenching.

PART 2 PRODUCTS

2.01 DOMESTIC COLD WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Copper Tubing: ASTM B88, Type K annealed.
 - 1. Fittings: ASME B16.22, wrought copper.
 - 2. Joints: Brazed, AWS A5.8 BCuP silver alloy with melting range 1,190 to 1,480 degrees F.

2.02 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: Solder, lead free, (ASTM B32) or brazed, AWS A5.8 BCuP silver alloy with melting range 1,190 to 1,480 degrees F.
- B. Copper Tubing: ASTM B88, Type L hard drawn. Press

- 1. Fittings: ASME B16.18, ASME 16.22, or ASME16.26, copper and copper alloy press fittings. Shall conform to performance of IAPMO PS 117.
 - a. Seal: EPDM seal shall be factory installed.
 - b. Leak Detection: system design shall have a leak detection method to provide the installer a quick and easy identification of fittings which have not been pressed prior to the system being put into service.
- 2. Manufacturers:
 - a. Everflow JW Press
 - b. Nibco Press System
 - c. Viega ProPress

2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: CISPI 301, hubless.
 - 1. Fittings: Cast iron, CISPI 301.
 - Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
 a. Manufacturer: Ideal Tridon or equal.
- B. ABS Pipe: ASTM D2661, Acrylonitrile-Butadiene-Styrene (ABS) material.
 - 1. Fittings: ABS, ASTM D2661.
 - 2. Joints: ASTM D2235, solvent weld.
- C. PVC Pipe: ASTM D3034, Type PSM, polyvinyl chloride (PVC) material, bell and spigot style rubber ring sealed gasket joint.
 - 1. Fittings: PVC, ASTM D3034.
 - 2. Joints: ASTM F477, elastomeric gaskets.

2.04 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron, CISPI 301.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. ABS Pipe: ASTM D2751 or ASTM F628, Schedule 40, DWV, Acrylonitrile-Butadiene-Styrene (ABS) material.
 - 1. Fittings: ABS, ASTM D2751.
 - 2. Joints: ASTM D2235, solvent weld.
- C. ABS Pipe: ASTM D2661 or ASTM D2751, Acrylonitrile-Butadiene-Styrene (ABS) material.
 - 1. Fittings: ABS, ASTM D2662.
 - 2. Joints: ASTM D2235, solvent weld.
- D. PVC Pipe: ASTM D1785 Schedule 40, polyvinyl chloride (PVC) material.
 - 1. Fittings: ASTM D2466, Schedule 40, PVC.
 - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.05 UNIONS AND FLANGES

- A. Unions for Pipe 2 Inches and Smaller:
 - 1. Ferrous Piping: Class 150, malleable iron, threaded.
 - 2. Copper Piping: Class 150, bronze unions with brazed joints.
 - 3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
 - 4. PVC Piping: PVC.
 - 5. CPVC Piping: CPVC.
- B. Flanges for Pipe 2-1/2 Inches and Larger:
 - 1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
 - 2. Copper Piping: Class 150, slip-on bronze flanges.
 - 3. PVC Piping: PVC flanges.
 - 4. CPVC Piping: CPVC flanges.
 - 5. Gaskets: 1/16-inch-thick preformed neoprene gaskets.

C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2464, Schedule 80, threaded, PVC pipe.

2.06 BEDDING AND COVER MATERIALS

- A. Bedding: Sand, ASTM C33; fine aggregate, natural or manufactured sand.
- B. Soil Backfill from Above Pipe to Finish Grade: Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Refer to Section, ADMINISTRATIVE REQUIREMENTS for verification of existing conditions before starting work.
- B. Verify excavations are to required grade, dry, and not over-excavated.
- C. Verify trenches are ready to receive piping.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.03 INSTALLATION - BURIED PIPING SYSTEMS

- A. Verify connection size, location, and invert are as indicated on Drawings.
- B. Establish elevations of buried piping with not less than 2 feet of cover.
- C. Establish minimum separation from other services in accordance with local code.
- D. Excavate pipe trench in accordance with Section 312000.
- E. Install pipe to elevation as indicated on Drawings.
- F. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 depth; compact to 95% maximum density.
- G. Install pipe on prepared bedding.
- H. Route pipe in straight line.
- I. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- J. Pipe Cover and Backfilling:
 - 1. Maintain optimum moisture content of fill material to attain required compaction density.
 - 2. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 6 inches compacted layers to 12 inches minimum cover over top of jacket. Compact to 95% maximum density.
 - 3. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
 - 4. Do not use wheeled or tracked vehicles for tamping.

3.04 INSTALLATION - ABOVE GROUND PIPING

- A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
- C. Group piping whenever practical at common elevations.
- D. Sleeve pipe passing through partitions, walls, and floors.

- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not accessible.
- H. Contractor shall verify all fittings and joints have been properly sealed prior to charging the system.
- I. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- J. Slope piping and arrange systems to drain at low points.
- K. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- L. Install piping penetrating roofed areas to maintain integrity of roof assembly.
- M. Install piping specialties in accordance with Section, HYDRONIC PIPING SPECIALTIES.
- N. Insulate piping. Refer to Section, PLUMBING INSULATION.

Section 22 05 23 GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. Ball valves.

1.02 SUBMITTALS

- A. Refer to Section, SUBMITTAL PROCEDURES for submittal requirements.
- B. Product Data: Submit manufacturer's catalog information with valve data and ratings for each service.
- C. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.03 QUALITY ASSURANCE

- A. Single-Source Responsibility: Comply with the requirements specified in Section, MATERIALS AND EQUIPMENT, under SOURCE LIMITATIONS Article.
- B. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
- C. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the various MSS Standard Practices referenced.

1.04 CLOSEOUT SUBMITTALS

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS, for submittal requirements.
- B. Project Record Documents: Record actual locations of valves.
- C. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

- A. Apollo
- B. Milwaukee
- C. NIBCO
- D. Watts
- E. Jamesbury
- F. Bell & Gossett
- G. Mueller

2.02 VALVE FEATURES, GENERAL

- A. Valve Design: Rising stem or rising outside screw and yoke stems.
 - 1. Non-rising stem valves may be used where headroom prevents full extension of rising stems.
- B. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.
- C. Sizes: Same size as upstream pipe, unless otherwise indicated.
- D. Operators: Provide the following special operator features:
 - 1. Handwheels, fastened to valve stem, for valves other than quarter turn.
 - 2. Lever handles, on quarter-turn valves 6 inches and smaller, except for plug valves. Provide plug valves with square heads; provide 1 wrench for every 10 plug valves.

- E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
- G. End Connections: As indicated in the valve specifications.
 - 1. Threads: Comply with ANSI B1.20.1.
 - 2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
 - 3. Solder-Joint: Comply with ANSI B16.18.
 - 4. Caution: Where soldered end connections are used, use solder having a melting point below 840 degrees F for gate, globe, and check valves; below 421 degrees F for ball valves.

2.03 BALL VALVES

- A. All ball valves, for both throttling and shutoff duty. Full-flow port, 90-degree on-off operation.
- B. Ball Valves, up to 2-Inch Size: Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; two-piece construction up to 1 inch, three piece from 1-1/4 Inches to 2 inches; with bronze body conforming to ASTM B584, standard (or regular) port, chrome-plated solid brass ball (no hollow balls), replaceable Teflon or "TFE" seats and seals, blowoutproof stem, separate adjustable packing nut, and vinyl-covered steel handle. Provide solder ends for condenser water, chilled water, and domestic hot and cold water service; threaded ends for heating hot water and low-pressure steam.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install valves with stems upright or horizontal, not inverted.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install valves with clearance for installation of insulation and allowing access.
- D. Provide access where valves and fittings are not accessible.

3.02 VALVE ENDS SELECTION

- A. Select valves with the following ends or types of pipe/tube connections:
 - 1. Copper Tube Size, 2 Inches and Smaller: Solder ends, except provide threaded ends for heating hot water and low-pressure steam service.
 - 2. Steel Pipe Sizes, 2 Inches and Smaller: Threaded or grooved end.
 - 3. Steel Pipe Sizes 2-1/2 Inches and Larger: Grooved end or flanged.

3.03 VALVE APPLICATIONS

- A. Install shutoff and drain valves at locations indicated on Drawings in accordance with this Section.
- B. Install ball valves for shutoff and to isolate equipment, part of systems, or vertical risers.
- C. Install globe valves for throttling, bypass, or manual flow control services.
- D. Install spring-loaded check valves on discharge of water pumps.
- E. Install gate valves in domestic water systems for shutoff service.

SECTION 22 05 29 HAGERS AND SUPPORTS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. Pipe hangers and supports.
 - 2. Accessories.
 - 3. Inserts.
 - 4. Formed steel channel.

1.02 SUBMITTALS

- A. Refer to Section, SUBMITTAL PROCEDURES for submittal procedures.
- B. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog, data including load capacity.
- C. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.

1.03 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- B. Perform work in accordance with applicable authority for welding hanger and support attachments to building structure.

PART 2 PRODUCTS -- NOT USED

2.01 PIPE HANGERS AND SUPPORTS

- A. Plumbing Piping DWV:
 - 1. Conform to MSS SP58, MSS SP69, and MSS SP89.
 - 2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron or carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches and Larger: carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes 3 Inches and Smaller: Cast iron hook.
 - 6. Wall Support for Pipe Sizes 4 Inches and Larger: Welded steel bracket and wrought steel clamp.
 - 7. Vertical Support: Steel riser clamp.
 - 8. Floor Support: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
 - 9. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.
- B. Plumbing Piping Water:
 - 1. Conform to MSS SP58, MSS SP69, and MSS SP89.
 - 2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron or carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches and Larger: carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes 3 Inches and Smaller: Cast iron hook.
 - 6. Vertical Support: Steel riser clamp.
 - 7. Copper Pipe Support: Copper-plated, carbon-steel ring.

2.02 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

PART 3 EXECUTION

3.01 PREPARATION

A. Obtain permission from Structural Engineer before drilling or cutting structural members.

3.02 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install in accordance with MSS SP 58, MSS SP 69, and MSS SP 89.
- B. Install hangers with minimum 1/2-inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers with 1-1/2-inch-minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.
- G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper-plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Provide clearance in hangers and from structure and other equipment for installation of insulation.

Section 22 05 33 Heat Tracing for Plumbing Piping

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes plumbing piping heat tracing for freeze prevention with the following electric heating cables:
 - 1. Plastic insulated, series resistance.

1.02 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each type of product indicated.
 - 1. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.
- B. Shop Drawings: For electric heating cable. Include plans, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.
- E. Warranty: Special warranty specified in this Section.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to Authorities Having Jurisdiction, and marked for intended use.

1.04 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.
- B. Warranty Period: 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 PLASTIC-INSULATED, SERIES-RESISTANCE HEATING CABLES

- A. Manufacturers:
 - 1. Delta-Therm Corporation.
 - 2. Easy Heat Inc., division of Emerson Industrial Automation
 - 3. NuHeat Industries
 - 4. Raychem
- B. Comply with IEEE 515.1.
- C. Heating Element: Single- or dual-stranded resistor wire. Terminate with waterproof, factory-assembled non-heating leads with connectors at both ends.
- D. Electrical Insulating Jacket: Minimum 4.0-mil Kapton with silicone jacket or Tefzel.
- E. Maximum Operating Temperature: 300 degrees F.
- F. Capacities and Characteristics:
 - 1. Maximum Heat Output: 6 W/foot.
 - 2. Number of Parallel Cables: 2
 - 3. Volts: 120 V.
 - 4. Phase: 1

2.02 CONTROLS

- A. Heat trace controller provided by manufacturer:
 - 1. Accepts an input signal to energize the heat trace from the building control system.
 - 2. Provides output fault alarm to the building control system.

2.03 ACCESSORIES

Humanities Restroom Renovation

- A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.
- B. Warning Labels: Refer to Section, IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT.
- C. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.
 - 1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4-inch minimum.
 - 2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

- A. Install the following types of electric heating cable for the applications described:
 - 1. Pipe Freeze Protection: Plastic-insulated, series-resistance heating cable.

3.03 INSTALLATION

A. Install electric heating cable across expansion, construction, and control joints according to manufacturer's written recommendations using cable protection conduit and slack cable to allow movement without damage to cable.

Electric Heating Cable Installation for Freeze Protection for Piping:

- 1. Install electric heating cables after piping has been tested and before insulation is installed.
- 2. Install electric heating cables according to IEEE 515.1.
- 3. Install insulation over piping with electric cables according to Section, PLUMBING INSULATION.
- 4. Install warning tape on piping insulation where piping is equipped with electric heating cables.
- B. Set field-adjustable switches and circuit-breaker trip ranges.
- C. Protect installed heating cables, including non-heating leads, from damage.

3.04 CONNECTIONS

- A. Ground equipment according to Section, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- B. Connect wiring according to Section, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.

3.05 FIELD QUALITY CONTROL

- A. Testing: Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.
 - 1. Test cables for electrical continuity and insulation integrity before energizing.
 - 2. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.
- B. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounting cables.
- C. Remove and replace malfunctioning units and retest as specified above.

SECTION 22 05 53 IDENTIFICATION FOR PLUMING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. Pipe markers.

1.02 SUBMITTALS

- A. Refer to Section, SUBMITTAL PROCEDURES for submittal procedures.
- B. Product Data: Submit manufacturers' catalog literature for each product required.

1.03 CLOSEOUT SUBMITTALS

A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for closeout procedures.

1.04 QUALITY ASSURANCE

A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

PART 2 PRODUCTS

2.01 MECHANICAL IDENTIFICATION MATERIALS

- A. Manufacturer:
 - 1. Allen Systems, Inc.
 - 2. Brady (W.H.) Co.; Signmark Div.
 - 3. Industrial Safety Supply Co., Inc.
 - 4. Seton Name Plate Corp.
 - 5. MSI (marketing Services, Inc.)

2.02 PIPE MARKERS

- A. Color And Lettering: Conform to ASME A13.1.
 - 1. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.
- B. Plastic Tape Pipe Markers:
 - 1. Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.02 INSTALLATION

- A. Install identifying devices after completion of coverings and painting.
- B. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4-inchdiameter and smaller. Identify service, flow direction, and pressure. Install it in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction

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SECTION 22 07 00 PLUMBING INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Piping system insulation.

1.02 SUBMITTALS

- A. Refer to Section, SUBMITTAL for submittal procedures.
- B. Product Data: Submit product description, thermal characteristics, and list of materials and thickness for each service and location.
- C. Manufacturer's Installation Instructions: Submit manufacturer's published literature indicating proper installation procedures.

1.03 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

PART 2 PRODUCTS

2.01 PIPE INSULATION

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - 1. Johns Manville Insulations.
 - 2. Knauf Insulation
 - 3. Owens-Corning Fiberglas Corp.
- B. Man Made Mineral Fiber: ASTM C547; rigid molded, noncombustible.
 - 1. k (ksi) factor: 0.24 at 75 degrees F.
 - 2. Maximum service temperature: 850 degrees F.
 - 3. Vapor Retarder Jacket: White Kraft paper with glass fiber yarn and bonded to aluminized film, secured with self-sealing longitudinal laps and butt strips or with outward clinch expanding staples and vapor retarder mastic.
- C. Hydrous Calcium Silicate: ASTM C533; rigid molded, asbestos free, gold color.
 - 1. k (ksi) factor: 0.44 at 300 degrees F.
 - 2. Maximum Service Temperature: 1200 degrees F.
 - 3. Tie Wire: Stainless steel with twisted ends on maximum 12 inch centers.
- D. Jackets:
 - 1. PVC Plastic: One piece molded type fitting covers and sheet material, off-white color.
 - a. Thickness: 10 mil.
 - b. Connections: Brush on welding adhesive.
 - 2. Canvas Jacket: UL listed fabric, 6 oz per sq yd, plain weave cotton treated with dilute fire retardant lagging adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Refer to Section, ADMINISTRATIVE REQUIREMENTS for coordination and project conditions.
- B. Verify piping and equipment has been tested before applying insulation materials.
- C. Verify surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Exposed Piping: Locate insulation and cover seams in least visible locations.

- B. Insulated Pipes Conveying Fluids Below Ambient Temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- C. Man-Made Mineral Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
 - 1. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure-sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
- D. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- E. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- F. Man-Made Mineral Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
 - 1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure-sensitive adhesive system on standard factory-applied jacket and butt strips or both.
- G. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Inserts And Shields:
 - 1. Application: Piping or Equipment 1-1/2 inches diameter or larger.
- I. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
- J. Insert Location: Between support shield and piping and under finish jacket.
- K. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
- L. Insert Material: Compression-resistant insulating material suitable for planned temperature range and service.
- M. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of 1 hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section for penetrations of assemblies with fire resistance rating greater than 1 hour.
- N. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel, or direct buried. Install factory-fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open-mesh glass fabric, with 1-mil-thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.
- O. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- P. Finish insulation at supports, protrusions, and interruptions.
- Q. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- R. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

3.03 APPLICATION

A. For automatic-circulating hot water systems and externally heated (such as heat trace or impedance heating) systems, piping up to 2" shall be insulated with 1 inch of insulation having a conductivity not exceeding 0.27. Piping 2" and greater shall be insulated with 1-1/2" thickness. Domestic cold water piping shall be insulated with 0.5 inch of insulation for condensation control.

SECTION 22 11 00 FACILITY WATER DISRIBUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hose bibs.
- B. Water hammer arrestors.
- C. Thermostatic mixing valves.

1.02 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products.
 - 1. Domestic Water Specialties: Submit manufacturer's catalog information, component sizes, rough-in requirements, service sizes, and finishes.
- C. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves, and accessories.

1.03 CLOSEOUT SUBMITTALS

- A. Refer to Section, Execution and Closeout REQUIREMENTS for closeout procedures.
- B. Project Record Documents: Record actual locations of valves and equipment.
- C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views, and recommended maintenance intervals.

1.04 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

PART 2 PRODUCTS

2.01 HOSE BIBS

2.02 MANUFACTURERS:

- A. Mifab .
- B. Watts
- C. Woodford.
- D. Zurn.
- E. Interior: Bronze or brass with integral mounting flange, replaceable hexagonal disk, hose thread spout, with hand wheel, lock shield and removable key, integral vacuum breaker in conformance with ASSE 1011.

2.03 WATER HAMMER ARRESTORS

- A. Manufacturers:
- B. Amtrol Inc.
- C. Josam Co.
- D. MIFAB Inc.
- E. Sioux Chief Mfg Co.
- F. Jay R. Smith Mfg. Co.
- G. Watts.
- H. Zurn.
- I. ASSE 1010; copper construction, bellows or piston type sized in accordance with PDI WH-201.
- J. Precharged suitable for operation in temperature range 34 degrees to 250 degrees and maximum 250 psi working pressure.

2.04 THERMOSTATIC MIXING VALVES

- A. Manufacturers:
- B. Caleffi.
- C. Leonard Valve Co.
- D. Powers / Watts.
- E. Symmons Industries.
- F. Valve: Chrome-plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
- G. Accessories:
 - 1. Check valve on inlets.
 - 2. Volume control shutoff valve on outlet.
 - 3. Stem thermometer on outlet.
 - 4. Strainer stop checks on inlets.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify piping and equipment has been tested before applying insulation materials.
- B. Verify surfaces are clean and dry, with foreign material removed.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.

3.03 INSTALLATION

A. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping where shown on drawings.

3.04 CLEANING

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for cleaning requirements.
- B. Disinfect water distribution system in accordance with the state health department, local Authority Having Jurisdiction, and/or state plumbing code as required.

Section 22 13 00 Facility Sanitary Sewerage

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cleanouts.

1.02 SUBMITTALS

- A. Refer to Section, SUBMITTAL PROCEDURES for submittal procedures.
- B. Product Data.
- C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

1.03 CLOSEOUT SUBMITTALS

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for closeout procedures.
- B. Project Record Documents: Record actual locations of equipment.
- C. Operation and Maintenance Data: Submit frequency of treatment required for pumps and equipment.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section, Product Requirements for product storage and handling requirements.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.05 ENVIRONMENTAL REQUIREMENTS

- **A.** Refer to Section, PRODUCT REQUIREMENTS.
- B. Do not install underground piping when bedding is wet or frozen

PART 2 PRODUCTS

2.01 CLEANOUTS

- A. Exterior Surfaced Areas: Round or Square cast nickel bronze access frame and non-skid cover.
- B. Exterior Unsurfaced Areas: Line type with lacquered cast-iron body and round epoxy-coated cover with gasket.
- C. Interior Finished Floor Areas: Lacquered cast-iron body with anchor flange, reversible clamping collar, threaded top assembly, and round scored cover with gasket in service areas and round or square depressed cover with gasket to accept floor finish in finished floor areas.
- D. Interior Finished Wall Areas: Line type with lacquered cast iron-body and round epoxy-coated cover with gasket, and round stainless steel access cover secured with machine screw.
- E. Interior Unfinished Accessible Areas: Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Refer to Section, ADMINISTRATIVE REQUIREMENTS for coordination and Project conditions.
- B. Verify excavations are to required grade, dry, and not overexcavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.03 INSTALLATION - BURIED PIPING SYSTEMS

- A. Verify connection size, location, and invert are as indicated on Drawings.
- B. Establish elevations of buried piping with not less than 12 inches of cover.
- C. Establish minimum separation of 12 inches from water piping in accordance with the plumbing code.
- D. Remove scale and dirt on inside of piping before assembly.
- E. Route pipe in straight line.

3.04 INSTALLATION – ABOVE-GROUND PIPING

- A. Establish invert elevations, slopes for drainage to 1/4 inch per foot minimum. Maintain gradients. Pipe 4 inch or larger in diameter shall be permitted to have a slope of not less than 1/8 inch per foot.
- B. Install floor cleanouts at elevation to accommodate finished floor.
- C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide access where cleanouts and fittings are not accessible.
- H. Install piping penetrating roofed areas to maintain integrity of roof assembly.
- I. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section.
- J. Install bell and spigot pipe with bell end upstream.
- K. Sleeve pipes passing through partitions, walls, and floors.
- L. Install firestopping at fire-rated construction perimeters and openings containing penetrating sleeves and piping.
- M. Support cast iron drainage piping at every joint.

3.05 Field Quality Control

A. Test sanitary waste and vent piping system in accordance with local Authority Having Jurisdiction.

SECTION 22 40 00 PLUMBING FIXTURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Water closets.
 - 2. Urinals.
 - 3. Lavatories.
 - 4. Sinks.
 - 5. Floor drains and floor sinks.

1.02 SUBMITTALS

- A. Refer to Section, SUBMITTAL PROCEDURES for submittal procedures.
- B. Product Data: Submit catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Installation Instructions: Submit installation methods and procedures.

1.03 PERFORMANCE REQUIREMENTS

A. Furnish and install all fixtures and equipment, complete and in place, fully functional and including all accessories and appurtenances required to perform the intended or indicated functions.

1.04 CLOSEOUT SUBMITTALS

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for closeout procedures.
- B. Operation and Maintenance Data: Submit fixture, trim, exploded view, and replacement parts lists.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All materials employed in permanent construction shall be new, full weight, in first class condition, and suitable for space provided.
- B. All similar materials shall be of one manufacturer. Fixture trim for the entire job shall be supplied by the same manufacturer to the extent possible.
- C. Fixtures and their trim shall be complete in every respect, including such items as escutcheons, hanger plates, bolts, supplies, stops, traps, etc.
- D. All exposed metal parts of all fixtures, including faucets, waste fittings, indirect waste piping, waste plugs, strainers, flush valves, traps, supplies, and escutcheons shall be polished chromeplated brass, unless otherwise specified including all parts within a base cabinet.

2.02 SYSTEM ACCESSORIES

A. Fixture Supports & Carriers: All fixture supports shall be ANSI approved to adequately support the fixture. Carrier shall best suit the fixture arrangement and wall space available for the piping arrangement and materials employed.

2.03 FIXTURE CONNECTIONS

- A. Fixture Stops: Fixture stops shall be by the primary plumbing fixture manufacturer (such as American Standard or Kohler) or a specialty manufacturing company such as Brass Craft or McGuire. Stops shall be chrome-plated with threaded or solder connection on the water supply inlet. Jam nuts are acceptable only on the fixture side of the stop. Stop handles shall be tool or key operated.
- B. Fixture Risers: Risers shall be braided stainless steel.

2.04 PLUMBING FIXTURES

- A. Description: See Plumbing Fixture Schedule and/or notes on plans for fixture types and accessories.
- B. Manufacturers: In addition to the manufacturer listed on the Plumbing Fixture Schedule, the followed are approved equals.
- C. Flush Valve Water Closets
 - 1. American Standard Plumbing
 - 2. Eljer Plumbingware
 - 3. Kohler Co.
 - 4. Sloan
 - 5. TOTO USA
- D. Wall-Hung Urinals
 - 1. American Standard Plumbing
 - 2. Eljer Plumbingware
 - 3. Kohler Co.
 - 4. Sloan
 - 5. TOTO USA
- E. Lavatories
 - 1. American Standard Plumbing
 - 2. Eljer Plumbingware
 - 3. Kohler Co.
 - 4. Sloan
 - 5. TOTO USA
- F. Sinks
 - 1. American Standard Plumbing
 - 2. Elkay
 - 3. Eljer Plumbingware
 - 4. Kohler Co.
 - 5. Sloan
- G. Floor Drains and Floor Sinks
 - 1. Jay R. Smith Mfg Co.
 - 2. Josam Co.
 - 3. MIFAB Inc.
 - 4. Sioux Chief
 - 5. Watts.
 - 6. Zurn.
- H. Faucets & Shower Valves
 - 1. American Standard
 - 2. Chicago Faucet
 - 3. Delta
 - 4. Kohler
 - 5. Moen
 - 6. Sloan
 - 7. Symmons
 - 8. Toto
 - 9. Zurn
- I. Flush Valves
 - 1. Sloan
 - 2. TOTO USA
 - 3. Zurn

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- J. Seats
 - 1. Primary fixture manufacturer, or
 - 2. Bemis
 - 3. Church
 - 4. Olsonite
- K. Lavatory Insulation Kit
 - 1. Product Description: Where sinks are required to comply with the ADA and in locations requiring heat trace, furnish the following: Safety Covers conforming to ANSI A177.1 and consisting of insulation kit of molded closed cell vinyl construction, 3/16 inch thick, white color, for insulating tailpiece, P-trap, valves, and supply piping. Furnish with weep hole and angle valve access covers.
 - 2. Plumberex Specialty Products
 - 3. Trubro

PART 3 EXECUTION

3.01 EXAMINATION

- A. Refer to Section, ADMINISTRATIVE REQUIREMENTS for coordination and project conditions.
- B. Verify walls and floor finishes are prepared and ready for installation of fixtures.
- C. Verify electric power is available and of correct characteristics.
- D. Confirm millwork is constructed with adequate provision for installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. All fixtures shall be installed to meet manufacturer's recommendations and local codes.
- B. Unless otherwise noted, fixture rough-in shall be at heights shown within contract documents, or if not within contract documents, as recommended by manufacturer. Note special rough-in requirements for handicapped person fixtures.
- C. An exposed stop valve shall be installed on each supply to each fixture connection. Stops shall be located in an accessible location behind or below the fixture serviced, otherwise in branch piping as approved.
- D. Install fixtures complete with all necessary items such as carriers, plates, bolts, and escutcheons. Floor mounted fixtures shall have china bolt caps.
- E. Escutcheons shall be installed on piping at all wall penetrations. Escutcheons shall seat tight to the wall.
- F. All wall-hung fixtures shall be securely supported by a carrier designed for the specific fixture and mounted tight to wall. The contractor shall provide adequate blocking, reinforcing and stiffening of plumbing wall to adequately support the fixture or wall support. Fixture installation which causes deflection of the wall will require reopening of the wall and re-support of the fixture. Wall hangers are not acceptable.
- G. Set floor and roof drains in place, level and at proper elevation for drainage specified.
- H. Use sealing compound Dow #784 white silicone sealant, or approved equal, for the following installations:
 - 1. Rims and trim of stainless steel sinks and drop-in lavatories.
 - 2. Between the wall and the outer edge of wall-hung water closets and urinals.
 - 3. Between the wall and the adjoining edge(s) of mop sinks.
 - 4. Between the floor and the bottom circumference of floor-mounted water closets.
- I. Adjust faucets, operating hardware, and flush valves for specified flow. Test all tailpieces, traps, supplies, and faucets for leaks.

- J. Metering faucets shall be supplied by an adjustable tempering valve located in an accessible area. Provide shut-off valves, check valves, and bypass line as shown on drawings.
- K. Verify and adjust hands-free faucets and flush valves to manufacturer's recommended sensitivity and time delay settings. Verify and adjust hands-free faucet supply water temperature to 110°F.
- L. Install safety covers to comply with the ADA where required.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop-drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

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- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for testing, adjusting, and balancing.
- B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for final cleaning.
- B. Clean plumbing fixtures and equipment.

3.07 PROTECTION OF INSTALLED CONSTRUCTION

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for protecting installed construction.
- B. Do not permit use of fixtures before final acceptance.

SECTION 23 05 00 COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Flashing.
 - 2. Escutcheons.
 - 3. Grout.
 - 4. HVAC demolition.
 - 5. HVAC salvage
 - 6. Equipment installation requirements common to equipment sections.
 - 7. Painting and finishing.
 - 8. Firestopping relating to HVAC work.
 - 9. Firestopping accessories.
 - 10. Supports and anchorages.

1.03 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. CPVC: Chlorinated polyvinyl chloride plastic.
 - 2. PE: Polyethylene plastic.
 - 3. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.
- H. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire-rated construction.

1.04 SYSTEM DESCRIPTION

A. Firestopping Materials: ASTM E814 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1-hour fire rating.

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1. Ratings may be 3 hours for firestopping in through-penetrations of 4-hour fire-rated assemblies, unless otherwise required by applicable codes.

1.05 SUBMITTALS

- A. Product Data: For the following:
 - 1. Firestopping: Submit data on product characteristics, performance, and limitation criteria.

1.06 QUALITY ASSURANCE

- A. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
- B. Through Penetration Firestopping of Fire-Rated Assemblies: ASTM E814 with 0.10-inch water gauge minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1 hour.
 - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1 hour.
 - 2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1 hour.
 - 3. Floor Penetrations within Wall Cavities: T-Rating is not required.
- C. Through Penetration Firestopping of Non-Fire-Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
 - 1. Non-combustible Penetrating Items: Non-combustible materials for penetrating items connecting maximum of three stories.
 - 2. Penetrating Items: Materials approved by Authorities Having Jurisdiction for penetrating items connecting maximum of two stories.
- D. Fire-Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- E. Fire-Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10-inch water gauge minimum positive pressure differential to achieve fire-resistant rating as indicated on Drawings for floor assembly.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.08 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 PRODUCTS

2.01 FLASHING

- A. Metal Flashing: 26-gauge-thick galvanized steel.
- B. Metal Counterflashing: 22-gauge-thick galvanized steel.
- C. Lead Flashing:
 - 1. Waterproofing: 5 lb/sq ft sheet lead.
 - 2. Soundproofing: 1 lb/sq ft sheet lead.

- D. Flexible Flashing: 47-mil-thick sheet butyl; compatible with roofing.
- E. Caps: Steel, 22-gauge minimum; 16 gauge at fire-resistant elements.

2.02 FIRESTOPPING

- A. Manufacturers:
 - 1. Dow Corning Corp.
 - 2. Hilti Corp.
 - 3. 3M Fire Protection Products
- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

2.10 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- C. General:
 - 1. Furnish UL-listed products.
 - 2. Select products with rating not less than rating of wall or floor being penetrated.
- D. Non-Rated Surfaces:
 - 1. Stamped-steel, chrome-plated, hinged, split-ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
 - 2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop- type wall sleeve.

PART 3 EXECUTION

3.01 HVAC DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
 - 1. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - 2. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
 - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.
- D. Temporarily cap all existing piping and ductwork to remain.

3.02 HVAC SALVAGE

- A. For ducts, pipes, roof hoods, and fans to be salvaged.
 - 1. Carefully remove, store, protect, and reinstall components.
 - 2. Temporarily cap all existing piping and ductwork to remain.
 - 3. Provide additional fittings or transitions required to reinstall salvaged piping, ductwork or equipment.
- 4. Contractor may choose (at no additional cost to the owner) to replace any system components called out as salvage.
- 5. 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.
- B. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- C. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.03 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- B. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- C. Install equipment to allow right of way for piping installed at required slope.

3.04 INSTALLATION – FLASHING

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms for sound control.
- C. Provide curbs for roof installations 14 inches minimum high above roofing surface. Flash and counterflash with sheet metal; seal watertight. Attach counterflashing to equipment and lap base flashing on roof curbs. Flatten and solder joints.
- D. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.05 INSTALLATION – FIRESTOPPING

A. Install material at fire-rated construction perimeters and openings containing penetrating sleeves, piping, and other items, requiring firestopping according to manufacturer's instructions to maintain fire ratings per drawings.

3.06 PAINTING

- A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

SECTION 23 05 29 HANGERS AND SUPPORTS FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. Duct hangers and supports.
 - 2. Hanger rods.
 - 3. Formed steel channel.
 - 4. Equipment bases and supports.

1.02 SUBMITTALS

- A. Refer to Section, SUBMITTAL PROCEDURES for submittal procedures.
- B. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
- C. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- D. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.

1.03 QUALITY ASSURANCE

A. Perform work in accordance with applicable authority for welding hanger and support attachments to building structure.

PART 2 PRODUCTS

2.01 DUCT HANGERS AND SUPPORTS

- 1. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards -Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- 3. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- 4. 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.
- 5. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- 6. Trapeze and Riser Supports:
 - a. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.02 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.03 FORMED STEEL CHANNEL

A. Product Description: Galvanized 12-gauge-thick steel. With holes 1-1/2 inches on center.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify the attachment surfaces are ready for anchors and supports prior to installation.

3.02 PREPARATION

A. Do not drill or cut structural members.

3.03 INSTALLATION - INSERTS

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

3.04 INSTALLATION - DUCT HANGERS AND SUPPORTS

- A. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "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.
- C. Hangers Exposed to View: Threaded rod and angle or channel supports.
- D. 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.
- E. 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.

Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. Testing, adjusting, and balancing of air systems.
 - 2. Measurement of final operating condition of HVAC systems.

1.02 REFERENCES

- A. Associated Air Balance Council:
 - 1. AABC MN-1 National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 111 Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.
- C. Natural Environmental Balancing Bureau:
 - 1. NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.03 SUBMITTALS

- A. Refer to Section, SUBMITTAL for submittal procedures.
- B. Test Reports: Indicate data on AABC MN-1 National Standards for Total System Balance forms or NEBB Report forms.
- C. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- D. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required. Include detailed procedures, agenda, sample report forms, and copy of AABC National Project Performance Guaranty or copy of NEBB Certificate of Conformance Certification.
- E. Submit draft copies of report for review prior to final acceptance of Project.
- F. Furnish reports in binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced Drawings with air outlets and equipment identified to correspond with datasheets, and indicating thermostat locations.

1.04 CLOSEOUT SUBMITTALS

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for closeout procedures.
- B. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AABC MN-1 National Standards for Field Measurement and Instrumentation, Total System Balance or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- B. Prior to commencing work, calibrate each instrument to be used.

1.06 QUALIFICATIONS

- A. Test and Balance Engineer's Qualifications: A Professional Engineer (either on the installer's staff or an independent consultant), registered in the State in which the services are to be performed, and having at least 3-years of successful testing, adjusting, and balancing experience on projects with testing and balancing requirements similar to those required for this Project.
- B. Agency Qualifications:

- Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement, and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
- The independent testing, adjusting, and balancing agency certified by National Environmental Balancing Bureau (NEBB) or the Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this Project, and having at least one Professional Engineer registered in the State in which the services are to be performed, certified by NEBB or AABC as a Test and Balance Engineer.

1.07 SCHEDULING

- A. Refer to Section, ADMINISTRATIVE REQUIREMENTS for coordination and project conditions.
- B. Test, adjust, and balance the air systems before hydronic, steam, and refrigerant systems.
- C. Test, adjust, and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5 degrees F wet bulb temperature of maximum summer design condition, and within 10 degrees F dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.
 - 1. Schedule and provide assistance in final adjustment and test of life safety system with Fire Authority.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Refer to Section, ADMINISTRATIVE REQUIREMENTS, for coordination and Project conditions.
- B. Verify systems are complete and operable before commencing work. Verify the following:
 - 1. Systems are started and operating in safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed, and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
 - 12. Hydronic systems are flushed, filled, and vented.
 - 13. Pumps are rotating correctly.
 - 14. Proper strainer baskets are clean and in place or in normal position.
 - 15. Service and balancing valves are open.

3.02 PREPARATION

A. Furnish instruments required for testing, adjusting, and balancing operations.

3.03 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 10% of design.
- B. Air Outlets and Inlets: Adjust total to within plus 10% and minus 5% of design to space. Adjust outlets and inlets in space to within plus or minus 10% of design.

3.04 ADJUSTING

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS, for testing, adjusting, and balancing.
- B. Verify recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
- E. Report defects and deficiencies noted during performance of services, preventing system balance.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to obtain required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in main ducts by Pitot tube traverse of entire crosssectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.
- E. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.
- F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50% loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. At modulating damper locations, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.
- L. For variable air volume system powered units set volume controller to airflow setting indicated. Confirm connections properly made, and confirm proper operation for automatic variable-air-volume temperature control.

3.06 PROJECT CLOSEOUT

A. Some system balancing and adjusting will be for comfort. Accordingly, Contractor shall allow for readjusting air quantities or other settings after building completion and occupancy, for user comfort rather than conformance to indicated design values.

3.07 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing:
 - 1. Modified Duct System
 - a. Air Inlets and Outlets.
 - 2. Fans.

END OF SECTION

24-08

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SECTION 23 07 00 HVAC INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. Ductwork insulation and jackets.
 - 2. Internal ductwork insulation (duct liner).

1.02 SUBMITTALS

- A. Product Data: Submit product description, list of materials, and thickness for each service or equipment scheduled and locations.
- B. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.
- C. Manufacturer's Installation Instructions: Submit manufacturer's installation instructions for each product type.

1.03 ENVIRONMENTAL REQUIREMENTS

- A. Do not install insulation and related products when ambient temperatures and conditions are not meeting manufacturer's requirements.
- B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 INSULATION

- A. Manufacturer:
 - 1. Ductmate Industries (duct liner only)
 - 2. Johns Manville Insulations.
 - 3. Knauf Insulation
 - 4. Owens Corning Fiberglas Corp.

2.02 DUCTWORK INSULATION

- A. Flexible Glass Fiber: ASTM C553; flexible, non-combustible blanket.
 - 1. k (ksi) Value: 0.29 at 75 degrees F.
 - 2. Vapor Retarder Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, secured with pressure-sensitive tape.
- B. Rigid Glass Fiber: ASTM C612; rigid, non-combustible blanket.
 - 1. k (ksi) Value: 0.29 at 75 degrees F.
 - 2. Density: 3.0 lb/cu ft.
 - 3. Vapor Retarder Jacket: Kraft paper with glass fiber yarn and bonded to aluminized film, secured with pressure-sensitive tape.
- C. Duct Liner:
 - 1. Fibrous-Glass Duct Liner: ASTM C1071; flexible, noncombustible blanket.
 - a. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 - b. k (ksi) Value: 0.27 at 75 degrees F.
 - c. Adhesive: Waterproof fire-retardant type.
 - d. Liner Fasteners: Galvanized steel, self-adhesive pad or welded with press-on head.
 - 2. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify ductwork are tested and ready for installation.

3.02 INSTALLATION

- A. Continue insulation vapor barrier through penetrations.
- D. External Ductwork Insulation:
 - 1. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
 - 2. For insulated ductwork conveying air below ambient temperature, install vapor barrier jacket. Finish with tape. Seal vapor barrier penetrations with vapor barrier adhesive.
 - 3. For insulated ductwork conveying air above ambient temperature, install with or without standard vapor barrier jacket. Where service access is required, bevel and seal ends of insulation.
 - 4. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 5. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging.
 - 6. For exterior applications, install insulation with vapor barrier jacket. Cover with outdoor jacket.
- B. Duct Liner:
 - 1. Duct Lining shall be applied in strict accordance with the latest edition of SMACNA's "HVAC Duct Construction Standard Metal & Flexible" and NAIMA's "Fibrous Glass Duct Liner Standard".
 - 2. Length of mechanical fasteners shall be selected in accordance with the manufacturer's recommendation as listed on each product. Mechanical fasteners shall be installed perpendicular to the duct surface, and in no instance shall the pin compress the liner more than 1/8" relative to the nominal thickness of the insulation.
 - 3. All exposed edges of the duct liner shall be coated with the factory applied edge coating or an adhesive which conforms to ASTM C 916.
 - 4. When duct lining is applied with an adhesive, the adhesive shall be applied to the sheet metal with a 90% minimum coverage. All exposed duct liner edges not coated by the manufacturer shall be coated with the same adhesive. All rips and tears shall be repaired using this same adhesive.
 - 5. Transverse joints shall be firmly butted with no gaps and coated with adhesive. Longitudinal corner joints shall be overlapped and compressed.
 - 6. When air velocities are 4,000 to 6,000 FPM, metal nosing shall be applied to all upstream transverse edges to additionally secure the insulation.

3.03 EXISTING INSULATION REPAIR

A. Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping, and sealed over existing.

3.04 SCHEDULES

- A. Ductwork Insulation:
 - 1. Do not insulate exposed ductwork (unless noted otherwise), fibrous glass ductwork (duct board), or lined ductwork. See Section, METAL DUCTWORK for duct liner.
 - 2. Exposed Outdoor Ductwork:
 - a. Application Requirements: Insulate all exposed outdoor ductwork.
 - 3. Cold Ductwork (Below Ambient Temperature): Insulate round and oval ductwork in concealed locations and in fan/mechanical areas.

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	a.	Application Requirements: Insulate the following cold ductwork:	

- 1) Outdoor air intake ductwork between air entrance and fan inlet or HVAC unit inlet.
- 2) HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet.
- Insulate neck and bells of supply diffusers. 3)
- HVAC plenums and unit housings not pre-insulated at factory or lined. 4)
- 4. Insulate ductwork according to the following:
- 5. Insulate ductwork per the following table:

	Exterior₁	Unconditioned Space and Buried Ducts	Indirectly Conditioned Space _{2,3}
Supply & Return for Heating & Cooling	R-8	R-6	R-1.9
Heating Only	R-6	R-6	R-1.9
Cooling Only	R-8	R-6	R1.9

- Includes attics above insulated ceilings, parking garages, and crawl spaces. 1)
- Includes return air plenums with or without exposed roofs above. 2)
- 3) Return ducts in this location do not require insulation.
- For runouts less than 10 feet in length to air terminals or air outlets, the rated R-4) value need not exceed R-3.5.
- Install acoustical duct liner in all rectangular supply and return air ductwork for the b. first 10 feet (minimum) of connections to air handling equipment.

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Section 23 09 00 INSTRUMENTATION AND CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Modifications to existing building Metasys System.
 - a. Provide a duct temperature sensor installed in the restroom exhaust duct main. This shall function as the restroom stall space temperature for integration with the existing MZ-B2 or ASU-B2. (Zone 9 should be the restroom supply) This temperature sensor will replace the existing Metasys Thermostat. Temperature setpoint for this zone shall be set (adj) through the graphical display on the existing control system.
 - b. Provide a space temperature sensor in the open restroom space. This shall enable the plumbing heat trace system for the island sink wall.
 - c. Integrate the replacement exhaust fan EF-B2. This fan shall run when MZ-B2/ASU-B2 is running, and during normal occupied periods.
 - d. See descriptions and device locations shown on the HVAC and Plumbing drawings.

1.02 SUBMITTALS

- A. Refer to Section, SUBMITTAL PROCEDURES for submittal procedures.
- B. Product Data: Submit data on each type of sensor, controller, actuator, and all other devices.
- C. Manufacturer's Installation Instructions: Submit manufacturer's instructions for all devices.

1.03 CLOSEOUT SUBMITTALS

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for closeout procedures.
- B. Operation and Maintenance Data: Submit instructions for all devices.

1.04 QUALITY ASSURANCE

- A. System Installer Qualifications:
 - 1. The Installer shall have authorization from the manufacturer to work on the existing Building Metasys System.
 - 2. The Installer shall have an established working relationship with the existing Building Metasys Control System Manufacturer of not less than 3 years.
 - The Installer shall have successfully completed Control System Manufacturer's classes on the control system. The Installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request.
 - 4. The installer shall have an office within 90 miles of the Project site and provide 24hour response in the event of a customer call.
- B. REFERENCES
 - HVAC instrumentation and controls design, work, and installation of materials and equipment shall comply with the rules and regulations of all codes and ordinances of local, State and Federal authorities, the utility purveyors, and Authorities Having Jurisdiction. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:
 - a. Oregon Mechanical Specialty Code (OMSC).
 - b. Oregon Electrical Specialty Code (OESC).
 - c. Oregon Energy Efficiency Specialty Code (OEESC).

1.05 WARRANTY

A. Labor and materials for control system specified shall be warranted free from defects for a period of 12 months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request.

Medford School District Humanities Restroom Renovation

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Johnson Controls - Metasys

2.02 MATERIALS

- A. All products used in this installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of 2 years. The installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing. Spare parts shall be available for at least 5 years after completion of this contract.
 - 1. Space Temperature Sensors
 - 2. Duct-Mounted Temperature Sensors

2.03 COMMUNICATION

A. This project shall integrate with the existing district-wide and Building Metasys System, and utilize relevant existing Metasys compatible devices.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Refer to Section, ADMINISTRATIVE REQUIREMENTS for coordination and project conditions.
- B. Verify roof curbs are installed and dimensions are as shown on shop drawing.

3.02 INSTALLATION

3.03 GENERAL WORKMANSHIP

- A. Contractor shall provide additional controls and electrical components to make the control system for the renovation area fully functional. This includes but is not limited to:
 - 1. Controllers
 - 2. Relays
 - 3. Transformers
 - 4. Actuators
 - 5. Mounting plates
- B. Install equipment, piping, wiring/conduit parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- C. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- D. Install all equipment in readily accessible location as defined by Chapter 1, Article 100, Part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.
- E. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- F. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.04 FIELD QUALITY CONTROL

- A. All work, materials and equipment shall comply with the rules and regulations of applicable local, State, and Federal codes and ordinances as identified in Part 1 of this Section.
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.
- C. Contractor shall arrange for field inspections by local and/or State Authorities Having Jurisdiction over the work.

3.05 WIRING

- A. All control and interlock wiring shall comply with the national and local electrical codes and Division 26 of these Specifications. Where the requirements of this Section differ with those in Division 26, the requirements of this Section shall take precedence.
- B. Where Class 2 wires are in concealed and accessible locations including ceiling return air plenums, approved cables not in raceway may be used provided that circuits meet NEC Class 2 (current-limited) requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current limit.)
- C. All cables shall be UL listed for application, i.e., cables used in ceiling plenums shall be UL listed specifically for that purpose.
- D. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).
- E. Where Class 2 wiring is run exposed, wiring shall be run parallel along a surface or perpendicular to it, and bundled, using approved wire ties at no greater than 10 foot intervals. Such bundled cable shall be fastened to the structure, using specified fasteners, at 5 foot intervals or more often to achieve a neat and workmanlike result.
- F. All wire-to-device connections shall be made at a terminal blocks or terminal strip. All wireto wire connections shall be at a terminal block, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- G. Maximum allowable voltage for control wiring shall be 120V. If only higher voltages are available, the Control System Contractor shall provide step down transformers.
- H. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.
- I. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations in accordance with other sections of this specification and local codes.
- J. Size of conduit and size and type of wire shall be the design responsibility of the Control System Contractor, in keeping with the manufacturer's recommendation and NEC.
- K. Control and status relays are to be located in designated enclosures only. These relays may also be located within packaged equipment control panel enclosures. These relays shall not be located within Class 1 starter enclosures.
- L. Follow manufacturer's installation recommendations for all communication and network cabling. Network or communication cabling shall be run separately from other wiring.
- M. Adhere to Division 26 requirements for installation of raceway.
- N. The Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
- O. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 3 feet in length and shall be supported at each end. Flexible metal conduit less than 1/2-inch electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal conduits shall be used.

3.06 INSTALLATION OF SENSORS

- A. Install sensors in accordance with the manufacturer's recommendations.
- B. Mount sensors rigidly and adequate for the environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.
- D. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.
- E. Install duct static pressure tap with tube end facing directly downstream of air flow.
- F. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.

- G. All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.
- H. Wiring for space sensors shall be concealed in building walls. EMT conduit is acceptable within mechanical and service rooms.
- I. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.
- J. MANUFACTURER'S FIELD SERVICES
 - 1. Refer to Section, QUALITY REQUIREMENTS for manufacturer's field services requirements.
- K. DEMONSTRATION
 - 1. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for demonstration and training requirements.
 - 2. Demonstrate fan operation and maintenance procedures.
- L. PROTECTION OF FINISHED WORK
 - 1. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for protecting finished work requirements.
 - 2. Do not operate fans for until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

3.07 PROGRAMMING

- A. Provide integration of new and existing devices serving the systems shown on the HVAC and Plumbing drawings. Descriptions of controls functions are described on HVAC and Plumbing drawings for the following functions.
 - 1. Provide a duct temperature sensor installed in the restroom exhaust duct main. This shall function as the restroom stall space temperature for integration with the existing MZ-B2 or ASU-B2. (Zone 9 should be the restroom supply) This temperature sensor will replace the existing Metasys Thermostat. Temperature setpoint for this zone shall be set (adj) through the graphical display on the existing control system.
 - 2. Provide a space temperature sensor in the open restroom space. This shall enable the plumbing heat trace system for the island sink wall.
 - 3. Integrate the replacement exhaust fan EF-B2. This fan shall run when MZ-B2/ASU-B2 is running, and during normal occupied periods.
- B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index.

SECTION 23 31 00 HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SUMMARY

- A. SECTION INCLUDES:
 - 1. Materials and installation of low-pressure metallic ductwork, joints and accessories
- B. Sheet vapor barrier under concrete slabs on grade.

1.02 REFERENCE STANDARDS

- A. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- B. American Society for Testing and Materials International, (ASTM).
 - 1. ASTM A 480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip
 - 2. ASTM A635/A635M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements.
 - 3. ASTM A 653/A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- C. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 1. SMACNA HVAC Duct Construction Standards Metal and Flexible.
 - 2. SMACNA HVAC Air Duct Leakage Test Manual.

1.03 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements, for submittal procedures.
- B. Product Data: Submit SDS Safety Data for the following:
 - 1. Sealants.
 - 2. Tape.
 - 3. Proprietary joints.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect on site stored or installed absorptive material from moisture damage.
- B. Seal ends of ducts with plastic membrane until the time of installation to protect against dirt and debris.

PART 2 PRODUCTS

2.01 DUCTWORK

- A. Duct Materials:
 - 1. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90/A90M.
 - 2. Fasteners: Rivets, bolts, or sheet metal screws.
 - 3. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- B. Ductwork Fabrication:
 - 1. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
 - 2. Fabricate and support round ducts with longitudinal seams in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible (Round Duct Construction Standards), and as indicated on Drawings. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
 - 3. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide turning vanes.
 - 4. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment, and 45 degrees convergence downstream.

- 5. Fabricate continuously welded round and oval duct fittings two gauges heavier than duct gauges indicated in SMACNA Standard. Minimum 4-inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- 6. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45degree lateral wye takeoff, use 90-degree conical tee connections.
- C. Insulated Flexible Ducts:
 - 1. Manufacturers:
 - a. Flexmaster.
 - b. Hercules.
 - c. Hart & Cooley
 - d. Flexible Technologies
 - e. JP Lamborn
 - 2. Product Description: Two ply-vinyl film supported by helical-wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
 - a. Thermal resistance: R4.2.
 - b. Max velocity: 4,000 FPM.
 - c. Temp. range: -10°F-160°F
 - d. Pressure rating: -1.0" to 10" WC
- D. Spiral Round Ducts:
 - 1. Product Description: UL 181, Class 1, round spiral lock seam duct constructed of galvanized steel.
 - 2. Construction:
 - a. 3"-14" duct diameter min. 28 gauge.
 - b. 15"-24" duct diameter min. 26 gauge.
 - 3. Fittings:
 - a. 3"-14" fitting diameter min 28 gauge.
 - b. 15"-18" fitting diameter min 26 gauge.
 - c. 20"-24" fitting diameter min. 24 gauge.
- E. Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30°F to plus 200°F
- F. Tape: polyvinyl treated, open weave fiberglass tape, 2" wide.

PART 3 EXECUTION

3.01 EXAMINATION

1. Verify equipment connection sizes before fabricating transitions.

3.02 INSTALLATION

- A. Metal Ducts: Install in accordance with SMACNA Duct Construction Standards Metal and Flexible.
- B. Connect flexible ducts to metal ducts with drawbands.
- C. Use crimp joints with or without bead for joining round duct sizes 8 inches and smaller with crimp in direction of airflow.
- D. Install flexible connections immediately adjacent to fans and motorized equipment. Install flexible connections specified between fan inlet and discharge ductwork. Prevent flexible connectors being in tension while running.
- E. Install backdraft dampers on discharge of exhaust fans and as indicated on Drawings.
- F. Cut openings in ductwork to accommodate thermometers and controllers. Cut pitot tube openings for testing of systems, complete with metal can with spring device or screw to eliminate against air leakage.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

Section 23 34 00 HVAC FANS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Downblast centrifugal roof fans.
- B. Products furnished but not installed under this Section include roof curbs for roof-mounted exhaust fans and hoods.

1.02 SUBMITTALS

- A. Refer to Section, SUBMITTAL PROCEDURES for submittal procedures.
- B. Shop Drawings: Indicate size and configuration of fan assembly, mountings, weights, ductwork, and accessory connections.
- C. Product Data: Submit data on each type of fan and include accessories, fan curves with specified operating point plotted, power, rpm, sound power levels for both fan inlet and outlet at rated capacity, electrical characteristics, and connection requirements.
- D. Manufacturer's Installation Instructions: Submit fan manufacturer's instructions.

1.03 CLOSEOUT SUBMITTALS

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for closeout procedures.
- B. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.04 QUALITY ASSURANCE

- A. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
- C. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- D. Balance Quality: Conform to AMCA 204.
 - 1. Energy Recovery Unit Wheel Energy Transfer Rating: Meet ARI 1060.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Fans:
 - a. Greenheck, Inc.
 - b. Cook (Loren) Co.
 - c. Twin City Fan and Blower Co.
 - d. U.S. Fan.

2.02 FANS, GENERAL

- A. General: Provide fans that are factory fabricated and assembled, factory tested, and factory finished, with indicated capacities and characteristics. Requirements of individual fan sections take precedence over "Fans, General" Section.
- B. Performance:
 - 1. Performance Base: Job-site conditions.
 - 2. Temperature Limit: Maximum 300 degrees F.
 - 3. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.
- C. Fans and Shafts: Statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower.

- 1. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70% of the first critical speed at the top of the speed range of the fan's class.
- D. Belt Drives: Factory-mounted, with final alignment and belt adjustment made after installation.
 - 1. Service Factor: 1.5.
- E. Belts (if present): Oil-resistant, non-sparking, and non-static.
- F. Belt Guard: Provide steel belt guards for motors mounted on the outside of the fan cabinet.
 - 1. Fabricate to SMACNA Standard; 0.106-inch thick, 3/4-inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
- G. Motors and Fan Wheel Pulleys: Adjustable pitch for use with motors through 15 hp; fixed pitch for use with motors larger than 15 hp. Select pulley so that pitch adjustment is at the middle of the adjustment range at fan design conditions.
- H. Shaft Bearings: Provide type indicated, having a median life "Rating Life" (AFBMA L50) of 100,000 hours, calculated in accordance with AFBMA Standard 9 for ball bearings and AFBMA Standard 11 for roller bearings.
- I. Disconnect Switch: Factory-wired, non-fusible, in fan housing for thermal overload protected motor, NEMA 250 Type 1 enclosure.
- J. Motors: Open dripproof, NEMA MG1: Premium.
- K. Roof Curb (where required): 12-inch high self-flashing of galvanized steel construction with continuously welded seams, built-in cant strips and factory-installed nailer strip.

2.03 DOWNBLAST CENTRIFUGAL ROOF FANS

- A. Fan Unit: Downblast-type. V-belt or direct drive (see schedules), with spun aluminum housing; resilient-mounted motor; aluminum wire bird screen; square base to suit roof curb with continuous curb gaskets.
- B. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variableand adjustable-pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning prelubricated ball bearings.
- C. Accessories:
 - 1. Motor-Operated Damper: Aluminum multiple-blade construction, felt edged with offset hinge pin, nylon bearings, blades linked and line voltage motor drive, power open, spring return.
 - 2. Fan speed controller.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Refer to Section, ADMINISTRATIVE REQUIREMENTS for coordination and project conditions.
- B. Verify roof curbs are installed and dimensions are as shown on shop drawing.

3.02 INSTALLATION

- A. Secure fans and gravity ventilators with cadmium-plated steel lag screws to roof curb or structure.
- B. Install backdraft dampers on inlet to roof and wall exhaust fans and gravity ventilators used in relief air applications.
- C. Provide backdraft dampers on outlet from cabinet and ceiling fans, and as indicated on Drawings.
- D. Install safety screen where inlet or outlet is exposed.
- E. Pipe scroll drains to nearest floor drain.
- F. Install backdraft dampers on discharge of exhaust fans, and as indicated on Drawings.
- G. Provide sheaves required for final air balance.

3.03 MANUFACTURER'S FIELD SERVICES

A. Refer to Section, QUALITY REQUIREMENTS for manufacturer's field services requirements.

3.04 **DEMONSTRATION**

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for demonstration and training requirements.
- B. Demonstrate fan operation and maintenance procedures.

3.05 PROTECTION OF FINISHED WORK

- A. Refer to Section, EXECUTION AND CLOSEOUT REQUIREMENTS for protecting finished work requirements.
- B. Do not operate fans for until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

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SECTION 23 37 00 AIR INLETS AND OUTLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grilles and diffusers.

1.02 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products.

1.03 QUALITY ASSURANCE

- A. Test and rate diffuser, register, and grille performance in accordance with ASHRAE 70.
- B. Test and rate louver performance in accordance with AMCA 500.COORDINATION

PART 2 PRODUCTS

2.01 GRILLES AND DIFFUSERS

- A. Manufacturers:
 - 1. Titus Products Division; Philips Industries, Inc.
 - 2. Price Air Distribution Products.
 - 3. Nailor Industries.
- B. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- C. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
- D. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.
- E. Types: Provide ceiling diffusers of type, capacity, and with accessories and finishes as listed on diffuser schedule.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify inlet and outlet locations.
- B. Verify ceiling and wall systems are ready for installation.

3.02 INSTALLATION

- A. Install diffusers to ductwork with airtight connection.
- B. Install balancing dampers on duct takeoff to diffusers, grilles, and registers, whether or not dampers are furnished as part of diffuser, grille, and register assembly

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SECTION 26 00 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Basic Electrical Requirements specifically applicable to Division 26 Sections.

1.2 SCOPE OF WORK

- A. The specifications describe the quality and character of the materials and methods of installation.
- B. The drawings and these specifications are complementary to each other in that all apparatus, materials and equipment outlined in the Drawings and/or specified herein shall be considered essential to the contract.
- C. The drawings include plans of the building, with diagrammatic layouts showing approximate locations of equipment and devices. Before installing, study adjacent architectural features, and make installation in the most logical manner in accordance with Code and Regulatory Requirements.
- D. The electrical symbols, notes, instructions and schedules on the drawings are included as part of these specifications.

1.3 WORK SCHEDULE AND SEQUENCE

- A. Install work in stages to accommodate the Owner's operational requirements. Coordinate schedule and hours of operation with the Owner prior to start of construction.
- B. Coordinate installation sequence with detailed coordination shop drawings provided under Division 1.

1.4 REFERENCES

- A. ANSI/NFPA 70 National Electrical Code
- B. National Electrical Safety Code

1.5 SUBMITTALS

- A. Conform to Division 1 requirements.
- B. Include a transmittal form clearly indicating the Project, the name of the Contractor and the contents of the submittal.

- C. Include Contractor's stamp and signature indicating that the submittal has been reviewed and conforms to Contract Documents. Submittals without Contractor's stamp will be returned without review.
- D. Identify deviations from Contract Documents, including variations and limitations. Review of a submittal does not constitute acceptance of deviations from the Contract Documents, unless such deviation is clearly indicated as such on the submittal, and specifically accepted as such.
- E. Submit shop drawings and product data, grouped to include complete systems, products and accessories in a single package.
 - 1. Reference catalog cuts and brochures of products to proper paragraph in specifications. Furnish numerical index by specification article number, listing product name, catalog number and reference to page number of submittal brochure.
 - 2. Arrange the submittals in the same sequence as the specifications and reference in the upper right-hand corner, the particular specification provision for which each submittal is intended.
 - 3. Cross reference individual catalog numbers of substitute products to number of specified materials.
 - 4. Submit manufacturer's certification that equipment meets or exceeds the minimum requirements as specified.
 - 5. Where materials, equipment and installations are specified to conform with societies or agencies such as ANSI, NECA, etc., submit certification of such compliance.
 - 6. The submittal shall be complete and with catalog data and information properly marked to show, among other things, material capacity and performance to meet capacities or performance as specified or indicated
 - 7. Mark dimensions and values in units to match those specified.
- F. Review of the submittal is only for general conformance with design concept of project and general compliance with information given in the contract documents. The Contractor is responsible for confirmation and correlation of the dimensions, quantities and sizes, for information that pertains to fabrication methods or construction techniques, and for coordination work of all trades.
- G. For items which are not manufactured and which have to be specifically fabricated, submit shop drawings and details.
- H. Ordering of equipment prior to approval of submittals is done entirely at the risk of the Contractor.

1.6 COORDINATION SUBMITTALS

A. Develop detailed coordination shop drawings in conjunction with other trades, where required by complex and/or congested spaces, to minimize conflict, to allow for correct sequence of installation, and to provide all required clearances. See Division 1 for expanded requirements.

1.7 PROJECT RECORD DRAWINGS

- A. Conform to Division 1 requirements.
- B. Keep an accurate record of the work under this Contract, as it progresses, to be available for inspection at all times. See individual Division 26 Sections for specific requirements.

C. Upon completion of the work, transfer all changes and information onto a new set of reproducible drawings in an orderly and legible manner.

1.8 QUALITY ASSURANCE

- A. For actual fabrication, installation and testing of the work, use only trained and experienced workers completely familiar with the equipment and materials, and the manufacturer's installation requirements.
- B. Include the services of experienced superintendents for each sub-section who shall be constantly in charge of the work, together with the qualified journeymen, helpers, and laborers, required to properly unload, install, connect, adjust, start, operate and test the work involved, including equipment and materials furnished by others.
- C. Perform the work under this section shall be in cooperation with the work of other trades to prevent conflict or interference and to aid in timely completion of the overall project.

1.9 DELIVERY, STORAGE AND HANDLING

A. Storage and handling of equipment and/or systems for project, whether it be onsite or offsite, shall be addressed by the Contractor's IAQ Management Plan. Plan must meet or exceed the recommended control measures of the "Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3)."

1.10 REGULATORY REQUIREMENTS

- A. Conform to International Building Code, International Fire Code, and NFPA 101 Life Safety Code
- B. Electrical: Conform to NFPA 70.

1.11 FIELD CONDITIONS

- A. Visit the project site and become familiar with field conditions including accessibility and physical obstructions. Bid submission indicates familiarity with, and acceptance of, field conditions.
- B. Separate Sections cover site, architectural and mechanical Work. Study the complete set of contract documents to become familiar with the entire Project including site, architectural and structural features and systems as related to Work in this Division. Pay special attention to Divisions featuring equipment requiring electrical interface including Owner-furnished equipment, elevator equipment, and mechanical systems (plumbing, hvac, fire sprinkler, controls).
- C. Study and become familiar with any and all peculiarities and limitations of the spaces available for the installation of all work and materials furnished and installed under the contract. Exercise due and particular caution to determine that all parts of work are made quickly and easily accessible.

- D. If any conflicts occur which necessitate departures from the Drawings, submit details of departures and reasons therefore for written approval. Do not install the affected equipment or related impacted wiring until approval is received.
- E. Should there be omissions or discrepancies in the plans and specifications, or discrepancies from actual site conditions, bring them to the attention of the Engineer ten (10) working days in advance of the date of bid opening so that corrections or clarifications can be made.
- F. Install Work in locations shown on Drawings, unless prevented by Project conditions. Coordinate work with that of other trades. Verify that adjacent and related construction conforms to contract documents and to coordination shop drawings.
- G. If Project conditions, including changes initiated by other trades or discovery of conditions unknown at time of bid, require rearrangement of work, mark such changes on as-built drawings. If Project conditions require unspecified materials and methods, submit Request For Information (RFI) to the Architect with drawings showing the proposed alternative materials or methods. Obtain permission of the Architect before proceeding.
- H. All RFIs must include a proposed solution. RFIs submitted without proposed solutions will be returned without review.

1.12 COORDINATION

- A. Provide and coordinate all information, drawings or layouts of equipment or work under this section which affect the work of the other trades.
- B. In case changes in the indicated locations or arrangements are necessary due to developed conditions in the construction, or rearrangement of furnishings, or equipment, these changes shall be made without extra cost to the Owner, provided the change is ordered before work directly connected is installed, and no extra materials are required.

1.13 EXISTING UTILITIES

- A. The location of utilities shown on the plans are the best known information available at time of design. Contact the appropriate agencies and confirm the information and make arrangements for connection thereto, prior to excavation and installation of any piping or systems.
- B. Perform exploratory excavation and/or use locate service as needed to confirm locations of existing underground utilities.

1.14 PROJECT SITE VISITS

A. Periodic visits to the project site by the Architect/Engineer are for the express purpose of verifying compliance with the contract documents. Such site visits shall not be construed as construction supervision, i.e., the Architect/Engineer assumes no responsibility for providing a safe place for the performance of the work by the Contractor or the Contractor's employees or the safety of the supplies of the Contractor. Neither shall such site visits relieve the Contractor of the responsibility for the discovery of his own errors and the correction of them, nor of the responsibility of properly performing the work.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. See Drawings and individual Sections of Division 26.

2.2 SUBSTITUTIONS

- A. Conform to Division 1 requirements.
- B. Conformance to construction documents is the responsibility of the party making the substitution, regardless of approval.
- C. Layout on drawings, including space allotted for clearances, access, etc., is based on performance and physical attributes of equipment specified and/or scheduled on plans. Coordinate with other systems, subsystems and trades as required when using substituted materials or equipment.
- D. If the use of substitute materials or equipment requires alternate arrangement of equipment, fixtures, devices, wiring or accessories, prepare drawings showing proposed changes. Obtain permission of the Architect before proceeding.
- E. If the use of substitute materials or equipment results in different performance than that provided by the specified materials or equipment, adjust Work as required to provide parity performance, at no additional cost to the Government. Obtain permission of the Engineer before proceeding.
- F. If the use of substitute materials or equipment results in an increase in the cost, including changes to the Work of other trades, pay for any said increase in cost.
- G. See Drawings and individual Sections of Division 26 for further specific information required for substitutions.

2.3 VALUE ENGINEERING

A. Conform to SUBSTITUTIONS above.

2.4 REFERENCE TO SCHEDULES AND DRAWINGS

A. Refer to schedules on drawings for equipment identification, features, ratings, configuration, performance and design requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See Drawings and individual Sections of Division 26. In addition the following general requirements shall apply:
 - 1. Obtain Manufacturer's printed installation instruction to aid in properly executing work of installing equipment whenever such instructions are available. Submit copies of such instructions to the Architect prior to time of installation.

2. Install equipment in a neat and workmanlike manner. Align, level and adjust for satisfactory appearance and operation. Install so that connection and disconnection of wiring and accessories can be made readily, and so that all parts are easily accessible for inspection, operation, maintenance and repair.

END OF SECTION 26 05 00

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Copper building wire.
 - 2. Metal-clad cable, Type MC.
 - 3. Armored cable, Type AC.
 - 4. Fire-alarm wire and cable.
 - 5. Connectors and splices.

B. Related Requirements:

1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Copper building wire.
 - 2. Metal-clad cable, Type MC.
 - 3. Armored cable, Type AC.
 - 4. Fire-alarm wire and cable.
 - 5. Connectors and splices.
- B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

- C. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 or ASTM B496 for stranded conductors.
- D. Conductor Insulation:
 - 1. Type THHN and Type THWN-2. Comply with UL 83.
 - 2. Type XHHW-2. Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Comply with UL 1569.
 - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- C. Circuits:
 - 1. Single circuit and multicircuit with color-coded conductors.
 - 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Ground Conductor: Insulated.
- F. Conductor Insulation:
 - 1. Type TFN/THHN/THWN-2. Comply with UL 83.
 - 2. Type XHHW-2. Comply with UL 44.
- G. Armor: Steel or Aluminum, interlocked.
- H. Jacket: PVC applied over armor.

2.3 ARMORED CABLE, TYPE AC

- A. Description: A factory assembly of insulated current-carrying conductors with or without an equipment grounding conductor in an overall metallic sheath.
- B. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Comply with UL 4.
 - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- C. Circuits:

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	 Single circuit and multicircuit with color-coded conductors. Power-Limited Fire-Alarm Circuits: Comply with UL 1424. 				
D.	Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.				
E.	Ground Conductor: Insulated.				
F.	Conductor Insulation: Type THHN/THWN-2. Comply with UL 83.				
G.	Armor: Steel or Aluminum, interlocked.				
2.4	FIRE-ALARM WIRE AND CABLE				
A.	General Wire and Cable Requirements: NRTL listed and labeled a Article 760.	as complying with NFPA 70,			

- B. Signaling Line Circuits: Twisted, shielded pair, not less than size as recommended by system manufacturer.
 - 1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.
- C. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
 - 1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
 - 2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.
 - 3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire-alarm and cable tray installation, plenum rated.

2.5 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 - 1. Material: Copper or Bronze.
 - 2. Type: One or Two hole with standard or long barrels.
 - 3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
 - 1. Copper; solid or stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:
 - 1. Copper:
 - a. Solid or stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Feeders: Type XHHW-2, single conductors in raceway.
- B. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.
- C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Armored cabler Type AC or Metal-clad cable Type MC.
- D. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION, GENERAL

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points in accordance with Section 260533.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 INSTALLATION OF FIRE-ALARM WIRE AND CABLE

- A. Comply with NFPA 72.
- B. Wiring Method: Install wiring in metal pathway according to Section 270528.29 "Hangers and Supports for Communications Systems."
 - 1. Fire-alarm circuits and equipment control wiring associated with fire-alarm system must be installed in a dedicated pathway system.
 - a. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.
 - 2. Signaling Line Circuits: Power-limited fire-alarm cables must not be installed in the same cable or pathway as signaling line circuits.
- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes; cabinets; or equipment enclosures where circuit connections are made.
- E. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.
- F. Risers: Install at least two vertical cable risers to serve the fire-alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent receipt or transmission of signals from other floors or zones.
- G. Wiring to Remote Alarm Transmitting Device: 1 inch (25 mm) conduit between the fire-alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.5 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torquetightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, 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 inch (150 mm) of slack.

D. Comply with requirements in Section 284621.11 "Addressable Fire-Alarm Systems" for connecting, terminating, and identifying wires and cables.

3.6 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.9 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Perform each of the following visual and electrical tests:
 - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
 - b. Test bolted connections for high resistance using one of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.
 - 3) Thermographic survey.
 - c. Inspect compression-applied connectors for correct cable match and indentation.
 - d. Inspect for correct identification.
 - e. Inspect cable jacket and condition.
 - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.
 - g. Continuity test on each conductor and cable.
 - h. Uniform resistance of parallel conductors.
- B. Cables will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports to record the following:
 - 1. Procedures used.

- 2. Results that comply with requirements.
- 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.
SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Category 6 balanced twisted pair cable.
 - 2. Balanced twisted pair cable hardware.
 - 3. RS-232 cable.
 - 4. RS-485 cable.
 - 5. Control cable.
 - 6. Control-circuit conductors.
 - 7. Fire-alarm wire and cable.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Category 6 balanced twisted pair cable.
 - 2. Balanced twisted pair cable hardware.
 - 3. RS-232 cable.
 - 4. RS-485 cable.
 - 5. Control cable.
 - 6. Control-circuit conductors.
 - 7. Fire-alarm wire and cable.

1.3 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
 - 1. Flame Travel Distance: 60 inch (1520 mm) or less.
 - 2. Peak Optical Smoke Density: 0.5 or less.
 - 3. Average Optical Smoke Density: 0.15 or less.

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C.	Flame Travel and Smoke Density for Riser Cables in Non-Plenum determined by testing identical products according to UL 1666.	Building S	paces:	As

D. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.2 CATEGORY 6 BALANCED TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250 MHz.
- B. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- C. Conductors: 100 ohm, No. 23 AWG solid copper.
- D. Shielding/Screening: Unshielded twisted pairs (UTP).
- E. Cable Rating: Plenum.
- F. Jacket: Blue thermoplastic.

2.3 BALANCED TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.
- B. General Requirements for Balanced Twisted Pair Cable Hardware:
 - 1. Comply with the performance requirements of Category 6.
 - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 - 3. Cables must be terminated with connecting hardware of same category or higher.
- C. Source Limitations: Obtain balanced twisted pair cable hardware from single source from single manufacturer.
- D. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
- E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- F. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
 - 1. Features:
 - a. Universal T568A and T568B wiring labels.
 - b. Labeling areas adjacent to conductors.
 - c. Replaceable connectors.

- d. 24 or 48 ports.
- 2. Construction: 16-gauge steel and mountable on 19 inch (483 mm) equipment racks.
- 3. Number of Jacks per Field: One for each four-pair cable indicated.
- G. Patch Cords: Factory-made, four-pair cables in <u>36 inch (900 mm)</u>lengths; terminated with an eight-position modular plug at each end.
 - 1. Patch cords must have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords must have latch guards to protect against snagging.
 - 2. Patch cords must have color-coded boots for circuit identification.
- H. Plugs and Plug Assemblies:
 - 1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
 - 2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.
 - 3. Marked to indicate transmission performance.
- I. Jacks and Jack Assemblies:
 - 1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
 - 2. Designed to snap-in to a patch panel or faceplate.
 - 3. Standards:
 - a. Category 6, unshielded balanced twisted pair cable must comply with IEC 60603-7-4.
 - 4. Marked to indicate transmission performance.
- J. Faceplate:
 - 1. Four port, vertical single-gang faceplates designed to mount to single-gang wall boxes.
 - 2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 260533.16 "Boxes and Covers for Electrical Systems."
 - 3. For use with snap-in jacks accommodating any combination of balanced twisted pair, optical fiber, and coaxial work area cords.
- K. Legend:
 - 1. Machine printed, in the field, using adhesive-tape label.
 - 2. Snap-in, clear-label covers and machine-printed paper inserts.

2.4 RS-232 CABLE

- A. Plenum-Type, TIA 232-F:
 - 1. Three or Nine, No. 22 AWG, stranded (7x30) tinned copper conductors.
 - 2. PE insulation.
 - 3. Aluminum foil-polyester tape shield with 100 percent shield coverage.

- 4. Fluorinated ethylene propylene jacket.
- 5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
- 6. Flame Resistance: Comply with NFPA 262.

2.5 RS-485 CABLE

- A. Plenum-Rated Cable: NFPA 70, Type CMP.
 - 1. Paired, one pair, No. 22 AWG, stranded (7x30) tinned-copper conductors.
 - 2. Fluorinated ethylene propylene insulation.
 - 3. Unshielded.
 - 4. Fluorinated ethylene propylene jacket.
 - 5. Flame Resistance: NFPA 262.

2.6 CONTROL CABLE

- A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 - 1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
 - 2. PVC insulation.
 - 3. Unshielded.
 - 4. PVC jacket.
 - 5. Flame Resistance: Comply with NFPA 262.

2.7 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- B. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

2.8 FIRE-ALARM WIRE AND CABLE

- A. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- B. Signaling Line Circuits: Twisted, shielded pair, not less than size as recommended by system manufacturer.
- C. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
 - 1. Control-Voltage Circuits: No. 16 AWG, minimum, in pathway.
 - 2. Low-Voltage Circuits: No. 12 AWG, minimum, in pathway.

3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire-alarm and cable tray installation, plenum rated.

2.9 SOURCE QUALITY CONTROL

- A. Factory test twisted pair cables according to TIA-568-C.2.
- B. Cable will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Test cables on receipt at Project site.
 - 1. Test each pair of twisted pair cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems" for raceway selection and installation requirements for conduits as supplemented or modified in this Section.
- B. Comply with requirements in Section 260533.16 "Boxes and Covers for Electrical Systems" for raceway selection and installation requirements for boxes as supplemented or modified in this Section.
 - 1. Outlet boxes for cables must be no smaller than 4 inch (102 mm) square by 2-1/8 inch (53 mm) deep with extension ring sized to bring edge of ring to within 1/8 inch (3.1 mm) of the finished wall surface.
 - 2. Flexible metal conduit must not be used.
- C. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.
- D. Install manufactured conduit sweeps and long-radius elbows if possible.
- E. Raceway Installation in Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
 - 2. Secure conduits to backboard if entering the room from overhead.
 - 3. Extend conduits 3 inch (75 mm) above finished floor.
 - 4. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA-568-C Series of standards.
 - 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
 - 3. Terminate all conductors; cable must not contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - 4. Cables may not be spliced and must be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
 - 5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
 - 6. Secure and support cables at intervals not exceeding <u>30 inch</u> (760 mm) and not more than <u>6 inch</u> (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
 - 8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
 - 9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
 - 10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
 - 11. Support: Do not allow cables to lie on removable ceiling tiles.
 - 12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
 - 13. Provide strain relief.
 - 14. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
 - 15. Ground wire must be copper, and grounding methods must comply with IEEE C2. Demonstrate ground resistance.
- C. Balanced Twisted Pair Cable Installation:
 - 1. Comply with TIA-568-C.2.
 - 2. Install termination hardware as specified in Section 271513 "Communications Copper Horizontal Cabling" unless otherwise indicated.
 - 3. Do not untwist balanced twisted pair cables more than 1/2 inch (12 mm) at the point of termination to maintain cable geometry.
- D. Installation of Control-Circuit Conductors:
 - 1. Install wiring in raceways.
 - 2. Use insulated spade lugs for wire and cable connection to screw terminals.
- E. Open-Cable Installation:
 - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 - 2. Suspend copper cable not in a wireway or pathway a minimum of 8 inch (200 mm) above ceilings by cable supports not more than 30 inch (760 mm) apart.

- 3. Cable must not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.
- F. Installation of Cable Routed Exposed under Raised Floors:
 - 1. Install plenum-rated cable only.
 - 2. Install cabling after the flooring system has been installed in raised floor areas.
 - 3. Below each feed point, neatly coil a minimum of 72 inch (1830 mm) of cable in a coil not less than 12 inch (305 mm) in diameter.

3.4 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

3.5 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:
 - 1. Class 1 remote-control and signal circuits; No 14 AWG.
 - 2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
 - 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.7 GROUNDING

- A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For control-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers must use label stocks, laminating adhesives, and inks complying with UL 969.

C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire must have a unique tag.

3.9 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination, but not after cross-connection.
 - a. Test instruments must meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in its "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in its "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. Section Includes:
 - 1. Grounding and bonding conductors.
 - 2. Grounding and bonding bushings.
 - 3. Grounding and bonding hubs.
 - 4. Grounding and bonding connectors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

- A. Equipment Grounding Conductor:
 - 1. General Characteristics: 600 V, THHN/THWN-2 or THWN-2, copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. ASTM Bare Copper Grounding and Bonding Conductor:
 - 1. Referenced Standards: Complying with one or more of the following:
 - a. Soft or Annealed Copper Wire: ASTM B3.
 - b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
 - c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
 - d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/B787M.

2.2 GROUNDING AND BONDING BUSHINGS

- A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.
- B. Source Limitations: Obtain products from single manufacturer.

- C. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- D. UL KDER Bonding Bushing:
 - 1. General Characteristics: Threaded bushing with insulated throat.
- E. UL KDER Grounding Bushing:
 - 1. General Characteristics: Threaded bushing with insulated throat and mechanical-type wire terminal.

2.3 GROUNDING AND BONDING HUBS

- A. Description: Hubs with certified grounding or bonding locknut.
- B. Source Limitations: Obtain products from single manufacturer.
- C. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- D. UL KDER Grounding and Bonding Hub:
 - 1. General Characteristics: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

2.4 GROUNDING AND BONDING CONNECTORS

- A. Source Limitations: Obtain products from single manufacturer.
- B. Performance Criteria:
 - 1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
 - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
- C. UL KDER Crimped Pressure-Type Grounding and Bonding Cable Connector:
 - 1. General Characteristics: Crimp-and-compress connectors that bond to conductor when connector is compressed around conductor.
 - a. Copper, C and H shaped.
- D. UL KDER Split-Bolt Pressure-Type Grounding and Bonding Cable Connector:
 - 1. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened.
 - a. Copper.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- B. Inspect test results, in facility record documents, of grounding system measured at point of electrical service equipment connection.
- C. Prepare written report listing conditions detrimental to performance of the Work.
- D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS

- A. Grounding and Bonding Conductors:
 - 1. Provide solid or stranded conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.
 - 2. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
 - 3. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 4. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
 - 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch (41 mm) wide and 1/16 inch (1.6 mm) thick.

- B. Grounding and Bonding Connectors:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

3.3 INSTALLATION OF GROUNDING AND BONDING

- A. Comply with manufacturer's published instructions.
- B. Special Techniques:
 - 1. Grounding and Bonding Conductors:
 - a. 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.
 - 2. Grounding and Bonding Connectors: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
 - a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - b. Make connections with clean, bare metal at points of contact.
 - c. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 - d. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - e. Grounding and Bonding for Piping:
 - 1) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
 - f. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
 - 3. Equipment Grounding and Bonding:
 - a. Install insulated equipment grounding conductors with feeders and branch circuits.
 - b. 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.

3.4 FIELD QUALITY CONTROL FOR GROUNDING AND BONDING

A. Tests and Inspections:

- 1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.
- B. Nonconforming Work:
 - 1. Grounding system will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace defective components and retest.

3.5 PROTECTION

A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Support, anchorage, and attachment components.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Slotted support systems, hardware, and accessories.
 - b. Clamps.
 - c. Hangers.
 - d. Sockets.
 - e. Eye nuts.
 - f. Fasteners.
 - g. Anchors.
 - h. Saddles.
 - i. Brackets.
 - 2. Include rated capacities and furnished specialties and accessories.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame Rating: Class 1.
 - 2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch (10 mm) diameter holes at a maximum of 8 inch (200 mm) on center in at least one surface.
 - 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 2. Material for Channel, Fittings, and Accessories: Galvanized steel.
 - 3. Channel Width: Selected for applicable load criteria.

- 4. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. 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 where used.
 - 2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 - 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).
 - 5. Toggle Bolts: All steel springhead type.
 - 6. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 SELECTION

- A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA NEIS 101
 - 2. NECA NEIS 102.
 - 3. NECA NEIS 105.
 - 4. NECA NEIS 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

- C. Comply with requirements for raceways specified in Section 260533.13 "Conduits for Electrical Systems."
- D. Comply with requirements for boxes specified in Section 260533.16 "Boxes and Covers for Electrical Systems."
- E. Provide seismic controls with hangers and supports in accordance with requirements specified in "Section 260548.16 "Seismic Controls for Electrical Systems."
- F. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as required by NFPA 70. Minimum rod size must be 1/4 inch (6 mm) in diameter.
- G. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.
- H. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch (38 mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 INSTALLATION OF SUPPORTS

- A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA NEIS 1, EMT and ERMC may be supported by openings through structure members, in accordance with NFPA 70.
- C. 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 must be weight of supported components plus 200 lb (90 kg).
- D. 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.
 - 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. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. 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 comply with seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

END OF SECTION 260529

SECTION 260533.13 - CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Type EMT-S duct raceways and elbows.
 - 2. Type ERMC-S duct raceways, elbows, couplings, and nipples.
 - 3. Type FMC-S duct raceways.
 - 4. Type FMT duct raceways.
 - 5. Type LFMC duct raceways.
 - 6. Fittings for conduit, tubing, and cable.
 - 7. Electrically conductive corrosion-resistant compounds for threaded conduit.
- B. Products Installed, but Not Furnished, under This Section:
 - 1. See Section 260553 "Identification for Electrical Systems" for electrical equipment labels.

1.2 DEFINITIONS

- A. Conduit: A structure containing one or more duct raceways.
- B. Duct Raceway: A single enclosed raceway for conductors or cable.
- C. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Type EMT-S duct raceways and elbows.
 - 2. Type ERMC-S duct raceways, elbows, couplings, and nipples.
 - 3. Type FMC-S duct raceways.
 - 4. Type FMT duct raceways.
 - 5. Type LFMC duct raceways.
 - 6. Fittings for conduit, tubing, and cable.
 - 7. Electrically conductive corrosion-resistant compounds for threaded conduit.
- B. Sustainable design submittals.
 - 1. Solvent cements.

PART 2 - PRODUCTS

2.1 TYPE EMT-S DUCT RACEWAYS AND ELBOWS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria: UL CCN FJMX; including UL 797.
- B. Source Quality Control:
 - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
 - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL FJMX Steel Electrical Metal Tubing (EMT-S) and Elbows:
 - 1. Material: Steel.
 - 2. Options:
 - a. Exterior Coating: Zinc.
 - b. Interior Coating: Zinc.
 - c. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.2 TYPE ERMC-S DUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria: UL CCN DYIX; including UL 6.
- B. Source Quality Control:
 - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
 - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL DYIX Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:
 - 1. Exterior Coating: Zinc.
 - 2. Options:
 - a. Interior Coating: Zinc.
 - b. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.3 TYPE FMC-S DUCT RACEWAYS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria: UL CCN DXUZ; including UL 1.
- B. Source Quality Control:
 - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
 - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL DXUZ Steel Flexible Metal Conduit (FMC-S):
 - 1. Material: Steel.
 - 2. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.4 TYPE FMT DUCT RACEWAYS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria: UL CCN ILJW; including UL Subject 1652.
- B. Source Quality Control:
 - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
 - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL ILJW Steel Flexible Metallic Tubing (FMT):
 - 1. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.5 TYPE LFMC DUCT RACEWAYS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria: UL CCN DXHR; including UL 360.
- B. Source Quality Control:

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	1. 2.	Product Data: Prepare and submit catalog cuts, brochures, an illustrating size, physical appearance, and other characteristics of pro Manufacturer's Published Instructions: Prepare and submit insta operating instructions for product.	d performance data oduct. allation, testing, and
C.	UL DXHR - Steel Liquidtight Flexible Metal Conduit (LFMC-S):		
	1. 2.	Material: Steel. Minimum Trade Size: Metric designator 21 (trade size 3/4).	
2.6	FITTINGS FOR CONDUIT, TUBING, AND CABLE		
A.	Performance Criteria:		
1. Regulatory Requirements: Listed an electrical testing laboratory recognize intended location and application.		Regulatory Requirements: Listed and labeled in accordance with N electrical testing laboratory recognized by authorities having jurisdic intended location and application.	FPA 70, by qualified tion, and marked for

- B. Source Quality Control:
 - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
 - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL DWTT Fittings for Type ERMC Duct Raceways:
 - 1. Listing Criteria: UL CCN DWTT; including UL 514B.
 - 2. Options:
 - a. Material: Steel.
 - b. Coupling Method: Compression coupling or Setscrew coupling. Setscrew couplings with only single screw per conduit are unacceptable.
 - c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.
- D. UL FKAV Fittings for Type EMT Duct Raceways:
 - 1. Listing Criteria: UL CCN FKAV; including UL 514B.
 - 2. Options:
 - a. Material: Steel.
 - b. Coupling Method: Compression coupling or Setscrew coupling. Setscrew couplings with only single screw per conduit are unacceptable.
 - c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.
- E. UL ILNR Fittings for Type FMC Duct Raceways:
 - 1. Listing Criteria: UL CCN ILNR; including UL 514B.
- F. UL DXAS Fittings for Type LFMC Duct Raceways:
 - 1. Listing Criteria: UL CCN DXAS; including UL 514B.

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2.7	ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT C	COMPOUNDS FOR THREADED
Α.	Performance Criteria:	

- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- 2. Listing Criteria: UL CCN FOIZ; including UL Subject 2419.
- B. Source Quality Control:
 - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
 - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL FOIZ Electrically Conductive Corrosion-Resistant Compound for Threaded Conduit:

PART 3 - EXECUTION

3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.
- B. Outdoors:
 - 1. Exposed and Subject to Severe Physical Damage: ERMC.
 - 2. Exposed and Subject to Physical Damage: ERMC or Corrosion-resistant EMT.
 - a. Locations less than 2.5 m (8 ft) above finished floor.
 - 3. Exposed and Not Subject to Physical Damage: ERMC or Corrosion-resistant EMT.
 - 4. Concealed Aboveground: ERMC or EMT.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- C. Indoors:
 - 1. Exposed and Subject to Severe Physical Damage: ERMC. Locations include the following:
 - a. Loading docks.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - 2. Exposed and Subject to Physical Damage: ERMC or EMT. Locations include the following:
 - a. Locations less than 2.5 m (8 ft) above finished floor.
 - b. Stub-ups to above suspended ceilings.

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	 Exposed and Not Subject to Physical Damage: ERMC or E Concealed in Ceilings and Interior Walls and Partitions: ER Damp or Wet Locations: ERMC or Corrosion-resistant EMT Connection to Vibrating Equipment (Including Transforme Electric Solenoid, or Motor-Driven Equipment): LFMC. 	MT. MC or EMT. rs and Hydraulic, Pneumatic,	
D. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guideline		delines.	
	1. ERMC: Provide threaded-type fittings unless otherwise indic	cated.	
3.2	INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS		
Α.	Comply with manufacturer's published instructions.		
В.	Reference Standards for Installation: Unless more stringent i specified in Contract Documents or manufacturers' published i following:	installation requirements are instructions, comply with the	
	1. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.		

- 2. Type ERMC-S: Article 344 of NFPA 70 and NECA NEIS 101.
- 3. Type FMC-S: Article 348 of NFPA 70 and NECA NEIS 101.
- 4. Type FMT: Article 360 of NFPA 70 and NECA NEIS 101.
- 5. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
- 6. Expansion Fittings: NEMA FB 2.40.
- 7. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
 - 1. General Requirements for Installation of Duct Raceways:
 - a. Complete duct raceway installation before starting conductor installation.
 - b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft (0.6 m) above finished floor.
 - c. Install no more than equivalent of three 90-degree bends in conduit run except for control wiring conduits, for which no more than equivalent of two 90-degree fewer bends are permitted. Support within 12 inch (300 mm) of changes in direction.
 - d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
 - e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
 - f. Support conduit within 12 inch (300 mm) of enclosures to which attached.
 - g. Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70.
 - h. Install devices to seal duct raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of duct raceways at the following points:
 - 1) Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

- 2) Where an underground service duct raceway enters a building or structure.
- 3) Conduit extending from interior to exterior of building.
- 4) Conduit extending into pressurized duct raceway and equipment.
- 5) Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
- 6) Where otherwise required by NFPA 70.
- i. Do not install conduits within 2 inch (50 mm) of the bottom side of a metal deck roof.
- j. Keep duct raceways at least 6 inch (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.
- k. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
- I. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb (90 kg) tensile strength. Leave at least 12 inch (300 mm) of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use.
- m. Install duct raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
 - 1) Termination fittings with shoulders do not require two locknuts.
- n. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts..
- 2. Type ERMC:
 - a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.
- 3. Types FMC, LFMC:
 - a. Provide a maximum of <u>36 inch (915 mm)</u> of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
- 4. Stub-ups to Above Recessed Ceilings:
 - a. Provide EMT or ERMC for duct raceways.
 - b. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- 5. Duct Raceway Terminations at Locations Subject to Moisture or Vibration:
 - a. Provide insulating bushings to protect conductors, including conductors smaller than 4 AWG..
- 6. Duct Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

- a. EMT: Provide setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
- b. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.
- 7. Expansion-Joint Fittings:
 - a. Install type and quantity of fittings that accommodate temperature change listed for the following locations:
 - 1) Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
 - 2) Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
 - Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
 - 4) Attics: 135 deg F (75 deg C) temperature change.
 - b. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
 - c. Install expansion fittings at locations where conduits cross building or structure expansion joints.
 - d. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's published instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- 8. Duct Raceways Penetrating Rooms or Walls with Acoustical Requirements: Seal duct raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.
- 9. Identification: Provide labels for conduit assemblies, duct raceways, and associated electrical equipment.
 - a. Provide warning signs.
- D. Interfaces with Other Work:
 - 1. Coordinate with Section 078413 "Penetration Firestopping" for installation of firestopping at penetrations of fire-rated floor and wall assemblies.
 - 2. Coordinate with Section 260529 "Hangers and Supports for Electrical Systems" for installation of conduit hangers and supports.

3.3 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 260533.13

SECTION 260533.16 - BOXES AND COVERS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metallic outlet boxes, device boxes, rings, and covers.
 - 2. Junction boxes and pull boxes.
 - 3. Cover plates for device boxes.

B. Related Requirements:

- 1. Section 078413 "Penetration Firestopping" specifies materials and methods for sealing penetrations of rated walls and partitions referenced by this Section.
- 2. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding referenced by this Section.
- 3. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.

1.2 DEFINITIONS

- A. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
 - 1. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
 - 2. Concrete Box: A box intended for use in poured concrete.
 - 3. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
 - 4. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
 - 5. Cover Plate: A cover designed for protecting wiring devices installed in flush-mounted device boxes while permitting their safe operation; also called a faceplate or wallplate.
 - 6. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
 - 7. Device Box: A box with provisions for mounting a wiring device directly to the box.
 - 8. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
 - 9. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
 - 10. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.

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	11.	Pedestal Floor Box Cover: A floor box cover that, when install means for typically vertical or near-vertical mounting of rec floor's finished surface.	ed as intended, provides a septacle outlets above the
	12.	Pull Box: A box with a blank cover that joins different runs access for pulling or replacing the enclosed cables or conductor	of raceway and provides prs.
	13.	Ring: A sleeve, which is not necessarily round, used for pos device flush with the plaster, concrete, drywall, or other wall su	sitioning a recessed wiring rface.
	14.	Ring Cover: A box cover, with raised center portion to accor ceiling thickness, for mounting wiring devices or luminaires flus	nmodate a specific wall or sh with the surface.
	15.	Termination Box: An enclosure designed for installation of ter consisting of bus bars, terminal strips, or terminal block connectors to accommodate incoming or outgoing conductors,	rmination base assemblies s with provision for wire or both.
В.	Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.		

C. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Prepare and submit the following:
 - 1. Shop Drawings for Floor Boxes: Show that floor boxes are located to avoid interferences and are structurally allowable. Indicate floor thickness at location where boxes are embedded in concrete floors and underfloor clearances where boxes are installed in raised floors.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's published instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- 2.2 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS
 - A. UL QCIT Metallic Outlet Boxes and Covers:
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN QCIT; including UL 514A.

- 2. Standard Features:
 - a. Box having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
 - b. Material: Sheet steel or Cast metal.
 - c. Sheet Metal Depth: Minimum 2.5 inch (65 mm).
 - d. Cast-Metal Depth: Minimum 2.4 inch (60.3 mm).
- B. UL QCIT Metallic Conduit Bodies:
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN QCIT; including UL 514A.
 - 2. Standard Features: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
- C. UL QCIT Metallic Device Boxes:
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN QCIT; including UL 514A.
 - 2. Standard Features:
 - a. Box with provisions for mounting wiring device directly to box.
 - b. Material: Sheet steel or Cast metal.
 - c. Sheet Metal Depth: minimum 2.5 inch (65 mm).
 - d. Cast-Metal Depth: minimum 2.4 inch (60.3 mm).
- D. UL QCIT Metallic Extension Rings:
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN QCIT; including UL 514A.
 - 2. Standard Features: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.
- E. UL QCIT Metallic Concrete Boxes and Covers:
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN QCIT; including UL 514A.

2. Standard Features: Box intended for use in poured concrete.

2.3 JUNCTION BOXES AND PULL BOXES

- A. UL BGUZ Indoor Sheet Metal Junction and Pull Boxes:
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN BGUZ; including UL 50 and UL 50E.
 - 2. Standard Features:
 - a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
 - b. Degree of Protection: Type 1.
- B. UL BGUZ Indoor Cast-Metal Junction and Pull Boxes:
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN BGUZ; including UL 50 and UL 50E.
 - 2. Standard Features:
 - a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
 - b. Degree of Protection: Type 1.
- C. UL BGUZ Outdoor Sheet Metal Junction and Pull Boxes:
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN BGUZ; including UL 50 and UL 50E.
 - 2. Standard Features:
 - a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
 - b. Degree of Protection: Type 3R.
- D. UL BGUZ Outdoor Cast-Metal Junction and Pull Boxes:
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN BGUZ; including UL 50 and UL 50E.

- a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
- b. Degree of Protection: Type 3R.

2.4 COVER PLATES FOR DEVICE BOXES

- A. UL QCIT or QCMZ Metallic Cover Plates for Device Boxes:
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN QCIT or UL CCN QCMZ; including UL 514D.
 - 2. Standard Features:
 - a. Cover plate-Securing Screws: Metal with head color to match cover plate finish.
 - b. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
 - c. Cover Plate Material: Galvanized steel.
- B. UL QCIT or QCMZ Nonmetallic Cover Plates for Device Boxes:
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN QCIT or UL CCN QCMZ; including UL 514D.
 - 2. Standard Features:
 - a. Cover Plate-Securing Screws: Metal with head color to match cover plate finish.
 - b. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
 - c. Cover Plate Material: 0.060 inch (1.5 mm) thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device.
 - d. Color: White.

PART 3 - EXECUTION

3.1 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.
- B. Degree of Protection:
 - 1. Outdoors: Type 3R unless otherwise indicated.

- 2. Indoors: Type 1 unless otherwise indicated.
- C. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor:
 - 1. Provide cast-metal boxes.
 - 2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.2 INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
 - 1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
 - 2. Electrical Safety: NFPA 70E.
 - 3. Commissioning of Active and Passive Fire Protection Features: NFPA 3 and NFPA 4.
 - 4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
 - 5. Life Safety and Means of Egress Work: NFPA 101.
 - 6. Work in Confined Spaces: NFPA 350.
 - 7. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
 - 8. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
 - 9. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
 - 1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
 - 2. Mount boxes at heights indicated on Drawings.
 - 3. 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, whether installed indoors or outdoors.
 - 4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
 - 5. Locate boxes so that cover or plate will not span different building finishes.
 - 6. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
 - 7. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
 - 8. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
 - 9. Set metal floor boxes level and flush with finished floor surface.
 - 10. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
 - 11. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:
 - a. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
 - b. Provide gaskets for cover plates and covers.
- D. Interfaces with Other Work:

- Identify field-installed conductors, interconnecting wiring, and components. a.
- Label each enclosure with engraved metal or laminated-plastic nameplate. b.
- Provide warning signs and arc-flash hazard warning labels for electrical C. equipment.

3.3 CLEANING

Α. Remove construction dust and debris from boxes before installing cover plates, covers, and hoods.

3.4 PROTECTION

Α. After installation, protect boxes from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260533.16

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SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Round sleeves.
 - 2. Rectangular sleeves.
 - 3. Sleeve-seal systems.
 - 4. Sleeve-seal fittings.
 - 5. Grout.
 - 6. Pourable sealants.
 - 7. Foam sealants.
- B. Related Requirements:
 - 1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fireresistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

- A. Steel Wall Sleeves:
 - 1. General Characteristics: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.
- B. Cast-Iron Wall Sleeves:
 - 1. General Characteristics: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.
- C. Round, Galvanized-Steel, Sheet Metal Sleeves:
 - General Characteristics: Galvanized-steel sheet; thickness not less than 0.0239 inch (0.6 mm); round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 RECTANGULAR SLEEVES

- A. Rectangular, Galvanized-Steel, Sheet Metal Sleeves:
 - 1. General Characteristics:
 - a. Material: Galvanized sheet steel.
 - b. Minimum Metal Thickness:
 - 1) For sleeve cross-section rectangle perimeter less than 50 inch (1270 mm) and with no side larger than 16 inch (400 mm), thickness must be 0.052 inch (1.3 mm).
 - 2) For sleeve cross-section rectangle perimeter not less than 50 inch (1270 mm) or with one or more sides larger than 16 inch (400 mm), thickness must be 0.138 inch (3.5 mm).

2.3 SLEEVE-SEAL SYSTEMS

- A. General Characteristics: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.
- B. Options:
 - 1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. General Characteristics: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit must have plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

- A. General Characteristics: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
 - 1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
 - 2. Design Mix: 5000 psi (34.5 MPa), 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.6 POURABLE SEALANTS

- A. Performance Criteria:
 - 1. General Characteristics: Single-component, neutral-curing elastomeric sealants of grade indicated below.

a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2.7 FOAM SEALANTS

- A. Performance Criteria:
 - 1. General Characteristics: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

- 3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS
 - A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4 inch (6.4 mm) annular clear space between sleeve and raceway or cable, unless sleeve-seal system is to be installed or seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inch (50 mm) above finished floor level. Install sleeves during erection of floors.
 - B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for wall assemblies.
 - C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boottype flashing units applied in coordination with roofing work.
 - D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve-seal systems. Size sleeves to allow for 1 inch (25 mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - E. Underground, Exterior-Wall and Floor Penetrations:

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- Install steel or cast-iron pipe sleeves with integral waterstops. Size sleeves to allow for 1 inch (25 mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Install sleeve during construction of floor or wall.
- 2. Install steel pipe sleeves. Size sleeves to allow for 1 inch (25 mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Grout sleeve into wall or floor opening.

3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

- A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.
- B. Install conduits and cable with no crossings within the sleeve.
- C. Fill opening around conduits and cables with expanding foam without leaving voids.
- D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

3.3 INSTALLATION OF SLEEVE-SEAL SYSTEMS

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 260544
SECTION 260548.16 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Restraints rigid type.
 - 2. Restraints cable type.
 - 3. Restraint accessories.
 - 4. Post-installed concrete anchors.
 - 5. Concrete inserts.

B. Related Requirements:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Restraints rigid type.
 - 2. Restraints cable type.
 - 3. Restraint accessories.
 - 4. Post-installed concrete anchors.
 - 5. Concrete inserts.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: ICC-ES product listing, UL product listing, FM Approvals, an evaluation service member of ICC-ES, or an agency acceptable to authorities having jurisdiction.
- B. Consequential Damage: Provide additional seismic-restraints for suspended components or anchorage of floor-, roof-, or wall-mounted components so that failure of a non-essential or essential component does not cause failure of any other essential building component.
- C. Fire/Smoke Resistance: Seismic-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested and labeled by qualified testing laboratory in accordance with ASTM E84 or UL 723.

- D. Component Supports:
 - 1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of qualified testing laboratory.

2.2 RESTRAINTS - RIGID TYPE

A. Description: Shop- or field-fabricated bracing assembly made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe, or other rigid steel brace member. Includes 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; rated in tension, compression, and torsion forces.

2.3 RESTRAINTS - CABLE TYPE

- A. Seismic-Load-Restraint Cables: ASTM A1023/A1023M galvanized or ASTM A603 galvanizedsteel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic-restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.
- B. Restraint cable assembly and cable fittings must comply with ASCE/SEI 19. Cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.4 RESTRAINT ACCESSORIES

- A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod. Non-metallic stiffeners are unacceptable.
- B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- C. 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.
- D. 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.
- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 POST-INSTALLED CONCRETE ANCHORS

- A. Mechanical Anchor Bolts:
 - 1. 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 for anchor and as tested according to ASTM E488/E488M.

- B. Adhesive Anchor Bolts:
 - 1. Drilled-in and capsule anchor system containing PVC 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 E488/E488M.
- C. Provide post-installed concrete anchors that have been prequalified for use in seismic and windload applications.
 - 1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
 - 2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.
- D. Expansion-type anchor bolts are not permitted for equipment in excess of 10 hp (7.46 kW) that is not vibration isolated.
 - 1. Undercut expansion anchors are permitted.

2.6 CONCRETE INSERTS

- A. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC446 testing.
- B. Comply with MSS SP-58.

2.7 SOURCE QUALITY CONTROL

- A. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
 - 1. Include rated load capacity for each seismic- and wind-load-restraint device.
 - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by ICC-ES product listing, UL product listing, FM Approvals, an evaluation service member of ICC-ES, or an agency acceptable to authorities having jurisdiction.
 - 4. Annotate to indicate application of each product submitted and compliance with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static, wind load, and seismic loads within specified loading limits.

3.3 INSTALLATION OF SEISMIC-RESTRAINT CONTROL DEVICES

- A. Provide seismic-restraint control devices for systems and equipment where required by applicable codes.
 - 1. Install equipment and devices to withstand the effects of earthquake motions and high wind events.
- B. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- C. Installation of seismic restraints must not cause any stresses, misalignment, or change of position of equipment or conduits.
- D. Equipment Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- E. Raceway, Cable, Wireway Support and Hanger Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
 - 2. Install seismic-restraint and wind-load-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- F. Equipment and Hanger Restraints:
 - 1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

- G. Install cables so they do not bend across edges of adjacent equipment or building structure.
- H. 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.
- I. 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.
- J. Post-Installed Concrete Anchors:
 - 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 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. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors must be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive-Type Anchor Bolts: 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.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

END OF SECTION 260548.16

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Labels.
 - 2. Bands.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 LABELS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria: UL CCN PGDQ2 for components; including UL 969.
- B. UL PGDQ2 Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weatherand chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
- C. UL PGDQ2 Self-Adhesive Labels: Polyester or Vinyl, thermal, transfer-printed, 3 mil (0.08 mm) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
 - 1. Minimum Nominal Size:
 - a. 1-1/2 by 6 inch (37 by 150 mm) for raceway and conductors.
 - b. 3-1/2 by 5 inch (76 by 127 mm) for equipment.
 - c. As required by authorities having jurisdiction.

2.2 BANDS

A. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

 B. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inch (50 mm) long, with diameters sized to suit diameters and that stay in place by gripping action.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

- A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:
 - 1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
 - 2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft (2.3 m) above finished floor.
- B. Pipe and Conduit Labeling: Comply with ASME A13.1.
- C. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded conductors.
 - 1. Color must be factory applied or field applied for sizes larger than 6 AWG when permitted by authorities having jurisdiction.
 - 2. Colors for 208Y/120 V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - 3. Colors for 240 V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - 4. Colors for 480Y/277 V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 - 5. Color for Neutral (Grounded Conductor): White.
 - 6. Color for Equipment Ground: Green.
- D. Color-Coding Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.

- E. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
 - 1. "POWER."
- F. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- G. Pull and Junction Boxes, 1000 V or Less: For conductors in pull and junction boxes, use vinyl wraparound labels, snap-around labels or snap-around color-coding bands to identify phase.
 - Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft (15 m) maximum intervals in straight runs, and at 25 ft (7.6 m) maximum intervals in congested areas.
 - 2. Identify system voltage and system or service type with black letters on orange field.
- H. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, for Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft (15 m) maximum intervals in straight runs, and at 25 ft (7.6 m) maximum intervals in congested areas.
 - 2. Identify system voltage and system or service type with black letters on orange field.
- I. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Label cover plate with the following information, in the order listed:
 - 1. Panelboard designation.
 - 2. Colon or dash.
 - 3. Branch circuit number.
- J. Equipment Identification Labels:
 - 1. Black letters on white field.
 - 2. Indoor Equipment: Self-adhesive label.
 - 3. Outdoor Equipment: Laminated acrylic or melamine sign.
 - 4. Equipment to Be Labeled:
 - a. Enclosed switches.
 - b. Enclosed circuit breakers.
 - c. Enclosed controllers.
 - d. Variable-speed controllers.
 - e. Remote-controlled switches, dimmer modules, and control devices.

3.3 INSTALLATION

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

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C.	Install identifying devices before installing acoustical ceilings and simi	lar concealment.	

- D. Verify identity of item before installing identification products.
- E. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- F. Apply identification devices to surfaces that require finish after completing finish work.
- G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.
- H. Vinyl Wraparound Labels:
 - 1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.
- I. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.
- J. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.

END OF SECTION 260553

SECTION 26 05 75 – ELECTRICAL CONNECTIONS TO EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Electrical connections to Owner-furnished equipment, and equipment specified under other Divisions and Sections.

1.2 REFERENCES

- A. NFPA 70 National Electrical Code
- B. NEMA WD 1 General Purpose Wiring Devices
- C. NEMA WD 6 Wiring Device Configurations

1.3 SUBMITTALS

- A. Conform to Division 1 requirements.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

- A. Electrical: Conform to NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

- 2.1 CORDS AND CAPS
 - A. Attachment Plug Construction: Conform to NEMA WD 1.
 - B. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - C. Cord Construction: NFPA 70; Type SJO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

D. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

PART 3 - EXECUTION

3.1 COORDINATION

- A. Coordinate work with systems and other trades under provisions of Division 1.
- B. Obtain and review shop drawings, product data, and manufacturer's instructions for Owner-Furnished equipment, and equipment furnished under other Divisions and Sections.
- C. Determine connection locations and requirements prior to roughing in.
- D. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
- E. Sequence electrical connections to coordinate with start-up schedule for equipment.

3.2 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.
- B. Verify that equipment supplied matches submittal data.

3.3 CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- F. Install disconnect switches, controllers, control stations, and control devices as indicated.
- G. Modify equipment control wiring with terminal block jumpers as indicated.
- H. Provide interconnecting conduit and wiring between devices and equipment where indicated or required.

END OF SECTION 26 05 75

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Indoor occupancy and vacancy sensors.
 - 2. Switchbox-mounted occupancy sensors.
 - 3. Conductors and cables.
- B. Related Requirements:
 - 1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Indoor occupancy and vacancy sensors.
 - 2. Switchbox-mounted occupancy sensors.
 - 3. Conductors and cables.
- B. Shop Drawings:
 - 1. Show installation details for the following:
 - a. Occupancy sensors.
 - b. Vacancy sensors.
 - 2. Interconnection diagrams showing field-installed wiring.
 - 3. Include diagrams for power, signal, and control wiring.
- C. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's warranties.

1.4 WARRANTY

- A. Special Extended Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within extended warranty period.
 - 1. Failures include, but are not limited to, the following:

- a. Faulty operation of lighting control software.
- b. Faulty operation of lighting control devices.
- 2. Extended Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. General Requirements for Sensors:
 - 1. Wall or Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
 - 2. Dual technology.
 - 3. Integrated OR Separate power pack.
 - 4. Hardwired connection to switch.
 - 5. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 6. Operation:
 - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - 7. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A.
 - 8. Power: Line voltage.
 - 9. Power Pack: Dry contacts rated for 20 A ballast or LED load at 120 and 277 V(ac), for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.
 - 10. Mounting:
 - a. Sensor: Suitable for mounting in any position in a standard device box or outlet box.
 - b. Relay: Externally mounted through a 1/2 inch (13 mm) knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 - 11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 - 12. Bypass Switch: Override the "on" function in case of sensor failure.
- B. Dual-Technology Type: Wall or Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

- 1. Sensitivity Adjustment: Separate for each sensing technology.
- 2. Detector Sensitivity: Detect occurrences of 6 inch (150 mm) minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch (23 200 sq. mm), and detect a person of average size and weight moving not less than 12 inch (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inch/s (305 mm/s).
- 3. Detection Coverage (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.
- 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180degree pattern centered on the sensor over an area of 1000 sq. ft. (110 sq. m) when mounted 48 inch (1200 mm) above finished floor.

2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox.
 - 1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - 3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
 - 4. Switch Rating: Not less than 800 VA ballast or LED load at 120 V, 1200 VA ballast or LED load at 277 V, and 800 W incandescent.
- B. Wall-Switch Sensor:
 - 1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft. (196 sq. m).
 - 2. Sensing Technology: Dual technology PIR and ultrasonic.
 - 3. Switch Type: SP, manual "on," automatic "off."
 - 4. Capable of controlling load in three-way application.
 - 5. Voltage: Dual voltage 120 and 277 V.
 - 6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
 - 7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
 - 8. Color: White.
 - 9. Faceplate: Color matched to switch.

2.3 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF SENSORS

- 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 not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.

3.3 INSTALLATION OF CONTACTORS

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structureborne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.4 INSTALLATION OF WIRING

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
- B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.
- C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems.

- 1. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.6 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Nonconforming Work:
 - 1. Lighting control devices will be considered defective if they do not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- C. Prepare test and inspection reports.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

END OF SECTION 260923

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. General-use switches.
 - 2. General-grade duplex straight-blade receptacles.
 - 3. Receptacles with ground-fault protective devices.
 - 4. Connectors, cords, and plugs.
- B. Related Requirements:
 - 1. Section 260923 "Lighting Control Devices" for occupancy sensors, timers, control-voltage switches, and control-voltage dimmers.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. General-use switches.
 - 2. General-grade duplex straight-blade receptacles.
 - 3. Receptacles with ground-fault protective devices.
 - 4. Connectors, cords, and plugs.
- B. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.4 WARRANTY FOR DEVICES

- A. Special Manufacturer Extended Warranty: Manufacturer warrants that devices perform in accordance with specified requirements and agrees to provide repair or replacement of devices that fail to perform as specified within extended warranty period.
 - 1. Initial Extended Warranty Period: Three years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

- 2.1 GENERAL-USE SWITCHES
 - A. Toggle Switch:

WIRING DEVICES

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- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the
 - Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - Leviton Manufacturing Co., Inc. C.
 - Pass & Seymour; Legrand North America, LLC. d.
- 2. **Regulatory Requirements:**
 - Listed and labeled in accordance with NFPA 70, by gualified electrical testing a. laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- 3. General Characteristics:
 - Reference Standards: UL CCN WMUZ and UL 20. a.
- 4. Options:
 - Device Color: White. a.
 - b. Configuration:
 - General-duty, 120-277 V, 20 A, single pole, double pole, three way, four 1) way.
- 5. Accessories:
 - Cover Plate: 0.060 inch (1.5 mm) thick, high-impact thermoplastic (nylon) with a. smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - Securing Screws for Cover Plate: Metal with head color matching wallplate finish. b.

2.2 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

- Α. **Duplex Straight-Blade Receptacle:**
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - Arrow Hart, Wiring Devices; Eaton, Electrical Sector. a.
 - Leviton Manufacturing Co., Inc. b.
 - Pass & Seymour; Legrand North America, LLC. c.
 - Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell d. Incorporated.
 - 2. **Regulatory Requirements:**
 - Listed and labeled in accordance with NFPA 70, by qualified electrical testing a. laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 3. General Characteristics:

- a. Reference Standards: UL CCN RTRT and UL 498.
- 4. Options:
 - a. Device Color: White.
 - b. Configuration: General-duty, NEMA 5-20R
- 5. Accessories:
 - a. Cover Plate: 0.060 inch (1.5 mm) thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.
- B. Tamper-Resistant Duplex Straight-Blade Receptacle:
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 - d. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - 2. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 3. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
 - 4. Options:
 - a. Device Color: White.
 - b. Configuration: General-duty, NEMA 5-20R
 - 5. Accessories:
 - a. Cover Plate: 0.060 inch (1.5 mm) thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.
- C. Tamper-Resistant Duplex Straight-Blade Receptacle with USB Outlet to Power Class 2 Equipment:
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - a. <u>Arrow Hart, Wiring Devices; Eaton, Electrical Sector</u>.

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- b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
- c. <u>Leviton Manufacturing Co., Inc</u>.
- d. Pass & Seymour; Legrand North America, LLC.
- 2. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- 3. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
- 4. Options:
 - a. Device Color: White.
 - b. Configuration: General-duty, NEMA 5-20R; two USB-A ports
- 5. Accessories:
 - a. Cover Plate: 0.060 inch (1.5 mm) thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.3 RECEPTACLES WITH ARC-FAULT AND GROUND-FAULT PROTECTIVE DEVICES

- A. General-Grade, Weather-Resistant, Tamper-Resistant Duplex Straight-Blade Receptacle with GFCI Device:
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. <u>Leviton Manufacturing Co., Inc</u>.
 - d. Pass & Seymour; Legrand North America, LLC.
 - 2. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 3. General Characteristics:
 - a. Reference Standards: UL CCN KCXS, UL 498, and UL 943.
 - 4. Options:
 - a. Device Color: White.

- b. Configuration: Heavy-duty, NEMA 5-20R.
- 5. Accessories:
 - a. Cover Plate: 0.060 inch (1.5 mm) thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.4 CONNECTORS, CORDS, AND PLUGS

- A. Outdoor-Use, Watertight, Sealed Cord Connector:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. General Characteristics:
 - a. Reference Standards: UL CCN AXUT and UL 498.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receptacles:
 - 1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION OF SWITCHES

- A. Comply with manufacturer's instructions.
- B. Reference Standards:
 - 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
 - 2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
 - 3. Consult Architect for resolution of conflicting requirements.
- C. Identification:
 - 1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."

a. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

3.3 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

- A. Comply with manufacturer's instructions.
- B. Reference Standards:
 - 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
 - 2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
 - 3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
 - 4. Consult Architect for resolution of conflicting requirements.
- C. Identification:
 - 1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."
 - a. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

3.4 INSTALLATION OF CONNECTORS, CORDS, AND PLUGS

- A. Comply with manufacturer's instructions.
- 3.5 FIELD QUALITY CONTROL OF SWITCHES
 - A. Tests and Inspections:
 - 1. Perform tests and inspections in accordance with manufacturers' instructions.
 - B. Nonconforming Work:
 - 1. Unit will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
 - C. Assemble and submit test and inspection reports.

3.6 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

- A. Tests and Inspections:
 - 1. Insert and remove test plug to verify that device is securely mounted.
 - 2. Verify polarity of hot and neutral pins.
 - 3. Measure line voltage.

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	4. 5.	Measure percent voltage drop. Measure grounding circuit continuity; impedance must be not greater th	an 2 ohms.
В.	Nonconforming Work:		
	1. 2.	Device will be considered defective if it does not pass tests and inspect Remove and replace defective units and retest.	ions.
C.	Assemble and submit test and inspection reports.		
3.7	FIELD QUALITY CONTROL OF CONNECTORS, CORDS, AND PLUGS		
Α.	Tests	s and Inspections:	
	1.	Perform tests and inspections indicated in manufacturer's instructions.	

- B. Nonconforming Work:
 - 1. Unit will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- C. Assemble and submit test and inspection reports.

3.8 PROTECTION

- A. Devices:
 - 1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
 - 2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.
- B. Connectors, Cords, and Plugs:
 - 1. After installation, protect connectors, cords, and plugs from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nonfusible switches.
 - 2. Enclosures.

1.2 DEFINITIONS

A. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. For each type of enclosed switch, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 2. Enclosure types and details for types other than UL 50E, Type 1.
 - 3. Current and voltage ratings.
 - 4. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 5. Include evidence of qualified electrical testing laboratory listing for series rating of installed devices.
- B. Shop Drawings: For enclosed switches and circuit breakers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
- C. Field Quality-Control Submittals:
 - 1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.6 WARRANTY

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.
 - 1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- B. Special Manufacturer Extended Warranty: Manufacturer warrants that enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.
 - 1. Extended-Warranty Period: Three years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain products 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 in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 NONFUSIBLE SWITCHES

- A. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - 1. <u>ABB, Electrification Business</u>.
 - 2. <u>Eaton</u>.
 - 3. <u>Siemens Industry, Inc., Energy Management Division</u>.
 - 4. Square D; Schneider Electric USA.
- B. Type HD, Heavy Duty, Three Pole, Single Throw, 600 V(ac), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

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3. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 ENCLOSURES

- A. Enclosed Switches: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: Enclosure must be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (UL 50E Type 1) or gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel (UL 50E Types 3R, 12).
- C. Conduit Entry: UL 50E Types 4, 4X, and 12 enclosures may not contain knockouts. UL 50E Types 7 and 9 enclosures must be provided with threaded conduit openings in both endwalls.
- D. Enclosures designated as UL 50E Type 4, 4X stainless steel, 12, or 12K must have dual cover interlock mechanism to prevent unintentional opening of enclosure cover when circuit breaker is ON and to prevent turning circuit breaker ON when enclosure cover is open.
- E. UL 50E Type 7/9 enclosures must be furnished with breather and drain kit to allow their use in outdoor and wet location applications.

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.
 - 1. Commencement of work will indicate Installer's acceptance of areas and conditions as satisfactory.

3.2 SELECTION OF ENCLOSURES

- A. Indoor, Dry and Clean Locations: UL 50E, Type 1.
- B. Outdoor Locations: UL 50E, Type 3R.
- C. Other Wet or Damp, Indoor Locations: UL 50E, Type 4.
- D. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: UL 50E, Type 12.

3.3 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Special Techniques:

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	1.	Coordinate layout and installation of switches, circuit breakers, equipment served and adjacent surfaces. Maintain required wor required clearances for equipment access doors and panels.	, and components with kspace clearances and
	2.	Install individual wall-mounted switches and circuit breakers with unless otherwise indicated.	n tops at uniform height
	3.	Comply with mounting and anchoring requirements specified "Seismic Controls for Electrical Systems."	in Section 260548.16
	4.	Temporary Lifting Provisions: Remove temporary lifting of eyes, and temporary blocking of moving parts from enclosures and com	channels, and brackets ponents.
	5.	Install fuses in fusible devices.	
3.4	IDEN	NTIFICATION	

- A. Comply with requirements in Section 260553 "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. Tests and Inspections for Switches:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, grounding, and clearances.
 - c. Verify that unit is clean.
 - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
 - e. Inspect bolted electrical connections for high resistance using one of the following methods:
 - 1) Use low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.
 - f. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on Drawings.
 - g. Verify correct phase barrier installation.
 - h. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
 - 2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- b. Measure contact resistance across each switchblade fuseholder. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
- B. Nonconforming Work:
 - 1. Enclosed switches will be considered defective if they do not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- C. Collect, assemble, and submit test and inspection reports.
 - 1. Test procedures used.
 - 2. Include identification of each enclosed switch tested and describe test results.
 - 3. List 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.

3.7 PROTECTION

A. After installation, protect enclosed switches and circuit breakers from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

3.8 MAINTENANCE

- A. Infrared Scanning of Enclosed Switches: Two months after Substantial Completion, perform infrared scan of joints and connections. Remove covers so joints and connections are accessible to portable scanner. Take visible light photographs at same locations and orientations as infrared scans for documentation to ensure follow-on scans match same conditions for valid comparison.
 - 1. Instruments and Equipment: Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2. Instrument: Use infrared-scanning device designed to measure temperature or to detect significant deviations from normal values. Provide documentation of device calibration.

3. Report: Prepare certified report that identifies units checked and that describes scanning results. Include notation of deficiencies detected, remedial actions taken, and scanning observations after remedial action.

END OF SECTION 262816

SECTION 265000 - LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Luminaires.
 - 2. Luminaire fittings.
 - 3. Lamps.

B. Related Requirements:

- 1. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260523 "Control-Voltage Electrical Power Cables" specifies wiring connections installed by this Section.
- 2. Section 260529 "Hangers and Supports for Electrical Systems" specifies channel and angle supports installed by this Section.
- 3. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
- 4. Section 260923 "Lighting Control Devices" specifies automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors installed by this Section.

1.2 DEFINITIONS

- A. BUG Rating: Backlight, uplight, and glare rating for light pollution from exterior luminaires.
- B. Correlated Color Temperature (CCT): The absolute temperature (in kelvins) of a blackbody whose chromaticity (color quality) most nearly resembles that of the light source.
- C. Color Rendering Index (CRI): The measure of the degree of color shift objects undergo when illuminated by the light source as compared with the color of those same objects when illuminated by a reference light source. The lower the CRI of a light source, the more difficult it is to identify colors and stripes on electronic components and wiring.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. For luminaires.
 - a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
 - 1) If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.

- 2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
- 3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.
- b. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- c. Include operating characteristics, electrical characteristics, and furnished accessories.
- d. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on Drawings.
- e. Include battery and charger data for emergency lighting units.
- f. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
- g. Include photometric data and adjustment factors obtained from qualified laboratory tests.
- h. Include manufacturer's sample warranty language.
- 2. For luminaire fittings.
 - a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
 - 1) If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
 - 2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
 - 3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.
 - b. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - c. Include operating characteristics, electrical characteristics, and furnished accessories.
 - d. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on Drawings.
 - e. Include manufacturer's sample warranty language.
- B. Sustainable Design Product Data:
 - 1. For luminaires.
 - a. Mercury Content: For fluorescent, mercury vapor, metal halide, high-pressuresodium, neon, and argon lamps, submit data indicating mercury content and lamp life.
 - b. Energy Efficiency: Submit product certificate indicating luminaire is certified by Energy Star or Design Lights Consortium.
 - c. Energy Usage: Submit product data showing compliance with ASHRAE 90.1.

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		d.	BUG Ratings: Submit product data indicating BUG ratings of luminaires.	all installed exterio	r
		e.	Luminaire Calculations: Submit product data indicating lu vertical illuminance.	men emittance and	ł
		f.	Environmental Product Declaration: For each product.		
		g.	Health Product Declaration: For each product.		
		h.	Sourcing of Raw Materials: Corporate sustainability report for e	each manufacturer.	
		I. ;	I nird-Party Certifications: For each product.		
		J.	Third-Party Certified Life Cycle Assessment. For each product		
	2.	For lu	iminaire fittings.		
		a.	Environmental Product Declaration: For each product.		
		D.	Health Product Declaration: For each product.	ach manufacturar	
		с. d	Third Party Certifications: For each product		
		e.	Third-Party Certified Life Cycle Assessment: For each product		
C.	Field quality-control reports.				
1.4	INFO	RMAT	IONAL SUBMITTALS		
Α.	Manufacturers' published instructions.				
В.	Field Reports:				

- 1. Manufacturer's field reports for field quality-control support.
- 2. Manufacturer's field reports for system startup support.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect exposed surface finishes on lighting equipment by applying strippable, temporary protective covering before shipping.

1.7 WARRANTY FOR LUMINAIRES

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed luminaires perform in accordance with specified requirements and agrees to repair or replace products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.
 - 1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- B. Special Manufacturer Extended Warranty: Manufacturer warrants that luminaires perform in accordance with specified requirements and agrees to provide repair or replacement of products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for labor, materials, and equipment.

1.8 WARRANTY FOR BATTERIES

- A. Special Manufacturer Extended Warranty for Batteries: Manufacturer warrants that batteries perform in accordance with specified requirements and agrees to provide repair or replacement of batteries that fail to perform as specified within extended-warranty period.
 - 1. Initial Extended-Warranty Period for Ni-Cd Batteries: Five years from date of Substantial Completion; full coverage for materials only, free on board origin, freight prepaid.
 - 2. Follow-On Extended-Warranty Period for Ni-Cd Batteries: 15 years from date of Substantial Completion; prorated coverage for materials only, free on board origin, freight prepaid.

PART 2 - PRODUCTS

2.1 LUMINAIRES

- A. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - b. See individual product types below for listing criteria.
 - c. Marked in accordance with UL CCN HYXT, including UL 1598, for compatible power supply, installation location, and environmental conditions.
- B. Source Quality Control:
 - 1. Compile and submit product data.
- C. Surface-Mounted Luminaire:
 - 1. Source Limitations: Bin LEDs for this luminaire type within three-step MacAdam Ellipse to ensure consistent chromaticity for all luminaires of this type.
 - 2. Product Listing Criteria, LED: UL CCN IFAM; including UL 1598.
 - 3. Product Listing Criteria, Outdoor Canopy Luminaires: UL CCN IFAW; including UL 1598.
- D. Recessed Luminaire:
 - 1. Source Limitations: Bin LEDs for this luminaire type within three-step MacAdam Ellipse to ensure consistent chromaticity for all luminaires of this type.
 - 2. Product Listing Criteria, LED: UL CCN IFAO; including UL 1598

2.2 LUMINAIRE FITTINGS

A. Performance Criteria:

- 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - b. See individual product types below for listing criteria.
- B. Source Quality Control:
 - 1. Compile and submit product data.
- C. Luminaire Support Accessories:
 - 1. Product Characteristics:
 - a. Sized and rated for luminaire weight.
 - b. Capable of maintaining luminaire position after cleaning.
 - c. Capable of supporting luminaire without causing deflection of ceiling or wall.
 - d. Capable of supporting horizontal force equal to 100 percent of luminaire weight and vertical force equal to 400 percent of luminaire weight.
 - 2. Required Product Options:
 - a. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm) wire supports adjustable to 10 ft (3 m) in length.
 - b. Single-Stem Hangers: 1/2 inch (13 mm) nominal diameter steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
 - c. Rod Hangers: 3/16 inch (5 mm) nominal diameter, cadmium-plated, threaded steel rod.

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 PREPARATION

- A. Shop Drawings: Prepare and submit the following:
 - 1. Drawings, Diagrams, and Supporting Documents for Custom Luminaires:
 - a. Include plans, elevations, sections, and mounting and attachment details.
 - b. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

c. Include diagrams for power, signal, and control wiring.

3.3 INSTALLATION OF LIGHTING

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
 - 1. Installation of Indoor Lighting Systems: NECA NEIS 500.
 - 2. Installation of Luminaires, Lampholders, and Lamps: Article 410 of NFPA 70.
 - 3. Installation of Emergency Lighting and Exit Signs: ICC IBC, NFPA 101, and Parts IV and V in Article 700 of NFPA 70.
 - 4. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
 - 1. Install luminaires level, plumb, and square with finished floor or grade unless otherwise indicated.
 - 2. Install luminaires at height and aiming angle as indicated on Drawings.
 - 3. Coordinate layout and installation of luminaires with other construction.
 - 4. Flush-Mounted Luminaire Support:
 - a. Secured to outlet box.
 - b. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - c. Trim ring flush with finished surface.
 - 5. Wall-Mounted Luminaire Support:
 - a. Attached to structural members in walls.
 - b. Do not attach luminaires directly to gypsum board.
 - 6. Remote Mounting of Ballasts: Do not exceed distance between ballast and luminaire recommended by ballast manufacturer.
 - 7. Emergency Power Units: Secure with approved fasteners in four or more locations, spaced near corners of unit.
 - 8. Install wiring connections for luminaires.
 - 9. Identification: Provide labels for luminaires and associated electrical equipment.
 - a. Identify field-installed conductors, interconnecting wiring, and components.
 - b. Provide warning signs.
 - c. Label each enclosure with engraved metal or laminated-plastic nameplate.
- D. Systems Integration: Integrate lighting control devices and equipment with electrical power connections for operation of luminaires as specified.

3.4 FIELD QUALITY CONTROL OF LIGHTING

A. Tests and Inspections:

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	 Perform manufacturer's recommended tests and inspections. Operational Test: After installing luminaires, switches, and a electrical circuitry has been energized, test units to confirm proper Test for Emergency Lighting: Interrupt power supply to demons Verify transfer from normal power to battery power and retransfer f Verify operation of photoelectric controls. 	accessories, and after operation. strate proper operation. to normal.		
В.	B. Nonconforming Work:			
	 Luminaire will be considered defective if it does not pass tests and Remove and replace defective units and retest. 	inspections.		
C.	Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.			
3.5	SYSTEM STARTUP			
Α.	Perform startup service.			
	1. Complete installation and startup checks in accordance with mainstructions.	anufacturer's published		

3.6 PROTECTION

A. After installation, protect lighting equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 265000
SECTION 280000 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Basic Electrical Requirements specifically applicable to Division 28 Sections.

1.2 SCOPE OF WORK

- A. The specifications describe the quality and character of the materials and methods of installation.
- B. The drawings and these specifications are complementary to each other in that all apparatus, materials and equipment outlined in the Drawings and/or specified herein shall be considered essential to the contract.
- C. The drawings include plans of the building, with diagrammatic layouts showing approximate locations of equipment and devices. Before installing, study adjacent architectural features, and make installation in the most logical manner in accordance with Code and Regulatory Requirements.
- D. The symbols, notes, instructions and schedules on the drawings are included as part of these specifications.

1.3 WORK SCHEDULE AND SEQUENCE

- A. Install work in stages to accommodate the Owner's operational requirements. Coordinate schedule and hours of operation with the Owner prior to start of construction.
- B. Coordinate installation sequence with detailed coordination shop drawings provided under Division 1.

1.4 REFERENCES

- A. ANSI/NFPA 70 National Electrical Code
- B. ANSI/NFPA 72 National Fire Alarm Code
- C. National Electrical Safety Code
- D. ADA Americans with Disabilities Act

1.5 SUBMITTALS

A. Conform to Division 1 requirements.

- B. Include a transmittal form clearly indicating the Project, the name of the Contractor and the contents of the submittal.
- C. Include Contractor's stamp and signature indicating that the submittal has been reviewed and conforms to Contract Documents. Submittals without Contractor's stamp will be returned without review.
- D. Identify deviations from Contract Documents, including variations and limitations. Review of a submittal does not constitute acceptance of deviations from the Contract Documents, unless such deviation is clearly indicated as such on the submittal, and specifically accepted as such.
- E. Submit shop drawings and product data, grouped to include complete systems, products and accessories in a single package.
 - 1. Reference catalog cuts and brochures of products to proper paragraph in specifications. Furnish numerical index by specification article number, listing product name, catalog number and reference to page number of submittal brochure.
 - 2. Arrange the submittals in the same sequence as the specifications and reference in the upper right-hand corner, the particular specification provision for which each submittal is intended.
 - 3. Cross reference individual catalog numbers of substitute products to number of specified materials.
 - 4. Submit manufacturer's certification that equipment meets or exceeds the minimum requirements as specified.
 - 5. Where materials, equipment and installations are specified to conform with societies or agencies such as ANSI, NECA, etc., submit certification of such compliance.
 - 6. The submittal shall be complete and with catalog data and information properly marked to show, among other things, material capacity and performance to meet capacities or performance as specified or indicated
 - 7. Mark dimensions and values in units to match those specified.
- F. Review of the submittal is only for general conformance with design concept of project and general compliance with information given in the contract documents. The Contractor is responsible for confirmation and correlation of the dimensions, quantities and sizes, for information that pertains to fabrication methods or construction techniques, and for coordination work of all trades.
- G. Ordering of equipment prior to approval of submittals is done entirely at the risk of the Contractor.

1.6 COORDINATION SUBMITTALS

A. Develop detailed coordination shop drawings in conjunction with other trades, where required by complex and/or congested spaces, to minimize conflict, to allow for correct sequence of installation, and to provide all required clearances. See Division 1 for expanded requirements.

1.7 PROJECT RECORD DRAWINGS

- A. Conform to Division 1 requirements.
- B. Keep an accurate record of the work under this Contract, as it progresses, to be available for inspection at all times. See individual Division 28 Sections for specific requirements.

C. Upon completion of the work, transfer all changes and information onto a new set of reproducible drawings in an orderly and legible manner.

1.8 QUALITY ASSURANCE

- A. For actual fabrication, installation and testing of the work, use only trained and experienced workers completely familiar with the equipment and materials, and the manufacturer's installation requirements.
- B. Include the services of experienced superintendents for each sub-section who shall be constantly in charge of the work, together with the qualified journeymen, helpers, and laborers, required to properly unload, install, connect, adjust, start, operate and test the work involved, including equipment and materials furnished by others.
- C. Perform the work under this section shall be in cooperation with the work of other trades to prevent conflict or interference and to aid in timely completion of the overall project.

1.9 DELIVERY, STORAGE AND HANDLING

A. Storage and handling of equipment and/or systems for project, whether it be onsite or offsite, shall be addressed by the Contractor's IAQ Management Plan. Plan must meet or exceed the recommended control measures of the "Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3)."

1.10 REGULATORY REQUIREMENTS

- A. Conform to International Building Code, International Fire Code, and NFPA 101 Life Safety Code
- B. Electrical: Conform to NFPA 70.
- C. Fire Alarm: Conform to NFPA 72 and ADA.

1.11 FIELD CONDITIONS

- A. Visit the project site and become familiar with field conditions including accessibility and physical obstructions. Bid submission indicates familiarity with, and acceptance of, field conditions.
- B. Separate Sections cover site, architectural and mechanical Work. Study the complete set of contract documents to become familiar with the entire Project including site, architectural and structural features and systems as related to Work in this Division. Pay special attention to Divisions featuring equipment requiring electrical interface including Owner-furnished equipment, elevator equipment, and mechanical systems (plumbing, hvac, fire sprinkler, controls).
- C. Study and become familiar with any and all peculiarities and limitations of the spaces available for the installation of all work and materials furnished and installed under the contract. Exercise due and particular caution to determine that all parts of work are made quickly and easily accessible.

- D. If any conflicts occur which necessitate departures from the Drawings, submit details of departures and reasons therefore for written approval. Do not install the affected equipment or related impacted wiring until approval is received.
- E. Should there be omissions or discrepancies in the plans and specifications, or discrepancies from actual site conditions, bring them to the attention of the Architect ten (10) working days in advance of the date of bid opening so that corrections or clarifications can be made.
- F. Install Work in locations shown on Drawings, unless prevented by Project conditions. Coordinate work with that of other trades. Verify that adjacent and related construction conforms to contract documents and to coordination shop drawings.
- G. If Project conditions, including changes initiated by other trades or discovery of conditions unknown at time of bid, require unspecified materials and methods or rearrangement of Work, prepare drawings showing proposed changes to meet Project conditions. Obtain permission of the Architect before proceeding.
- H. All RFIs must include a proposed solution. RFIs submitted without proposed solutions will be returned without review.

1.12 COORDINATION

- A. Provide and coordinate all information, drawings or layouts of equipment or work under this section which affect the work of the other trades.
- B. In case changes in the indicated locations or arrangements are necessary due to developed conditions in the construction, or rearrangement of furnishings, or equipment, these changes shall be made without extra cost to the Owner, provided the change is ordered before work directly connected is installed, and no extra materials are required.

1.13 EXISTING UTILITIES

- A. The location of utilities shown on the plans are the best known information available at time of design. Contact the appropriate agencies and confirm the information and make arrangements for connection thereto, prior to excavation and installation of any piping or systems.
- B. Perform exploratory excavation and/or use locate service as needed to confirm locations of existing underground utilities.

1.14 PROJECT SITE VISITS

A. Periodic visits to the project site by the Architect/Engineer are for the express purpose of verifying compliance with the contract documents. Such site visits shall not be construed as construction supervision, i.e., the Architect/Engineer assumes no responsibility for providing a safe place for the performance of the work by the Contractor or the Contractor's employees or the safety of the supplies of the Contractor. Neither shall such site visits relieve the Contractor of the responsibility for the discovery of his own errors and the correction of them, nor of the responsibility of properly performing the work.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. See Drawings and individual Sections of Division 28.

2.2 SUBSTITUTIONS

- A. Conform to Division 1 requirements.
- B. Conformance to construction documents is the responsibility of the party making the substitution, regardless of approval.
- C. Layout on drawings, including space allotted for clearances, access, etc., is based on performance and physical attributes of equipment specified and/or scheduled on plans. Coordinate with other systems, subsystems and trades as required when using substituted materials or equipment.
- D. If the use of substitute materials or equipment requires alternate arrangement of equipment, fixtures, devices, wiring or accessories, prepare drawings showing proposed changes. Obtain permission of the Architect before proceeding.
- E. If the use of substitute materials or equipment results in different performance than that provided by the specified materials or equipment, adjust Work as required to provide parity performance, at no additional cost to the Owner. Obtain permission of the Architect before proceeding.
- F. If the use of substitute materials or equipment results in an increase in the cost, including changes to the Work of other trades, pay for any said increase in cost.
- G. See Drawings and individual Sections of Division 28 for further specific information required for substitutions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See Drawings and individual Sections of Division 28. In addition the following general requirements shall apply:
 - 1. Obtain Manufacturer's printed installation instruction to aid in properly executing work of installing equipment whenever such instructions are available. Submit copies of such instructions to the Architect prior to time of installation.
 - 2. Install equipment in a neat and workmanlike manner. Align, level and adjust for satisfactory appearance and operation. Install so that connection and disconnection of wiring and accessories can be made readily, and so that all parts are easily accessible for inspection, operation, maintenance and repair.

END OF SECTION 28 00 00

SECTION 284621.11 - ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Existing fire-alarm system to be modified.
 - 2. System smoke detectors.
 - 3. Fire-alarm notification appliances.
 - 4. Fire-alarm addressable interface devices.
- B. Related Requirements:
 - Section 260519 "Low-Voltage Electrical Power Conductors and Cables" or Section 260523 "Control Voltage Electrical Power Cables" for cables and conductors for fire-alarm systems.

1.2 DEFINITIONS

- A. DACT: Digital alarm communicator transmitter.
- B. EMT: Electrical metallic tubing.
- C. FACU: Fire-alarm control unit.
- D. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the 2007 Energy Independence and Security Act (EISA).
- E. NICET: National Institute for Certification in Engineering Technologies.
- F. PC: Personal computer.
- G. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
 - 1. Control Voltage: Listed and labeled for use in remote-control, signaling, and powerlimited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with NFPA 70, Article 725.
 - 2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with NFPA 70, Article 300, Part I.

1.3 ACTION SUBMITTALS

- A. Approved Permit Submittal: Submittals must be approved by authorities having jurisdiction prior to submitting them to Architect.
- B. Product Data: For each type of product, including furnished options and accessories.

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	1. 2.	 Include construction details, material descriptions, dimensions, profiles, and finishe Include rated capacities, operating characteristics, and electrical characteristics. 	
C.	Shop Drawings: For fire-alarm system.		

- 1. Comply with recommendations and requirements in "Documentation" section of "Fundamentals" chapter in NFPA 72.
- 2. Include plans, elevations, sections, and details, including details of attachments to other Work.
- 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
- 4. Detail assembly and support requirements.
- 5. Include voltage drop calculations for notification-appliance circuits.
- 6. Include battery-size calculations.
- 7. Include input/output matrix.
- 8. Include written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.
- 9. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Qualification Statements: For Installer.
- C. Sample Warranty: Submittal must include line item pricing for replacement parts and labor.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:
 - a. Comply with "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - b. Provide "Fire-Alarm and Emergency Communications System Record of Completion Documents" in accordance with "Completion Documents" Article in "Documentation" section of "Fundamentals" chapter in NFPA 72.
 - c. Complete wiring diagrams showing connections between devices and equipment. Each conductor must be numbered at every junction point with indication of origination and termination points.
 - d. Riser diagram.
 - e. Device addresses.
 - f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
 - g. Record copy of site-specific software.
 - h. Provide "Inspection and Testing Form" in accordance with "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

- 1) Equipment tested.
- 2) Frequency of testing of installed components.
- 3) Frequency of inspection of installed components.
- 4) Requirements and recommendations related to results of maintenance.
- 5) Manufacturer's user training manuals.
- i. Manufacturer's required maintenance related to system warranty requirements.
- j. Abbreviated operating instructions for mounting at FACU and each annunciator unit.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On approved online or cloud solution.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Personnel must be trained and certified by manufacturer for installation of units required for this Project.
 - 2. Installation must be by personnel certified by NICET as fire-alarm Level IV technician.
 - 3. Obtain certification by NRTL in accordance with NFPA 72.
 - 4. Licensed or certified by authorities having jurisdiction.

1.7 FIELD CONDITIONS

- A. Seismic Conditions: Unless otherwise indicated on Contract Documents, specified Work in this Section must withstand the seismic hazard design loads determined in accordance with ASCE/SEI 7 for installed elevation above or below grade.
 - 1. The term "withstand" means "unit must remain in place without separation of parts from unit when subjected to specified seismic design loads."

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail because of defects in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXISTING FIRE-ALARM SYSTEM TO BE MODIFIED

A. Basis for Pricing: Johnson Controls.

- B. Description: Addressable multiplexed fire detection and alarm system serving multiple buildings on campus with main fire alarm control unit located remotely from the area of work.
- C. Source Limitations for Fire-Alarm System and Components: Components must be compatible with, and operate as extension of, existing system. Provide system manufacturer's certification that components provided have been tested as, and will operate as, a system.

2.2 SYSTEM SMOKE DETECTORS

- A. Photoelectric Smoke Detectors:
 - 1. Performance Criteria:
 - a. Regulatory Requirements:
 - 1) NFPA 72.
 - 2) UL 268.
 - b. General Characteristics:
 - 1) Detectors must be four-wire type.
 - 2) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
 - 3) Base Mounting: Detector and associated electronic components must be mounted in twist-lock module that connects to fixed base. Provide terminals in fixed base for connection to building wiring.
 - 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.
 - 6) Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
 - 7) Operator at FACU, having designated access level, must 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.).
 - 8) Detector must have functional humidity range within 10 to 90 percent relative humidity.
 - 9) Color: White.
 - 10) Remote Control: Unless otherwise indicated, detectors must be digitaladdressable type, individually monitored at FACU for calibration, sensitivity, and alarm condition.
 - Rate-of-rise temperature characteristic of combination smoke- and heatdetection units must be selectable at FACU for 15 or 20 deg F (8 or 11 deg C) per minute.
 - 12) Fixed-temperature sensing characteristic of combination smoke- and heatdetection units must be independent of rate-of-rise sensing and must be settable at FACU to operate at 135 or 155 deg F (57 or 68 deg C).
 - 13) Multiple levels of detection sensitivity for each sensor.

14) Sensitivity levels based on time of day.

2.3 FIRE-ALARM NOTIFICATION APPLIANCES

- A. Fire-Alarm Audible Notification Appliances:
 - 1. Description: Horns, bells, or other notification devices that cannot output voice messages.
 - 2. Performance Criteria:
 - a. Regulatory Requirements:
 - 1) NFPA 72.
 - b. General Characteristics:
 - 1) Individually addressed, connected to signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.
 - 2) Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
 - 3) Horns: Electric-vibrating-polarized type, 24 V(dc); with provision for housing operating mechanism behind grille. Comply with UL 464. Horns must produce sound-pressure level of 90 dB(A-weighted), measured 10 ft. (3 m) from horn, using coded signal prescribed in UL 464 test protocol.
 - 4) Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
- B. Fire-Alarm Visible Notification Appliances:
 - 1. Performance Criteria:
 - a. Regulatory Requirements:
 - 1) NFPA 72.
 - 2) UL 1971.
 - b. General Characteristics:
 - 1) Rated Light Output:
 - a) 15/30/75/110 cd, selectable in field.
 - 2) Clear or nominal white polycarbonate lens mounted on aluminum faceplate.
 - 3) Mounting: Wall mounted unless otherwise indicated.
 - 4) For units with guards to prevent physical damage, light output ratings must be determined with guards in place.
 - 5) Flashing must be in temporal pattern, synchronized with other units.
 - 6) Strobe Leads: Factory connected to screw terminals.
 - 7) Mounting Faceplate: Factory finished, red.

2.4 FIRE-ALARM ADDRESSABLE INTERFACE DEVICES

- A. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. NFPA 72.
 - 2. General Characteristics:
 - a. Include address-setting means on module.
 - b. Store internal identifying code for control panel use to identify module type.
 - c. Listed for controlling HVAC fan motor controllers.
 - d. Monitor Module: Microelectronic module providing system address for alarminitiating devices for wired applications with normally open contacts.
 - e. Integral Relay: Capable of providing direct signal to elevator controller to initiate elevator recall and to circuit-breaker shunt trip for power shutdown.
 - 1) Allow control panel to switch relay contacts on command.
 - 2) Have minimum of two normally open and two normally closed contacts available for field wiring.
 - f. Control Module:
 - 1) Operate notification devices.
 - 2) Operate solenoids for use in sprinkler service.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
 - 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Preinstallation Testing: Perform verification of functionality of installed components of existing system prior to starting work. Document equipment or components not functioning as designed.
- B. 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 in accordance with requirements indicated:

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- 1. Notify Construction Manager no fewer than seven 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.
- C. Protection of In-Place Conditions: Protect devices during construction unless devices are placed in service to protect facility during construction.

3.3 INSTALLATION OF EQUIPMENT

- A. Comply with NECA 305, NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
 - 1. Devices placed in service before other trades have completed cleanup must be replaced.
 - 2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with manufacturer's written storage instructions.
- 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 building.
 - 2. Connect new equipment to existing monitoring equipment at supervising station.
 - 3. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control and monitoring functions to new points. New components must be capable of merging with existing configuration without degrading performance of either system.
- C. Install cover on each smoke detector that is not placed in service during construction. Cover must remain in place except during system testing. Remove cover prior to system turnover.
- D. Remote Status and Alarm Indicators: Install in visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- E. Audible Alarm-Indicating Devices: Install not less than 6 inch (150 mm) below ceiling. Install bells and horns on flush-mounted back boxes with device-operating mechanism concealed behind grille. Install devices at same height unless otherwise indicated.
- F. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inch (150 mm) below ceiling. Install devices at same height unless otherwise indicated.
- G. Device Location-Indicating Lights: Locate in public space near device they monitor.

3.4 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplate must be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
 - 2. Nameplate must be laminated acrylic or melamine plastic signs with black background and engraved white letters at least 1/2 inch (13 mm) high.

3.5 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."
- C. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.

3.6 PATHWAYS

- A. Pathways must be installed in EMT.
- B. Exposed EMT must be painted red enamel.

3.7 CONNECTIONS

- A. Make addressable connections with supervised interface device to the following devices and systems. Install interface device less than <u>36 inch (910 mm)</u> from device controlled. Make addressable confirmation connection when such feedback is available at device or system being controlled.
 - 1. Alarm-initiating connection to elevator recall system and components.
 - 2. Supervisory connections at valve supervisory switches.

3.8 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."
- B. Install framed instructions in location visible from FACU.

3.9 GROUNDING

- A. Ground circuits in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Ground shielded cables at control panel location only. Insulate shield at device location.

3.10 FIELD QUALITY CONTROL

- A. Administrant for Tests and Inspections:
 - 1. Administer and perform tests and inspections with assistance of factory-authorized service representative.
- B. Tests and Inspections:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection must be based on completed record Drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.
 - b. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.
 - 2. System Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Test audible appliances for public operating mode in accordance with manufacturer's written instructions. Perform test using portable sound-level meter complying with Type 2 requirements in ASA S1.4 Part 1/IEC 61672-1.
 - 4. Test visible appliances for public operating mode in accordance with manufacturer's written instructions.
 - 5. Factory-authorized service representative must prepare "Fire Alarm System Record of Completion" in "Documentation" section of "Fundamentals" chapter in NFPA 72 and "Inspection and Testing Form" in "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
- C. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances.
- D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

END OF SECTION 284621.11