

DSA SUBMITTAL

DSA Appl #01-121955
DSA File #21-39

SAN PEDRO ELEMENTARY SCHOOL HVAC & FIRE ALARM UPGRADE

498 Point San Pedro Road, San Rafael, CA 94901

3584003000

San Rafael City Schools

310 Nova Albion Way, San Rafael, CA 94903



October 1, 2024

HMC Architects

**SAN PEDRO ELEMENTARY SCHOOL HVAC & FIRE ALARM UPGRADE
SAN RAFAEL, CALIFORNIA**

DSA Appl #01-121955 / DSA File #21-39

October 1, 2024
HMC # 3584003000

HMC ARCHITECTS
Architect

HOBACH-LEWIN, INC.
Structural Engineer

LP CONSULTING ENGINEERS, INC.
Mechanical/Plumbing Engineers

LP CONSULTING ENGINEERS, INC.
Electrical Engineer

SRCS SAN PEDRO ELEMENTARY SCHOOL
HVAC & FIRE ALARM UPGRADE
SAN RAFAEL, CALIFORNIA
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EXHIBIT D

**GENERAL CONSTRUCTION PROVISIONS
FOR THE FOLLOWING PROJECT:**

**SUN VALLEY ELEMENTARY SCHOOL HVAC & FIRE
ALARM UPGRADE PROJECT**

BY AND BETWEEN

SAN RAFAEL CITY SCHOOLS

AND

[DEVELOPER]

Dated as of _____, 20__

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1. Contract Terms and Definitions

1.1 Definitions

Wherever used in the Contract Documents, the following terms shall have the meanings indicated, which shall be applicable to both the singular and plural thereof:

1.1.1 Adverse Weather. Shall be only weather that satisfies all of the following conditions: (1) unusually severe precipitation, sleet, snow, hail, or extreme temperature or air conditions in excess of the norm for the location and time of year it occurred based on the closest weather station data averaged over the past five years, (2) that is unanticipated and would cause unsafe work conditions and/or is unsuitable for scheduled work that should not be performed during inclement weather (i.e., exterior finishes), and (3) at the Project.

1.1.2 Allowance(s): The Allowance Item(s) identified in **Exhibit C** and included in the Guaranteed Maximum Price. Any unused portion of the Allowance will revert to the District documented by a deductive Change Order. Developer hereby authorizes the District to execute a unilateral deductive Change Order at or near the end of the Project for all or any portion of the Allowance not allocated.

1.1.3 Allowance Expenditure Directive. Written authorization for expenditure of an Allowance, if any. Developer shall not bill for or be due any portion of an Allowance unless the District has identified specific work, Developer has submitted a price for that work or the District has proposed a price for that work, the District has accepted the cost for that work, and the District has executed an Allowance Expenditure Directive incorporating that work.

1.1.4 Approval, Approved, and/or Accepted. Written authorization, unless stated otherwise.

1.1.5 Architect (or "Design Professional in General Responsible Charge"). The individual, partnership, corporation, joint venture, or any combination thereof, named as Architect, who will have the rights and authority assigned to the Architect in the Contract Documents. The term Architect means the Design Professional in General Responsible Charge as defined in DSA PR 13-02 on this Project or the Architect's authorized representative.

1.1.6 As-Builts. Digitally prepared and reproducible drawings using the web-based ProCore application, or comparable, to be prepared on a monthly basis pursuant to the Contract Documents, that reflect changes made during the performance of the Work, recording differences between the original design of the Work and the Work as constructed since the preceding monthly submittal. See **Record Drawings**.

1.1.7 Burdened. The labor rate for Developer or any Subcontractor inclusive of any and all burden costs including, but not limited to, health and welfare pay, vacation and holiday pay, pension contributions, training rates, benefits of any kind, insurance of any kind, workers' compensation, liability insurance, truck expenses, supply expenses of any kind, payroll taxes, and any other taxes of any kind.

1.1.8 Change Order. A written order to Developer authorizing an addition to, deletion from, or revision in the Work, and/or authorizing an adjustment in the Guaranteed Maximum Price or Contract Time.

1.1.9 Claim. A Dispute that remains unresolved at the conclusion of all the applicable Dispute Resolution requirements provided herein.

1.1.10 Completion. The earliest of the date of acceptance by the District or the cessation of labor thereon for a continuous period of sixty (60) days.

1.1.11 Construction Change Directive. A written order prepared and issued by the District, the Construction Manager, and/or the Architect and signed by the District and the Architect, directing a change in the Work.

1.1.12 Construction Manager. The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the District. If no Construction Manager is used on the Project that is the subject of this Contract, then all references to Construction Manager herein shall be read to refer to District.

1.1.13 Construction Schedule. The progress schedule of construction of the Project as provided by Developer and approved by District.

1.1.14 Contingency. The GMP proposal will contain, as part of the estimated cost of the Work, Project's Contingency, a sum mutually agreed upon, controlled by District, and monitored by District and Developer to cover costs that are properly reimbursable as a cost of the Work, but are not the basis for a Change Order. Project's Contingency will not be used for changes in scope or for any item that would be the basis for an increase in the GMP. Developer will provide District with a monthly accounting of charges against Project's Contingency, if applicable, with each application for payment. Any unused Project Contingency belongs to District.

1.1.15 Contract. The agreement between the District and Developer contained in the Contract Documents.

1.1.16 Contract Documents. The Contract Documents consist exclusively of the documents evidencing the agreement of the District and Developer. The Contract Documents consist of the following documents:

1.1.16.1 Non-Collusion Declaration

1.1.16.2 Iran Contracting Act Certification

1.1.16.3 Site Lease

1.1.16.4 Facilities Lease, including Exhibits A-G

1.1.16.4.1 Iran Contracting Act Certification (if applicable)

1.1.16.4.2 Federal Debarment Certification (if applicable)

1.1.16.4.3 Federal Byrd Anti-Lobbying Certification (if applicable)

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1.1.16.4.13 Hazardous Materials Procedures and Requirements

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1.1.16.4.17 Skilled and Trained Workforce Certification

1.1.16.4.18 Project Labor Agreement (if applicable)

1.1.16.4.19 Registered Subcontractors List

1.1.16.4.20 Escrow Agreement for Security Deposits in Lieu of Retention (if used)

1.1.16.4.21 Guarantee Form

1.1.16.4.22 Agreement and Release of Any and All Claims

1.1.16.5 All Plans, Technical Specifications, and Drawings, including the Division of the State Architect approved versions of the foregoing

1.1.16.6 Any and all addenda to any of the above documents

1.1.16.7 Any and all change orders or written modifications to the above documents if approved in writing by the District

1.1.17 Contract Time. The time period stated in the Facilities Lease for the completion of the Work.

1.1.18 Daily Job Report(s). Daily Project reports prepared by Developer's employee(s) who are present on Site, which shall include the information required herein.

1.1.19 Day(s). Unless otherwise designated, day(s) means calendar day(s).

1.1.20 Department of Industrial Relations (or "DIR"). DIR is responsible, among other things, for labor compliance monitoring and enforcement of California prevailing wage laws and regulations for public works contracts.

1.1.21 Design Professional in General Responsible Charge. See definition of Architect above.

1.1.22 Developer. The person or persons identified in the Facilities Lease as contracting to perform the Work to be done under this Contract, or the legal representative of such a person or persons.

1.1.23 Dispute. A separate demand by Developer for a time extension, or payment of money or damages arising from Work done by or on behalf of Developer pursuant to the Contract and payment of which is not otherwise expressly provided for or Developer is not otherwise entitled to; or an amount of payment disputed by the District.

1.1.24 District. The public agency or the school district for which the Work is performed. The governing board of the District or its designees will act for the District in all matters pertaining to the Contract. The District may, at any time:

1.1.24.1 Direct Developer to communicate with or provide notice to the Construction Manager or the Architect on matters for which the Contract Documents indicate Developer will communicate with or provide notice to the District; and/or

1.1.24.2 Direct the Construction Manager or the Architect to communicate with or direct Developer on matters for which the Contract Documents indicate the District will communicate with or direct Developer.

1.1.25 Drawings (or "Plans"). The graphic and pictorial portions of the Contract Documents showing the design, location, scope and dimensions of the Work, generally including plans, elevations, sections, details, schedules, sequence of operation, and diagrams.

1.1.26 DSA. Division of the State Architect.

1.1.27 Force Account Directive. A process that may be used when the District and Developer cannot agree on a price for a specific portion of work or before Developer prepares a price for a specific portion of work and whereby Developer performs the work as indicated herein on a time and materials basis.

1.1.28 Guaranteed Maximum Price. The total monies payable to Developer under the terms and conditions of the Contract Documents.

1.1.29 Job Cost Reports. Any and all reports or records detailing the costs associated with work performed on or related to the Project that Developer shall maintain for the Project. Specifically, Job Cost Reports shall contain, but are not limited by or to, the following information: a description of the work performed or to be performed on the Project; quantity, if applicable, of work performed (hours, square feet, cubic yards, pounds, etc.) for the Project; Project budget; costs for the Project to date; estimated costs to complete the Project; and expected costs at completion. The Job Cost Reports shall also

reflect all Contract cost codes, change orders, elements of non-conforming work, back charges, and additional services.

1.1.30 Labor Commissioner's Office (or "Labor Commissioner"). Also known as the Division of Labor Standards Enforcement ("DLSE"): Division of the DIR responsible for adjudicating wage claims, investigating discrimination and public works complaints, and enforcing Labor Code statutes and Industrial Welfare Commission orders.

1.1.31 Material Safety Data Sheets (or "MSDS"). A form with data regarding the properties for potentially harmful substances handled in the workplace.

1.1.32 Municipal Separate Storm Sewer System (or "MS4"). A system of conveyances used to collect and/or convey storm water, including, without limitation, catch basins, curbs, gutters, ditches, man-made channels, and storm drains.

1.1.33 Plans. See "Drawings".

1.1.34 Premises. The real property on which the Site is located.

1.1.35 Product(s). New material, machinery, components, equipment, fixtures and systems forming the Work, including existing materials or components required and approved by the District for reuse.

1.1.36 Product Data. Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by Developer to illustrate a material, product, or system for some portion of the Work.

1.1.37 Program Manager. The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the District. If no Program Manager is designated for the Project that is the subject of the Contract Documents, then all references to Program Manager herein shall be read to refer to District.

1.1.38 Project. The planned undertaking as provided for in the Contract Documents.

1.1.39 Project Inspector (or "Inspector"). The individual(s) retained by the District in accordance with title 24 of the California Code of Regulations to monitor and inspect the Project.

1.1.40 Project Labor Agreement (or "PLA" or Project Stabilization Agreement or "PSA"). A prehire collective bargaining agreement in accordance with Public Contract Code section 2500 *et seq.* that establishes terms and conditions of employment for a specific construction project or projects and/or is an agreement described in Section 158(f) of Title 29 of the United States Code.

1.1.41 Proposed Change Order (or "PCO"). A written request prepared by Developer requesting that the District, the Construction Manager and the Architect issue a Change Order based upon a proposed change to the Work, to the Guaranteed Maximum Price, and/or to the Contract Time.

1.1.42 Provide. Shall include "provide complete in place," that is, "furnish and install," and "provide complete and functioning as intended in place" unless specifically stated otherwise.

1.1.43 Qualified SWPPP Practitioner (or "QSP"). Certified personnel that attended a State Water Resources Control Board sponsored or approved training class and passed the qualifying exam.

1.1.44 Record Drawings. Unless otherwise defined in the Special Conditions, Reproducible drawings (or Plans) prepared pursuant to the requirements of the Contract Documents, that reflect all changes made during the performance of the Work, recording differences between the original design of the Work and the Work as constructed upon completion of the Project. See also "**As-Built**."

1.1.45 Request for Information (or "RFI"). A written request prepared by Developer requesting that the Architect provide additional information necessary to clarify or amplify an item in the Contract Documents that Developer believes is not clearly shown or called for in the Drawings or Specifications or other portions of the Contract Documents, or to address problems that have arisen under field conditions.

1.1.46 Request for Substitution for Specified Item. A request by Developer to substitute an equal or superior material, product, thing, or service for a specific material, product, thing, or service that has been designated in the Contract Documents by a specific brand or trade name.

1.1.47 Safety Orders. Written and/or verbal orders for construction issued by the California Division of Occupational Safety and Health ("Cal/OSHA") or by the United States Occupational Safety and Health Administration ("OSHA").

1.1.48 Safety Plan. Developer's safety plan specifically adapted for the Project. Developer's Safety Plan shall comply with all provisions regarding Project safety, including all applicable provisions in these Construction Provisions.

1.1.49 Samples. Physical examples that illustrate materials, products, equipment, finishes, colors, or workmanship and that, when approved in accordance with the Contract Documents, establish standards by which portions of the Work will be judged.

1.1.50 Shop Drawings. All drawings, prints, diagrams, illustrations, brochures, schedules, and other data that are prepared by Developer, a subcontractor, manufacturer, supplier, or distributor, that illustrate how specific portions of the Work shall be fabricated or installed.

1.1.51 Site. The Project site as shown on the Drawings.

1.1.52 Specifications. That portion of the Contract Documents, Division 1 through Division 49, and all technical sections, and addenda to all of these, if any, consisting of written descriptions and requirements of a technical nature of materials, equipment, construction methods and systems, standards, and workmanship.

1.1.53 State. The State of California.

1.1.54 Storm Water Pollution Prevention Plan (or "SWPPP"). A document which identifies sources and activities at a particular facility that may contribute pollutants to storm water and contains specific control measures and time frames to prevent or treat such pollutants.

1.1.55 Subcontractor. A contractor and/or supplier who is under contract with Developer or with any other subcontractor, regardless of tier, to perform a portion of the Work of the Project.

1.1.56 Submittal Schedule. The schedule of submittals as provided by Developer and approved by District.

1.1.57 Surety. The person, firm, or corporation that executes as surety Developer's Performance Bond and Payment Bond, and must be a California admitted surety insurer as defined in the Code of Civil Procedure section 995.120.

1.1.58 Work. All labor, materials, equipment, components, appliances, supervision, coordination, and services required by, or reasonably inferred from, the Contract Documents, that are necessary for the construction and completion of the Project.

1.2 Laws Concerning the Contract Documents; Venue

The Contract is subject to all provisions of the Constitution and laws of California and the United States governing, controlling, or affecting District, or the property, funds, operations, or powers of District, and such provisions are by this reference made a part hereof. Any provision required by law to be included in this Contract shall be deemed to be inserted.

To the fullest extent permitted by California law, the county in which the District administration office is located shall be the venue for any action or proceeding that may be brought or arise out of, in connection with or by reason of this Contract.

1.3 No Oral Agreements

No oral agreement or conversation with any officer, agent, or employee of District, either before or after execution of Contract Documents, shall affect or modify any of the terms or obligations contained in any of the documents comprising the Contract Documents.

1.4 No Assignment

Except as specifically permitted in the Facilities Lease, Developer shall not assign the Contract Documents or any part thereof including, without limitation, any services or money to become due hereunder without the prior written consent of the District. Assignment without District's prior written consent shall be null and void. Any assignment of money due or to become due under the Contract Documents shall be subject to a prior lien for services rendered or material supplied for performance of Work called for under the Contract Documents in favor of all persons, firms, or corporations rendering services or supplying material to the extent that claims are filed pursuant to the Civil Code, Code of Civil Procedure, Government Code, Labor Code, and/or Public Contract Code, and shall also be subject to deductions for liquidated damages or withholding of payments as determined by District in accordance with the Contract Documents. Developer shall not assign or transfer in

any manner to a Subcontractor or supplier the right to prosecute or maintain an action against the District.

1.5 Notice and Service Thereof

1.5.1 Any notice from one party to the other or otherwise under the Contract Documents shall be in writing and shall be dated and signed by the party giving notice or by a duly authorized representative of that party. Notice shall not be effective for any purpose whatsoever unless served in one of the following manners:

1.5.1.1 If notice is given by personal delivery thereof, it shall be considered delivered on the day of delivery.

1.5.1.2 If notice is given by overnight delivery service, it shall be considered delivered one (1) day after date deposited, as indicated by the delivery service.

1.5.1.3 If notice is given by depositing same in United States mail, enclosed in a sealed envelope, it shall be considered delivered five (5) days after date deposited, as indicated by the postmarked date.

1.5.1.4 If notice is given by registered or certified mail with postage prepaid, return receipt requested, it shall be considered delivered on the day the notice is signed for.

1.6 No Waiver

The failure of District in any one or more instances to insist upon strict performance of any of the terms of the Contract Documents or to exercise any option herein conferred shall not be construed as a waiver or relinquishment to any extent of the right to assert or rely upon any such terms or option on any future occasion. No action or failure to act by the District, Architect, or Construction Manager shall constitute a waiver of any right or duty afforded the District under the Contract Documents, nor shall any action or failure to act constitute an approval of or acquiescence on any breach thereunder, except as may be specifically agreed in writing.

1.7 Substitutions For Specified Items

Developer shall not substitute different items for any items identified in the Contract Documents without prior written approval of the District, unless otherwise provided in the Contract Documents.

1.8 Materials and Work

1.8.1 Except as otherwise specifically stated in the Contract Documents, Developer shall provide and pay for all materials, labor, tools, equipment, transportation, supervision, temporary constructions of every nature, and all other services, management, and facilities of every nature whatsoever necessary to execute and complete the Work, in a good and workmanlike manner, within the Contract Time.

1.8.2 Unless otherwise specified, all materials shall be new and of the best quality of their respective kinds and grades as noted or specified, and workmanship shall be of high quality, and Developer shall use all diligence to

inform itself fully as to the required manufacturer's instructions and to comply therewith.

1.8.3 Materials shall be furnished in ample quantities and at such times as to ensure uninterrupted progress of Work and shall be stored properly and protected from the elements, theft, vandalism, or other loss or damage as required.

1.8.4 For all materials and equipment specified or indicated in the Drawings and Specifications, Developer shall provide all labor, materials, equipment, and services necessary for complete assemblies and complete working systems, functioning as intended. Incidental items not indicated on Drawings, nor mentioned in the Specifications, that can legitimately and reasonably be inferred to belong to the Work described, or be necessary in good practice to provide a complete assembly or system, shall be furnished as though itemized here in every detail. In all instances, material and equipment shall be installed in strict accordance with each manufacturer's most recent published recommendations and specifications.

1.8.5 Developer shall, after award of the Project by District and after relevant submittals have been reviewed, place orders for materials and/or equipment as specified so that delivery of same may be made without delays to the Work. Developer shall, upon five (5) days' demand from District, present documentary evidence showing that orders have been placed.

1.8.6 In the event of Developer's neglect in complying or failure to comply with the above instructions, District reserves the right, but has no obligation, to place orders for such materials and/or equipment as the District may deem advisable so that the Work may be completed by the date specified in the Facilities Lease, and all expenses incidental to the procuring of said materials and/or equipment shall be paid for by Developer or deducted from payment(s) to Developer.

1.8.7 Developer warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver the Site to District, together with all improvements and appurtenances constructed or placed thereon by it, and free from any claims, liens, or charges. Developer further agrees that neither it nor any person, firm, or corporation furnishing any materials or labor for any work covered by the Contract Documents shall have any right to lien any portion of the Premises or any improvement or appurtenance thereon, except that Developer may install metering devices or other equipment of utility companies or of political subdivision, title to which is commonly retained by utility company or political subdivision. In the event of installation of any such metering device or equipment, Developer shall advise District as to owner thereof.

1.8.8 Nothing contained in this Article, however, shall defeat or impair the rights of persons furnishing materials or labor under any bond given by Developer for their protection or any rights under any law permitting such protection or any rights under any law permitting such persons to look to funds due Developer in hands of District (e.g., Stop Payment Notices), and this provision shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing material for Work when no formal contract is entered into for such material.

1.8.9 Title to new materials and/or equipment for the Work of the Contract Documents and attendant liability for its protection and safety shall remain with Developer until incorporated in the Work of the Contract Documents and accepted by District. No part of any materials and/or equipment shall be removed from its place of storage except for immediate installation in the Work of the Contract Documents. Should the District, in its discretion, allow Developer to store materials and/or equipment for the Work off-site, Developer will store said materials and/or equipment at a bonded warehouse and with appropriate insurance coverage at no cost to District. Developer shall keep an accurate inventory of all materials and/or equipment in a manner satisfactory to District or its authorized representative and shall, at the District's request, forward it to the District.

1.8.10 [Reserved]

2. [Reserved]

3. Architect

3.1 The Architect shall represent the District during the Project and will observe the progress and quality of the Work on behalf of the District. Architect shall have the authority to act on behalf of District to the extent expressly provided in the Contract Documents and to the extent determined by District. Architect shall have authority to reject materials, workmanship, and/or the Work whenever rejection may be necessary, in Architect's reasonable opinion, to ensure the proper execution of the Contract Documents.

3.2 Architect shall, with the District and on behalf of the District, determine the amount, quality, acceptability, and fitness of all parts of the Work, and interpret the Specifications, Drawings, and shall, with the District, interpret all other Contract Documents.

3.3 Architect shall have all authority and responsibility established by law, including title 24 of the California Code of Regulations.

3.4 Developer shall provide District and the Construction Manager with a copy of all written communication between Developer and Architect at the same time as that communication is made to Architect, including, without limitation, all RFIs, correspondence, submittals, claims, change order requests and/or proposed change orders.

4. Construction Manager

4.1 If a Construction Manager is used on this Project ("Construction Manager" or "CM"), the Construction Manager will provide administration of the Contract Documents on the District's behalf. After execution of the Contract Documents, all correspondence and/or instructions from Developer and/or District shall be forwarded through the Construction Manager. The Construction Manager will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences, or procedures or for safety precautions in connection with the Work, which shall all remain Developer's responsibility.

4.2 The Construction Manager, however, will have authority to reject materials and/or workmanship not conforming to the Contract Documents, as determined by the District, the Architect, and/or the Project Inspector. The Construction Manager shall

also have the authority to require special inspection or testing of any portion of the Work, whether it has been fabricated, installed, or fully completed. Any decision made by the Construction Manager in good faith, shall not give rise to any duty or responsibility of the Construction Manager to: Developer, any Subcontractor, or their agents, employees, or other persons performing any of the Work. The Construction Manager shall have free access to any or all parts of Work at any time.

4.3 If the District does not use a Construction Manager on this Project, all references within the Contract Documents to Construction Manager or CM shall be read as District.

5. Inspector, Inspections, and Tests

5.1 Project Inspector

5.1.1 One or more Project Inspector(s), including special Project Inspector(s), as required, will be assigned to the Work by District, in accordance with requirements of title 24, part 1, of the California Code of Regulations, to enforce the building code and monitor compliance with Plans and Specifications for the Project previously approved by the DSA. Duties of Project Inspector(s) are specifically defined in section 4-342 of said part 1 of title 24.

5.1.2 No Work shall be carried on except with the knowledge and under the inspection of the Project Inspector(s). The Project Inspector(s) shall have free access to any or all parts of Work at any time. Developer shall furnish Project Inspector(s) reasonable opportunities for obtaining such information as may be necessary to keep Project Inspector(s) fully informed respecting progress and manner of work and character of materials, including, but not limited to, submission of form DSA 156 (or the most current version applicable at the time the Work is performed) to the Project Inspector at least 48 hours in advance of the commencement and completion of construction of each and every aspect of the Work. Forms are available on the DSA's website at: <http://www.dgs.ca.gov/dsa/Forms.aspx>. Inspection of Work shall not relieve Developer from an obligation to fulfill the Contract Documents. Project Inspector(s) and the DSA are authorized to suspend work whenever Developer and/or its Subcontractor(s) are not complying with the Contract Documents. Any work stoppage by the Project Inspector(s) and/or DSA shall be without liability to the District. Developer shall instruct its Subcontractors and employees accordingly.

5.1.3 If Developer and/or any Subcontractor requests that the Project Inspector(s) perform any inspection off-Site, this shall only be done if it is allowable pursuant to applicable regulations and DSA approval, if the Project Inspector(s) agree to do so, and at the expense of Developer.

5.2 Tests and Inspections

5.2.1 Tests and Inspections shall comply with title 24, part 1, California Code of Regulations, group 1, article 5, section 4-335, and with the provisions of the Specifications.

5.2.2 The District will select an independent testing laboratory to conduct the tests. Selection of the materials required to be tested shall be by the laboratory or the District's representative and not by Developer. Developer shall notify the

District's representative a sufficient time in advance of its readiness for required observation or inspection. This notice shall be provided, at a minimum, forty-eight (48) hours prior to the inspection of the material that needs to be tested and, at a minimum, seventy-two (72) hours prior to any special or off-site inspection.

5.2.3 Developer shall notify the District's representative a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents that must by terms of the Contract Documents be tested so that the District may arrange for the testing of same at the source of supply. This notice shall be provided, at a minimum, seventy-two (72) hours prior to the manufacture of the material that needs to be tested.

5.2.4 Any material shipped by Developer from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required, shall not be incorporated into and/or onto the Project.

5.2.5 The District will select the testing laboratory and pay for the costs for all tests and inspections, except those inspections performed at Developer's request and expense. Developer shall reimburse the District for any and all laboratory costs or other testing costs for any materials found to be not in compliance with the Contract Documents. At the District's discretion, District may elect to deduct laboratory or other testing costs for noncompliant materials from the Guaranteed Maximum Price, and such deduction shall not constitute a withholding.

5.3 Costs for After Hours and/or Off Site Inspections

If Developer performs Work outside the Inspector's regular working hours, costs of any inspections required outside regular working hours shall be borne by Developer and may be invoiced to Developer by the District or the District may deduct those expenses from the next Tenant Improvement Payment.

6. Developer

Developer shall construct and complete, in a good and workmanlike manner, the Work for the Guaranteed Maximum Price including any adjustment(s) to the Guaranteed Maximum Price pursuant to provisions herein regarding changes to the Guaranteed Maximum Price. Except as otherwise noted, Developer shall provide and pay for all labor, materials, equipment, permits (excluding DSA), fees, licenses, facilities, transportation, taxes, bonds and insurance, and services necessary for the proper execution and completion of the Work, except as indicated herein.

6.1 Status of Developer

6.1.1 Developer represents and warrants that Developer is an independent do or business entity that is: (i) free from the control and direction of the District in connection with the performance of the Services, (ii) performing Services that are outside the usual course of the District's business, and (iii) customarily engaged in an independently established trade, occupation, or business of the same nature as that involved in the Services performed, District being interested only in the results obtained. Developer understands and agrees that it and all of its employees and its Subcontractors shall not be considered

officers, employees, agents, partner, or joint venture of the District, and are not entitled to benefits of any kind or nature normally provided employees of the District and/or to which District's employees are normally entitled, including, but not limited to, State Unemployment Compensation or Worker's Compensation. Developer shall assume full responsibility for payment of all federal, state, and local taxes or contributions, including unemployment insurance, social security, and income taxes with respect to Consultant's employees. Developer is and shall at all times be deemed be wholly responsible for the manner in which it, its agents, and its Subcontractors perform the services required of it by the Contract Documents. Nothing herein contained shall be construed as creating the relationship of employer and employee, or principal and agent, between the District, or any of the District's employees or agents, and Developer or any of Developer's Subcontractors, agents or employees. District shall be permitted to monitor Developer's activities to determine compliance with the terms of the Contract Documents.

6.1.2 As required by law, Developer and all Subcontractors shall be properly licensed and regulated by the Contractors State License Board, 9821 Business Park Drive, Sacramento, California 95827 (Post Office Box 26000, Sacramento, California 95826), <http://www.cslb.ca.gov>.

6.1.3 As required by law, Developer and all Subcontractors shall be properly registered as public works contractors by the Department of Industrial Relations at <https://efiling.dir.ca.gov/PWCR/ActionServlet?action=displayPWCRRegistrationForm> or current URL.

6.1.4 Developer represents that Developer and all Subcontractors shall not be presently debarred, suspended, proposed for disbarment, declared ineligible or excluded pursuant to either Labor Code section 1777.1 or Labor Code section 1777.7.

6.1.5 [Reserved]

6.1.6 Developer represents that it has no existing interest and will not acquire any interest, direct or indirect, which could conflict in any manner or degree with the performance of Work required under this Contract and that no person having any such interest shall be employed by Developer.

6.1.7 [Reserved]

6.1.8 If Developer intends to make any change in the name or legal nature of the Developer's entity, Developer must first notify the District in writing prior to making any contemplated change. The District shall determine in writing if Developer's intended change is permissible while performing this Contract.

6.2 Project Inspection Card(s)

Developer shall verify that forms DSA 152 (or most current version applicable at the time the Work is performed) are issued for the Project prior to the commencement of construction.

6.3 Developer's Supervision

6.3.1 During progress of the Work, Developer shall keep on the Premises, and at all other locations where any Work related to the Contract is being

performed, an experienced and competent project manager and construction superintendent who are employees of Developer, to whom the District does not object and whom shall be fluent in English, written and verbal.

6.3.2 The project manager and construction superintendent shall both speak fluent English and the predominant language of Developer's employees.

6.3.3 Developer acknowledges the quality and qualifications of the Key Personnel were important factors in District's selection of Developer for the Project. Developer and District agree that the personal services of the Key Personnel are a material term of the Contract Documents. Developer and District agree further that the substitution or removal or change in role or level of effort of such Key Personnel would result in damages to the District, the measure of which would be impractical or extremely difficult to fix. In lieu such damages, District and Developer have agreed to liquidated damages as described below:

6.3.3.1 Before commencing the Work herein, Developer shall give written notice to District of Developer's Key Personnel.

6.3.3.2 Key Personnel shall be the same as those individuals identified in Developer's response to the District's RFQ/P.

6.3.3.3 For any substitution of any Key Personnel individual before the end of the individual's Project commitment period provided in Developer's Key Personnel staffing schedule, District may assess once, and Developer shall accept, liquidated damages in the amount of six (6) times the gross monthly salary for each substituted Key Personnel.

6.3.4 Developer's Key Personnel shall not be changed except with prior written notice to, and approval by, District.

6.3.5 If any of Developer's Key Personnel prove to be unsatisfactory to Developer, or to District, any of the District's employees, agents, the Construction Manager, or the Architect, the unsatisfactory Key Personnel shall be replaced. However, Developer shall immediately notify District in writing before any change occurs, but no less than two (2) business days prior. Any replacement of Key Personnel shall be made promptly and must be satisfactory to the District. Developer's Key Personnel shall each represent Developer, and all directions given to Key Personnel shall be as binding as if given to Developer.

6.3.6 Developer shall give efficient supervision to Work, using its best skill and attention. Developer shall carefully study and compare all Contract Documents, Drawings, Specifications, and other instructions and shall at once report to District, Construction Manager, and Architect any error, inconsistency, or omission that Developer or its employees and Subcontractors may discover, in writing, with a copy to District's Project Inspector(s). Developer shall have responsibility for discovery of errors, inconsistencies, or omissions.

6.3.7 All contractors doing work on the Project will provide their workers with identification badges. These badges will be worn by all members of the contractor's staff who are working in a District facility.

6.3.7.1 Badges must be filled out in full and contain the following information:

6.3.7.1.1 Name of contractor

6.3.7.1.2 Name of employee

6.3.7.1.3 Contractor's address and phone number

6.3.7.2 Badges are to be worn when Developer or his/her employees are on site and must be visible at all times. Contractors must inform their employees that they are required to allow District employees, the Architect, the Construction Manager, the Program Manager, or the Project Inspector to review the information on the badges upon request.

6.3.7.3 Continued failure to display identification badges as required by this policy may result in the individual being removed from the Project or assessment of fines against the contractor.

6.4 Duty to Provide Fit Workers

6.4.1 Developer and Subcontractor(s) shall at all times enforce strict discipline and good order among their employees and shall not employ any unfit person or anyone not skilled in work assigned to that person. It shall be the responsibility of Developer to ensure compliance with this requirement. District may require Developer to permanently remove unfit persons from Project Site.

6.4.2 Any person in the employ of Developer or Subcontractor(s) whom District may deem incompetent or unfit shall be excluded from working on the Project and shall not again be employed on the Project except with the prior written consent of District.

6.4.3 Developer shall furnish labor that can work in harmony with all other elements of labor employed or to be employed in the Work.

6.4.4 Fingerprinting. Developer shall comply with the provisions of Education Code section 45125.2 regarding the submission of employee fingerprints to the California Department of Justice and the completion of criminal background investigations of its employees, Subcontractor(s), and Subcontractors' employees. Developer shall not permit any employee to have any contact with District pupils until such time as Developer has verified in writing to the governing board of the District, (A) that such employee has not been convicted of a violent or serious felony, as defined in Education Code section 45122.1 and/or (B) that the prohibition does not apply to an employee as provided by Education Code section 45125.1(e)(2) or (3). Developer shall fully complete and perform all tasks required pursuant to the Criminal Background Investigation/ Fingerprinting Certification.

6.5 Field Office

6.5.1 Developer shall provide on the Site a temporary office.

6.6 Purchase of Materials and Equipment

Developer is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from District to assure that there will be no delays.

6.7 Documents on Work

6.7.1 Developer shall at all times keep on the Site, or at another location as the District may authorize in writing, one legible copy of all Contract Documents, including Addenda and Change Orders, and Titles 19 and 24 of the California Code of Regulations, the specified edition(s) of the Uniform Building Code, all approved Drawings, Plans, Schedules, and Specifications, and all codes and documents referred to in the Specifications, and made part thereof. These documents shall be kept in good order and available to District, Construction Manager, Architect, Architect's representatives, the Project Inspector(s), and all authorities having jurisdiction. Developer shall be acquainted with and comply with the provisions of these titles as they relate to this Project. (See particularly the duties of Contractor, Title 24, Part 1, California Code of Regulations, Section 4-343.) Developer shall also be acquainted with and comply with all California Code of Regulations provisions relating to conditions on this Project, particularly Titles 8 and 17. Developer shall coordinate with Architect and Construction Manager and shall submit its verified report(s) according to the requirements of Title 24.

6.7.2 Daily Job Reports

6.7.2.1 Developer shall maintain, at a minimum, at least one (1) set of Daily Job Reports on the Project. These must be prepared by Developer's employee(s) who are present on Site, and must include, at a minimum, the following information:

6.7.2.1.1 A brief description of all Work performed on that day.

6.7.2.1.2 A summary of all other pertinent events and/or occurrences on that day.

6.7.2.1.3 The weather conditions on that day.

6.7.2.1.4 A list of all Subcontractor(s) working on that day, including DIR registration numbers, Subcontractor employees working, and hours of work.

6.7.2.1.5 A list of each Developer employee working on that day and the total hours worked for each employee.

6.7.2.1.6 A complete list of all equipment on Site that day, whether in use or not.

6.7.2.1.7 A complete list of all materials, supplies, and equipment delivered on that day, and verification that all materials, supplies, and equipment comply with the Contract Documents and are properly stored.

6.7.2.1.8 A complete list of all inspections and tests performed on that day.

6.7.2.1.9 Daily verification the Project is properly secured from the public and unauthorized entry.

6.7.2.2 Each day Developer shall provide a copy of the previous day's Daily Job Report to the District or the District's Construction Manager.

6.8 Preservation of Records

Developer shall maintain, and District shall have the right to inspect, Developer's financial records for the Project, including, without limitation, Job Cost Reports for the Project in compliance with the criteria set forth herein. The District shall have the right to examine and audit all Daily Job Reports or other Project records of Developer's project manager(s), project superintendent(s), and/or project foreperson(s), all certified payroll records and/or related documents including, without limitation, Job Cost Reports, payroll, payment, timekeeping and tracking documents; and as it pertains to change orders, all books, estimates, records, contracts, documents, cost data, subcontract job cost reports, and other data of Developer, any Subcontractor, and/or supplier, including computations and projections related to estimating, negotiating, pricing, or performing the Work or modification, in order to evaluate the accuracy, completeness, and currency of the cost, manpower, coordination, supervision, or pricing data at no additional cost to the District. These documents may be duplicative and/or be in addition to any documents held in escrow by the District. Developer shall make available at its office at all reasonable times the materials described in this paragraph for the examination, audit, or reproduction until three (3) years after final payment under this Facilities Lease. Notwithstanding the provisions above, Developer shall provide any records requested by any governmental agency, if available, after the time set forth above.

6.9 Integration of Work

6.9.1 Developer shall do all cutting, fitting, patching, and preparation of Work as required to make its several parts come together properly, to fit it to receive or be received by work of other contractors, and to coordinate tolerances to various pieces of work, showing upon, or reasonably implied by, the Drawings and Specifications for the completed structure, and shall conform them as District and/or Architect may direct.

6.9.2 Developer shall make its own layout of lines and elevations and shall be responsible for the accuracy of both Developer's and Subcontractors' work resulting therefrom.

6.9.3 Developer and all Subcontractors shall take all field dimensions required in performance of the Work, and shall verify all dimensions and conditions on the Site. All dimensions affecting proper fabrication and installation of all Work must be verified prior to fabrication by taking field measurements of the true conditions. If there are any discrepancies between dimensions in drawings and existing conditions which will affect the Work, Developer shall bring such discrepancies to the attention of the District and Architect for adjustment before proceeding with the Work. In doing so, it is recognized that Developer is not acting in the capacity of a licensed design professional, and that Developer's examination is made in good faith to facilitate construction and does not create an affirmative responsibility of a design professional to detect errors, omissions or inconsistencies in the Contract Documents or to ascertain compliance with applicable laws, building codes or regulations. However, nothing in this provision shall abrogate Developer's responsibilities for discovering and reporting any error, inconsistency, or omission pursuant to the Contract within Developer's standard of care including, without limitation, any applicable laws,

ordinance, rules, or regulations. Following receipt of written notice from Developer, the District and/or Architect shall inform Developer what action, if any, Developer shall take with regard to such discrepancies.

6.9.4 All costs caused by noncompliant, defective, or delayed Work shall be borne by Developer, inclusive of repair work. Schedule delays resulting from unauthorized work shall be Developer's responsibility.

6.9.5 Developer shall not endanger any work performed by it or anyone else by cutting, excavating, or otherwise altering work and shall not cut or alter work of any other contractor except with consent of District.

6.10 Notifications

6.10.1 Developer shall notify the Architect and Project Inspector, in writing, of the commencement of construction of each and every aspect of the Work at least 48 hours in advance by submitting form DSA 156 (or the most current version applicable at the time the Work is performed) to the Project Inspector. Forms are available on the DSA's website at: <http://www.dgs.ca.gov/dsa/Forms.aspx>.

6.10.2 Developer shall notify the Architect and Project Inspector, in writing, of the completion of construction of each and every aspect of the Work at least 48 hours in advance by submitting form DSA 156 (or the most current version applicable at the time the Work is performed) to the Project Inspector.

6.11 Obtaining of Permits, Licenses and Registrations

6.11.1 Developer shall secure and pay for any permits (except DSA), licenses, registrations, approvals, and certificates necessary for prosecution of Work, including but not limited to those listed in the Special Conditions, **Exhibit D-1**, if any, before the date of the commencement of the Work or before the permits, licenses, registrations, approvals and certificates are legally required to continue the Work without interruption. Developer shall obtain and pay, only when legally required, for all licenses, approvals, registrations, permits, inspections, and inspection certificates required to be obtained from or issued by any authority having jurisdiction over any part of the Work included in the Contract Documents. All final permits, licenses, registrations, approvals and certificates shall be delivered to District before demand is made for final payment. The costs associated with said permits, licenses, registrations, approvals and certificates shall be direct reimbursement items and are not subject to any markup.

6.11.2 General Permit For Storm Water Discharges Associated With Construction and Land Disturbance Activities.

6.11.2.1 Developer acknowledges that all California school districts are obligated to develop and implement the following requirements for the discharge of storm water to surface waters from its construction and land disturbance activities pursuant to the Clean Water Act and Porter Cologne Water Quality Act. District has determined that the construction of this Project requires enrollment in the Construction Storm Water Permit. District has filed certain submittals referred to as Permit

Registration Documents ("PRDS") with the Regional Water Control Board ("Storm Water Pollution Prevention Plan" or "SWPPP").

6.11.2.2 Developer shall comply with any District SWPPP that is approved by the District and applicable to the Project, at no additional cost to the District. Developer shall pay any fees and any penalties that may imposed by a regulatory agency for its non-compliance with the SWPPP during the course of Work.

6.11.2.3 Developer shall provide a Qualified Storm Water Practitioner ("QSP") at no additional cost to the District, who shall be onsite and implement and monitor any and all SWPPP requirements applicable to the Project, including but not limited to:

6.11.2.3.1 All required visual observations, sampling, analysis, reporting and record keeping, including any Numeric Action Levels ("NALs"), if applicable;

6.11.2.3.2 Rain Event Action Plan ("REAP") at least forty eight (48) hours prior to any forecasted rain event requiring implementation of the REAP, including any erosion and sediment control measures needed to protect all exposed portions of the site, if applicable;

6.11.2.3.3 Active Treatment System ("ATS"), if applicable; and

6.11.2.3.4 Best management practices ("BMPs").

6.12 Royalties and Patents

6.12.1 Developer shall obtain and pay, when legally required, all royalties and license fees necessary for prosecution of Work before the earlier of the date of the commencement of the Work or the date the license is legally required to continue the Work without interruption. Developer shall defend suits or claims of infringement of patent, copyright, or other rights and shall hold the District, Construction Manager and the Architect harmless and indemnify them from loss on account thereof except when a particular design, process, or make or model of product is required by the Contract Documents. However, if Developer has reason to believe that the required design, process, or product is an infringement of a patent or copyright, Developer shall indemnify and defend the District, Construction Manager and Architect against any loss or damage.

6.12.2 The review by the District, Construction Manager or Architect of any method of construction, invention, appliance, process, article, device, or material of any kind shall be only as to its adequacy for the Work and shall not constitute approve use by Developer in violation of any patent or other rights of any person or entity.

6.13 Work to Comply With Applicable Laws and Regulations

6.13.1 Developer shall give all notices and comply with the following specific laws, ordinances, rules, and regulations and all other applicable laws, ordinances, rules, and regulations bearing on conduct of Work as indicated and specified, including but not limited to the appropriate statutes and administrative code sections. If Developer observes that Drawings and

Specifications are at variance with any applicable laws, ordinances, rules and regulations, or should Developer become aware of the development of conditions not covered by Contract Documents that may result in finished Work being at variance therewith, Developer shall promptly notify District in writing and any changes deemed necessary by District shall be made as provided in this **Exhibit D** for changes in Work.

6.13.1.1 National Electrical Safety Code, U. S. Department of Commerce

6.13.1.2 National Board of Fire Underwriters' Regulations

6.13.1.3 International Building Code, latest addition, and the California Code of Regulations, title 24, and other amendments

6.13.1.4 Manual of Accident Prevention in Construction, latest edition, published by A.G.C. of America

6.13.1.5 Industrial Accident Commission's Safety Orders, State of California

6.13.1.6 Regulations of the State Fire Marshall (title 19, California Code of Regulations) and Pertinent Local Fire Safety Codes

6.13.1.7 Americans with Disabilities Act

6.13.1.8 Education Code of the State of California

6.13.1.9 Government Code of the State of California

6.13.1.10 Labor Code of the State of California, division 2, part 7, Public Works and Public Agencies

6.13.1.11 Public Contract Code of the State of California

6.13.1.12 California Art Preservation Act

6.13.1.13 U. S. Copyright Act

6.13.1.14 U. S. Visual Artists Rights Act

6.13.2 Developer shall comply with all applicable mitigation measures, if any, adopted by any public agency or local utility with respect to this Project pursuant to the California Environmental Quality Act (Public Resources Code section 21000 et seq.).

6.13.3 If Developer performs any Work that it knew, or through exercise of reasonable care should have known, to be contrary to any applicable laws, ordinance, rules, or regulations, Developer shall bear all costs arising therefrom and arising from the correction of said Work.

6.13.4 Where Specifications or Drawings state that materials, processes, or procedures must be approved by the DSA, State Fire Marshall, or other body or agency, Developer shall use its best efforts to satisfy the requirements of such bodies or agencies applicable at the time the Work is performed, and as determined by those bodies or agencies.

6.13.5 [Reserved]

6.14 Safety/Protection of Persons and Property

6.14.1 Developer will be solely and completely responsible for conditions of the Site, including safety of all persons and property during performance of the Work. This requirement will apply continuously and not be limited to normal working hours.

6.14.2 Developer to provide safe access for staff and students at any time, and to provide barricades, sound walls, signage, fencing, and other reasonably necessary protective measures, as necessary, to protect staff and students during construction.

6.14.3 The wearing of hard hats will be mandatory at all times for all personnel on Site. Developer shall supply sufficient hard hats to properly equip all employees and visitors.

6.14.4 Any construction review of Developer's performance is not intended to include review of the adequacy of Developer's safety measures in, on, or near the Site.

6.14.5 Implementation and maintenance of safety programs shall be the sole responsibility of Developer.

6.14.6 Developer shall furnish to the District a copy of Developer's safety plan within the time frame indicated in the Contract Documents and specifically adapted for the Project.

6.14.7 Developer shall be responsible for all damages to persons or property that occur as a result of its fault or negligence in connection with the prosecution of the Contract Documents and shall take all necessary measures and be responsible for the proper care and completion and final acceptance by District. All Work shall be solely at Developer's risk.

6.14.8 Developer shall take, and require Subcontractors to take, all necessary precautions for safety of workers on the Project and shall comply with all applicable federal, state, local, and other safety laws, standards, orders, rules, regulations, and building codes to prevent accidents or injury to persons on, about, or adjacent to premises where Work is being performed and to provide a safe and healthful place of employment. Developer shall furnish, erect, and properly maintain at all times, all necessary safety devices, safeguards, construction canopies, signs, nets, barriers, lights, and watchmen for protection of workers and the public and shall post danger signs warning against hazards created by such features in the course of construction.

6.14.9 Hazards Control –Developer shall store volatile wastes in approved covered metal containers and remove them from the Site daily. Developer shall prevent accumulation of wastes that create hazardous conditions. Developer shall provide adequate ventilation during use of volatile or noxious substances.

6.14.10 Developer shall designate a responsible member of its organization on the Project, whose duty shall be to post information regarding protection and obligations of workers and other notices required under occupational safety and health laws, to comply with reporting and other occupational safety

requirements, and to protect the life, safety, and health of workers. Name and position of person so designated shall be reported to District by Developer.

6.14.11 Developer shall correct any violations of safety laws, rules, orders, standards, or regulations. Upon the issuance of a citation or notice of violation by the Division of Occupational Safety and Health, Developer shall correct such violation promptly.

6.14.12 Developer shall comply with any District storm water requirements that are approved by the District and applicable to the Project, at no additional cost to the District.

6.14.13 In an emergency affecting safety of life or of work or of adjoining property, Developer, without special instruction or authorization, shall act, at its discretion, to prevent such threatened loss or injury. Any compensation claimed by Developer on account of emergency work shall be determined by agreement.

6.14.14 All salvage materials will become the property of Developer and shall be removed from the Site unless otherwise called for in the Contract Documents. However, the District reserves the right to designate certain items of value that shall be turned over to the District unless otherwise directed by District.

6.14.15 All connections to public utilities and/or existing on-site services, including, without limitation, internet, phone, and data connections, shall be made and maintained in such a manner as to not interfere with the continuing use of same by the District during the entire progress of the Work.

6.14.16 Developer shall provide such heat, covering, and enclosures as are necessary to protect all Work, materials, equipment, appliances, and tools against damage by weather conditions, such as extreme heat, cold, rain, snow, dry winds, flooding, or dampness.

6.14.17 Developer shall protect and preserve the Work from all damage or accident, providing any temporary roofs, window and door coverings, boxings, or other construction as required by the Architect. Developer shall be responsible for existing structures, walks, roads, trees, landscaping, and/or improvements in working areas; and shall provide adequate protection therefor. If temporary removal is necessary of any of the above items, or damage occurs due to the Work, Developer shall replace same at his expense with same kind, quality, and size of Work or item damaged. This shall include any adjoining property of the District and others.

6.14.18 Developer shall take adequate precautions to protect existing roads, sidewalks, curbs, pavements, utilities, adjoining property, and structures (including, without limitation, protection from settlement or loss of lateral support), and to avoid damage thereto, and repair any damage thereto caused by construction operations.

6.14.19 Developer shall confine apparatus, the storage of materials, and the operations of workers to limits indicated by law, ordinances, permits, or directions of Architect, and shall not interfere with the Work or unreasonably encumber Premises or overload any structure with materials. Developer shall

enforce all instructions of District and Architect regarding signs, advertising, fires, and smoking, and require that all workers comply with all regulations while on Project Site.

6.14.20 Developer, Developer's employees, Subcontractors, Subcontractors' employees, or any person associated with the Work shall conduct themselves in a manner appropriate for a school site. No verbal or physical contact with neighbors, students, and faculty, profanity, or inappropriate attire or behavior will be permitted. Developer is also responsible for ensuring workers refrain from wearing inappropriate clothing and/or logos on the Project. District may require Developer to temporarily or permanently remove non-complying persons from Project Site.

6.14.21 Developer shall take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If such markers are disturbed, Developer shall have a civil engineer, registered as a professional engineer in California, replace them at no cost to District.

6.14.22 In the event that Developer enters into any agreement with owners of any adjacent property to enter upon the adjacent property for the purpose of performing the Work, Developer shall fully indemnify, defend, and hold harmless each person, entity, firm, or agency that owns or has any interest in adjacent property. The form and content of the agreement of indemnification shall be approved by the District prior to the commencement of any Work on or about the adjacent property. Developer shall also indemnify the District as provided in the indemnification provision herein. These provisions shall be in addition to any other requirements of the owners of the adjacent property.

6.15 General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities ("Construction Storm Water Permit")

6.15.1 Developer acknowledges that all California school districts are obligated to develop and implement the following requirements for the discharge of storm water to surface waters from its construction and land disturbance activities pursuant to the Clean Water Act and Porter Cologne Water Quality Act. District has determined that the construction of this Project requires enrollment in the Construction Storm Water Permit. District has filed certain submittals referred to as Permit Registration Documents (PRDS) with the Regional Water Control Board (Storm Water Pollution Prevention Plan or "SWPPP").

6.15.2 Developer shall comply with any District SWPPP that are approved by the District and applicable to the Project at no additional cost to the District. Developer shall pay any fees and any penalties that may be imposed by a regulatory agency for its non-compliance with the SWPPP during the course of Work.

6.15.3 Developer shall provide a Qualified SWPPP Practitioner (QSP) at no additional cost to the District, who shall be onsite and implement and monitor any and all SWPPP requirements applicable to the Project, including but not limited to:

6.15.3.1 All required visual observations, sampling, analysis, reporting and record keeping, including any Numeric Action Levels (NALs), if applicable;

6.15.3.2 Rain Event Action Plan (REAP) at least forty eight (48) hours prior to any forecasted rain event requiring implementation of the REAP, including any erosion and sediment control measures needed to protect all exposed portions of the site, if applicable;

6.15.3.3 Active Treatment System (ATS), if applicable; and

6.15.3.4 Best management practices (BMPs).

6.16 Working Evenings and Weekends

Developer may be required to work increased hours, evenings, and/or weekends at no additional cost to the District. Developer shall give the District forty-eight (48) hours' notice prior to performing any evening and/or weekend work. Developer shall perform all evening and/or weekend work in compliance with all applicable rules, regulations, laws, and local ordinances including, without limitation, all noise and light limitations. Developer shall reimburse the District for any increased or additional Inspector charges as a result of Developer's increased hours, or evening and/or weekend work.

6.17 Cleaning Up

6.17.1 Developer shall provide all services, labor, materials, and equipment necessary for protecting and securing the Work, all school occupants, furnishings, equipment, and building structure from damage until its completion and final acceptance by District. Dust barriers shall be provided to isolate dust and dirt from construction operations. At completion of the Work and portions thereof, Developer shall clean to the original state any areas beyond the Work area that become dust laden as a result of the Work. Developer must erect the necessary warning signs and barricades to ensure the safety of all school occupants. Developer at all times must maintain good housekeeping practices to reduce the risk of fire damage and must make a fire extinguisher, fire blanket, and/or fire watch, as applicable, available at each location where cutting, braising, soldering, and/or welding is being performed or where there is an increased risk of fire.

6.17.2 Developer at all times shall keep Premises, including property immediately adjacent thereto, free from debris such as waste, rubbish (including personal rubbish of workers, e.g., food wrappers, etc.), and excess materials and equipment caused by the Work. Developer shall not leave debris under, in, or about the Premises (or surrounding property or neighborhood), but shall promptly remove same from the Premises on a daily basis. If Developer fails to clean up, District may do so and the cost thereof shall be charged to Developer. If the Contract calls for Work on an existing facility, Developer shall also perform specific clean-up on or about the Premises upon request by the District as it deems necessary for continued operations. Developer shall comply with all related provisions of the Specifications.

6.17.3 If the Construction Manager, Architect, or District observes the accumulation of trash and debris, the District will give Developer a 24-hour written notice to mitigate the condition.

6.17.4 Should Developer fail to perform the required clean-up, or should the clean-up be deemed unsatisfactory by the District, the District may, at its sole discretion, then perform the clean-up. All cost associated with the clean-up work (including all travel, payroll burden, and costs for supervision) will be deducted from the Guaranteed Maximum Price.

6.18 No Relief from Obligations Based on Review by Other Persons

6.18.1 Developer shall not be relieved of obligations to perform the Work in accordance with the Contract Documents by act or omission of the District, Architect, Construction Manager, Project Inspector, or DSA or other entities having jurisdiction including, but not limited to, administration of the Contract, review of submittals, or by tests, observation, inspection, or permit /interconnection approvals.

7. Subcontractors

7.1 Developer shall provide the District with information for all of Developer's Subcontracts and Subcontractors as indicated in Developer's Submittals and Schedules Section herein.

7.2 No contractual relationship exists between the District and any Subcontractor, supplier, or sub-subcontractor by reason of the Contract Documents.

7.3 Developer agrees to bind every Subcontractor by terms of the Contract Documents as far as those terms that are applicable to Subcontractor's work including, without limitation, all labor, wage & hour, apprentice and related provisions and requirements. If Developer subcontracts any part of the Work called for by the Contract Documents, Developer shall be as fully responsible to District for acts and omissions of any Subcontractor and of persons either directly or indirectly employed by any Subcontractor, including Subcontractor caused Project delays, as it is for acts and omissions of persons directly employed by Developer. The divisions or sections of the Specifications and/or the arrangements of the drawings are not intended to control Developer in dividing the Work among Subcontractors or limit the work performed by any trade.

7.4 District's consent to, or approval of, or failure to object to, any Subcontractor under the Contract Documents shall not in any way relieve Developer of any obligations under the Contract Documents and no such consent shall be deemed to waive any provisions of the Contract Documents.

7.5 Developer is directed to familiarize itself with sections 1720 through 1861 of the Labor Code of the State of California, as regards the payment of prevailing wages and related issues, and to comply with all applicable requirements therein including, without limitation, section 1775 and Developer's and Subcontractors' obligations and liability for violations of prevailing wage law and other applicable laws.

7.6 Developer shall be responsible for the coordination of the trades, Subcontractors, sub-subcontractors, and material or equipment suppliers working on the Project.

7.6.1 Developer is responsible for ensuring that first-tier Subcontractors holding C-4, C-7, C-10, C-16, C-20, C-34, C-36, C-38, C-42, C-43, and/or C-46 licenses, are prequalified by the District to work on the Project pursuant to Public Contract Code section 20111.6.

7.6.2 Developer is responsible for ensuring that all Subcontractors are properly registered as public works contractors by the Department of Industrial Relations.

7.7 Developer is solely responsible for settling any differences between Developer and its Subcontractor(s) or between Subcontractors.

7.8 Developer must include in all of its subcontracts the assignment provisions indicated in the Termination section of these Construction Provisions.

8. Other Contracts/Contractors

8.1 District reserves the right to let other contracts, and/or to perform work with its own forces, in connection with the Project. Developer shall afford other contractors reasonable opportunity for introduction and storage of their materials and execution of their work and shall properly coordinate and connect Developer's Work with the work of other contractors.

8.2 Developer shall protect the work of any other contractor that Developer encounters while working on the Project.

8.3 If any part of Developer's Work depends for proper execution or results upon work of District or any other contractor, Developer shall visually inspect, and with reasonable effort, physically inspect all accessible portions of District's or any other contractor's work and, before proceeding with its Work, promptly report to the District in writing any defects in District's or any other contractor's work that render Developer's Work unsuitable for proper execution and results. Developer shall be held accountable for damages to District for District's or any other contractor's work that Developer failed to inspect or should have inspected. Developer's failure to inspect and report shall constitute Developer's acceptance of all District's or any other contractor's work as fit and proper for reception of Developer's Work, except as to defects that may develop in District's or any other contractor's work after execution of Developer's Work and not caused by execution of Developer's Work.

8.4 To ensure proper execution of its subsequent Work, Developer shall measure and inspect Work already in place and shall at once report to the District in writing any discrepancy between that executed Work and the Contract Documents.

8.5 Developer shall ascertain to its own satisfaction the scope of the Project and nature of District's or any other contracts that have been or may be awarded by District in prosecution of the Project to the end that Developer may perform under the Contract in light of the other contracts, if any.

8.6 Nothing herein contained shall be interpreted as granting to Developer exclusive occupancy of the Site, the Premises, or of the Project. Developer shall not cause any unnecessary hindrance or delay to the use and/or operation(s) of the Premises and/or to District or any other contractor working on the Project. If simultaneous execution of any contract or Premises operation is likely to cause interference with performance of Developer's obligations under the Contract Documents, Developer shall coordinate with those contractor(s), person(s), and/or entity(s) and shall notify the District of the resolution.

9. Drawings and Specifications

9.1 A complete list of all Drawings that form a part of the Contract Documents are to be found as an index on the Drawings themselves, and/or may be provided to Developer and/or in the Table of Contents.

9.2 Materials or Work described in words that so applied have a well-known technical or trade meaning shall be deemed to refer to recognized standards, unless noted otherwise.

9.3 Trade Name or Trade Term

It is not the intention of the Contract Documents to go into detailed descriptions of any materials and/or methods commonly known to the trade under "trade name" or "trade term." The mere mention or notation of "trade name" or "trade term" shall be considered a sufficient notice to Developer that it will be required to complete the work so named, complete, finished, and operable, with all its appurtenances, according to the best practices of the trade.

9.4 The naming of any material and/or equipment shall mean furnishing and installing of same, including all incidental and accessory items thereto and/or labor therefor, as per best practices of the trade(s) involved, unless specifically noted otherwise.

9.5 Contract Documents are complementary, and what is called for by one shall be binding as if called for by all. As such, Drawings and Specifications are intended to be fully cooperative and to agree. However, if Developer observes that Drawings and Specifications are in conflict with the Contract Documents, Developer shall promptly notify District and Architect in writing, and any necessary changes shall be made as provided in the Contract Documents.

9.6 Figured dimensions shall be followed in preference to scaled dimensions, and Developer shall make all additional measurements necessary for the work and shall be responsible for their accuracy. Before ordering any material or doing any work, each Developer shall verify all measurements at the building and shall be responsible for the correctness of same.

9.7 Should any question arise concerning the intent or meaning of the Contract Documents, including the Plans and Specifications, the question shall be submitted to the District for interpretation. If a conflict exists in the Contract Documents, these Construction Provisions shall control over the Facilities Lease, which shall control over the Site Lease, which shall control over Division 1 Documents, which shall control over Division 2 through Division 49 documents, which shall control over figured dimensions, which shall control over large-scale drawings, which shall control over small-scale drawings. In no case shall a document calling for lower quality and/or quantity of material or workmanship control. However, in the case of discrepancy or ambiguity solely between and among the Drawings and Specifications, the discrepancy or ambiguity shall be resolved in favor of the interpretation that will provide District with the functionally complete and operable Project described in the Drawings and Specifications.

9.8 Drawings and Specifications are intended to comply with all laws, ordinances, rules, and regulations of constituted authorities having jurisdiction, and where referred

to in the Contract Documents, the laws, ordinances, rules, and regulations shall be considered as a part of the Contract Documents within the limits specified.

9.9 As required by Section 4-317(c), Part 1, Title 24, CCR: "Should any existing conditions such as deterioration or non-complying construction be discovered which is not covered by the DSA-approved documents wherein the finished work will not comply with Title 24, California Code of Regulations, a construction change document, or a separate set of plans and specifications, detailing and specifying the required repair work shall be submitted to and approved by DSA before proceeding with the repair work."

9.10 Ownership of Drawings

All copies of Plans, Drawings, Designs, Specifications, and copies of other incidental architectural and engineering work, or copies of other Contract Documents furnished by District, are the property of District. They are not to be used by Developer in other work and, with the exception of signed sets of Contract Documents, are to be returned to District on request at completion of Work, or may be used by District as it may require without any additional costs to District. Neither Developer nor any Subcontractor, or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by the Architect. District hereby grants Developer, Subcontractors, sub-subcontractors, and material or equipment suppliers a limited license to use applicable portions of the Drawings prepared for the Project in the execution of their Work under the Contract Documents.

10. Developer's Submittals and Schedules

Developer's submittals shall comply with the provisions and requirements of the Specifications including, without limitation Submittals.

10.1 Schedule of Work, Schedule of Submittals, and Schedule of Values.

10.1.1 Developer shall comply with the construction schedule attached to the Facilities Lease as **Exhibit F** ("Construction Schedule"). [To be attached when available.]

10.1.2 Developer must provide all schedules both in hard copy and electronically, in a native format (e.g. Microsoft Project or Primavera) approved in advance by the District.

10.1.3 The District will review the schedules submitted and Developer shall make changes and corrections in the schedules as requested by the District and resubmit the schedules until approved by the District.

10.1.4 The District shall have the right at any time to discuss with Developer revisions to the schedule of values if, in the District's sole opinion, the schedule of values does not accurately reflect the value of the Work performed.

10.1.5 All schedules must be approved by the District before Developer can rely on them as a basis for payment.

10.1.6 Within TEN (10) calendar days after the date of the Notice to Proceed with Construction (unless otherwise specified in the Specifications), Developer shall prepare and submit to the District for review, in a form supported by sufficient data to substantiate its accuracy as the District may require:

10.1.6.1 Preliminary Schedule

A preliminary schedule of construction indicating the starting and completion dates of the various stages of the Work, including any information and following any form as may be specified in the Specifications. Once approved by District, this shall become the Construction Schedule. This schedule shall include and identify all tasks that are on the Project's critical path with a specific determination of the start and completion of each critical path task as well as all Contract milestones and each milestone's completion date(s) as may be required by the District.

10.1.6.1.1 The District is not required to approve a preliminary schedule of construction with early completion, i.e., one that shows early completion dates for the Work and/or milestones. Developer shall not be entitled to extra compensation if the District approves a Construction Schedule with an early completion date and Developer completes the Project beyond the date shown in the schedule but within the Contract Time. A Construction Schedule showing the Work completed in less than the Contract Time, the time between the early completion date and the end of the Contract Time shall be Float.

10.1.6.2 Preliminary Schedule of Values

A preliminary schedule of values for all of the Work, which must include quantities and prices of items aggregating the Guaranteed Maximum Price and must subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Unless the Special Conditions contain different limits, this preliminary schedule of values shall include, at a minimum, the following information and the following structure:

10.1.6.2.1 Divided into at least the following categories:

10.1.6.2.1.1 Overhead and profit

10.1.6.2.1.2 Supervision

10.1.6.2.1.3 General conditions

10.1.6.2.1.4 Layout

10.1.6.2.1.5 Mobilization

10.1.6.2.1.6 Submittals

10.1.6.2.1.7 Bonds and insurance

10.1.6.2.1.8 Close-out/Certification documentation

10.1.6.2.1.9 Demolition

10.1.6.2.1.10 Installation

10.1.6.2.1.11 Rough-in

10.1.6.2.1.12 Finishes

10.1.6.2.1.13 Testing

10.1.6.2.1.14 Punch list and District acceptance

10.1.6.2.2 And also divided by each of the following areas:

10.1.6.2.2.1 Site work

10.1.6.2.2.2 By each phase and/or building, as applicable

10.1.6.2.2.3 By each floor

10.1.6.2.3 The preliminary schedule of values shall not provide for values any greater than the following percentages of the Contract value:

10.1.6.2.3.1 Mobilization and layout combined to equal not more than 1%.

10.1.6.2.3.2 Submittals, samples and shop drawings combined to equal not more than 3%.

10.1.6.2.3.3 Bonds and insurance combined to equal not more than 2%.

10.1.6.2.3.4 Closeout documentation shall have a value in the preliminary schedule of not less than 3%.

10.1.6.2.4 Notwithstanding any provision of the Contract Documents to the contrary, payment of Developer's overhead, supervision, general conditions costs, and profit, as reflected in the Cost Breakdown, shall be paid based on percentage complete, with the disbursement of Progress Payments and the Final Payment.

10.1.6.2.5 Developer shall certify that the preliminary schedule of values as submitted to the District is accurate and reflects the costs as developed in preparing Developer's bid. For example, without limiting the foregoing, Developer shall not "front-load" the preliminary schedule of values with dollar amounts greater than the value of activities performed early in the Project.

10.1.6.2.6 The preliminary schedule of values shall be subject to the District's review and approval of the form and content thereof. In the event that the District objects to any portion of the preliminary schedule of values, the District shall notify Developer, in writing, of the District's objection(s) to the preliminary schedule of values. Within five (5) calendar days of the date of the District's written objection(s), Developer shall submit a revised preliminary schedule of values to the District for

review and approval. The foregoing procedure for the preparation, review and approval of the preliminary schedule of values shall continue until the District has approved the entirety of the preliminary schedule of values.

10.1.6.2.7 Once the preliminary schedule of values is approved by the District, this shall become the Schedule of Values. The Schedule of Values shall not be thereafter modified or amended by Developer without the prior consent and approval of the District, which may be granted or withheld in the sole discretion of the District.

10.1.6.3 Schedule of Values

The Developer shall provide for District review and approval prior to commencement of the Work a schedule of values for all of the Work, which includes quantities and prices of items aggregating the Guaranteed Maximum Price and subdivided into component parts as per specifications. The Schedule of Values shall not be modified or amended by the Developer without the prior consent and approval of the District, which may be granted or withheld in the sole discretion of the District. The District shall have the right at any time to revise the schedule of values if, in the District's sole opinion, the schedule of values does not accurately reflect the value of the Work performed.

10.1.6.4 Preliminary Schedule of Submittals

A preliminary schedule of submittals, including Shop Drawings, Product Data, and Samples submittals. Once approved by District, this shall become the Submittal Schedule. All submittals may be reviewed by District in ProCore and shall be forwarded to the Architect by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those submittals shall be forwarded to the District so as not to delay the Construction Schedule. Upon request by the District, Developer shall provide an electronic copy of all submittals to the District. All submittals shall be submitted no later than ninety (90) days after the Notice to Proceed with Construction.

10.1.6.5 Safety Plan

Developer's Safety Plan specifically adapted for the Project shall comply with the following requirements:

10.1.6.5.1 All applicable requirements of California Division of Occupational Safety and Health ("Cal/OSHA") and/or of the United States Occupational Safety and Health Administration ("OSHA").

10.1.6.5.2 All provisions regarding Project safety, including all applicable provisions in these Construction Provisions.

10.1.6.5.3 Developer's Safety Plan shall be in English and in the language(s) of Developer's and its Subcontractors' employees.

10.1.6.6 Complete Registered Subcontractor List

The name, address, telephone number, facsimile number, California State Contractors License number, classification, DIR registration number, and monetary value of all Subcontracts of any tier for parties furnishing labor, material, or equipment for completion of the Project.

10.2 Monthly Progress Schedule(s)

10.2.1 Developer shall provide Monthly Progress Schedule(s) to the District. A Monthly Progress Schedule shall update the approved Construction Schedule or the last Monthly Progress Schedule, showing all work completed and to be completed as well as updating the Registered Subcontractors List. The monthly Progress Schedule shall be sent as noted below and, if also requested by District, within the timeframe requested by the District and shall be in a format acceptable to the District and contain a written narrative of the progress of work that month and any changes, delays, or events that may affect the work. The process for District approval of the Monthly Progress Schedule shall be the same as the process for approval of the Construction Schedule.

10.2.2 Developer shall submit Monthly Progress Schedule(s) with all payment applications.

10.2.3 Developer must provide all schedules both in hard copy and electronically in a native format (e.g., Microsoft Project or Primavera), approved in advance by District.

10.2.4 District will review the schedules submitted and Developer shall make changes and corrections in the schedules as requested by the District and resubmit the schedules until approved by the District.

10.2.5 District shall have the right at any time to discuss with Developer revisions to the schedule of values if, in the District's sole opinion, the schedule of values does not accurately reflect the value of the Work performed.

10.2.6 All schedules must be approved by the District before Developer can rely on them as a basis for payment. District shall use best efforts to approve all submittals and schedules on or before fourteen (14) days after presentation of the same from Developer, providing there are no extenuating circumstances, and no such approval shall be unreasonably withheld by District.

10.3 Material Safety Data Sheets (MSDS)

Developer is required to ensure Material Safety Data Sheets are available in a readily accessible place at the Site for any material requiring a Material Safety Data Sheet per the federal "Hazard Communication" standard, or employees' "right to know" law. Developer is also required to ensure proper labeling on substances brought onto the job site and that any person working with the material or within the general area of the material is informed of the hazards of the substance and follows proper handling and protection procedures. Two additional copies of the Material Safety Data Sheets shall also be submitted directly to the District.

10.4 Submittals

10.4.1 Architect's favorable review shall neither be construed as a complete check nor relieve Developer, Subcontractor, manufacturer, fabricator, or supplier from responsibility for any deficiency that may exist or from any departures or deviations from the requirements of the Contract Documents unless Developer has, in writing, called Architect's attention to the deviations at the time of submission and the Architect has given specific written response. "Favorable review" shall mean merely that Architect has no objection to Developer using, upon Developer's own full responsibility, plan or method of Work proposed, or furnishing materials or equipment proposed.

11. Site Access, Conditions, And Requirements

11.1 Site Investigation

Developer has made a careful investigation of the Site and is familiar with the requirements of the Contract Documents and has accepted the readily observable, existing conditions of the Site.

11.2 Soils Investigation Report

When a soils investigation report obtained from test holes at Site or for the Project is available, that report may be made available to Developer but shall not be a part of this Contract but shall not alleviate or excuse Developer's obligation to perform its own investigation. Any information obtained from that report or any information given on Drawings as to subsurface soil condition or to elevations of existing grades or elevations of underlying rock is approximate only, is not guaranteed, does not form a part of this Contract, and Developer may not rely thereon. Developer acknowledges that it has made a visual examination of the Site and has made whatever tests Developer deems appropriate to determine underground condition of soil. Although any such report is not a part of this Contract, recommendations from the report may be included in the Drawings, Specifications, or other Contract Documents. It is Developer's sole responsibility to thoroughly review all Contract Documents, Drawings, and Specifications.

11.3 Access to Work

District and its representatives shall at all times have access to Work wherever it is in preparation or progress, including storage and fabrication. Developer shall provide safe and proper facilities for such access so that District's representatives may perform their functions. District shall provide Developer adequate advance notice for access to active construction zones such that Developer may provide for safety measures to District and representatives.

11.4 Layout and Field Engineering

11.4.1 All field engineering required for layout of this Work and establishing grades for earthwork operations shall be furnished by Developer at its expense. This Work shall be done by a qualified, California-registered civil engineer or licensed land surveyor approved in writing by District and Architect. Any required Record and/or As-Built Drawings of Site development shall be prepared by the approved civil engineer or licensed land surveyor.

11.4.2 Developer shall be responsible for having ascertained pertinent local conditions such as location, accessibility, and general character of the Site and for having satisfied itself as to the conditions under which the Work is to be performed. District shall not be liable for any claim for allowances because of Developer's error or negligence in acquainting itself with the conditions at the Site.

11.4.3 Developer shall protect and preserve established benchmarks and monuments and shall make no changes in locations without the prior written approval of District. Developer shall replace any benchmarks or monuments that are lost or destroyed subsequent to proper notification of District and with District's approval.

11.5 Utilities

Utilities shall be provided as indicated in the Specifications.

11.6 Sanitary Facilities

Sanitary facilities shall be provided as indicated in the Specifications.

11.7 Surveys

Developer shall provide surveys done by a California-licensed civil engineer or licensed land surveyor to determine locations of construction, grading, and site work as required to perform the Work.

11.8 Regional Notification Center

Developer, except in an emergency, shall contact the appropriate regional notification center at least two (2) days prior to commencing any excavation if the excavation will be conducted in an area or in a private easement that is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the District, and obtain an inquiry identification number from that notification center. No excavation shall be commenced and/or carried out by Developer unless an inquiry identification number has been assigned to Developer or any Subcontractor and Developer has given the District the identification number. Any damages arising from Developer's failure to make appropriate notification shall be at the sole risk and expense of Developer. Any delays caused by failure to make appropriate notification shall be at the sole risk of Developer and shall not be considered for an extension of the Contract Time.

11.9 Existing Utility Lines

11.9.1 Pursuant to Government Code section 4215, District assumes the responsibility for removal, relocation, and protection of main or trunk utility lines and facilities located on the construction Site at the time of commencement of construction under the Contract Documents with respect to any such utility facilities that are not identified in the Plans and Specifications. Developer shall not be assessed for liquidated damages for delay in completion of the Project caused by failure of District or the owner of a utility to provide for removal or relocation of such utility facilities.

11.9.2 Locations of existing utilities provided by District shall not be considered exact, but approximate within a reasonable margin and shall not

relieve Developer of its responsibilities to exercise reasonable care and to pay all costs of repair due to Developer's failure to do so. District shall compensate Developer for the costs of locating, repairing damage not due to the failure of Developer to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Plans and Specifications with reasonable accuracy, and for equipment necessarily idle during such work.

11.9.3 No provision herein shall be construed to preclude assessment against Developer for any other delays in completion of the Work. Nothing in this Article shall be deemed to require District to indicate the presence of existing service laterals, appurtenances, or other utility lines, within the exception of main or trunk utility lines. Whenever the presence of these utilities on the Site of the construction Project can be inferred from the presence of other visible facilities, such as buildings, meter junction boxes, on or adjacent to the Site of the construction.

11.9.4 If Developer, while performing Work under this Contract, discovers utility facilities not identified by District in Contract Plans and Specifications, Developer shall immediately notify the District and the utility in writing. In the event Developer fails to immediately provide notice and subsequently causes damage to the utility facilities, the cost of repair for damage to above-mentioned visible facilities shall be borne by Developer.

11.10 Notification

Developer understands, acknowledges and agrees that the purpose for prompt notification to the District pursuant to these provisions is to allow the District to investigate the condition(s) so that the District shall have the opportunity to decide how the District desires to proceed as a result of the condition(s). Accordingly, failure of Developer to promptly notify the District in writing, pursuant to these provisions, shall constitute Developer's waiver of any claim for damages or delay incurred as a result of the condition(s).

11.11 Hazardous Materials

Developer shall comply with all provisions and requirements of the Contract Documents related to hazardous materials including, without limitation, Hazardous Materials Procedures and Requirements.

11.12 No Signs

Neither Developer nor any other person or entity shall display any signs not required by law or the Contract Documents at the Site, fences, trailers, offices, or elsewhere on the Site without specific prior written approval of the District.

12. Trenches

12.1 Trenches Greater Than Five Feet

Pursuant to Labor Code section 6705, if the Guaranteed Maximum Price exceeds \$25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, Developer shall, in advance of excavation, promptly submit to the District and/or a registered civil or structural engineer employed by the District or Architect, a detailed plan showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

12.2 Excavation Safety

If such plan varies from the Shoring System Standards established by the Safety Orders, the plan shall be prepared by a registered civil or structural engineer, but in no case shall such plan be less effective than that required by the Safety Orders. No excavation of such trench or trenches shall be commenced until said plan has been accepted by the District or by the person to whom authority to accept has been delegated by the District.

12.3 No Tort Liability of District

Pursuant to Labor Code section 6705, nothing in this Article shall impose tort liability upon the District or any of its employees.

12.4 No Excavation without Permits

Developer shall not commence any excavation Work until it has secured all necessary permits including the required CalOSHA excavation/shoring permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

12.5 Discovery of Hazardous Waste and/or Unusual Conditions

12.5.1 Pursuant to Public Contract Code section 7104, if the Work involves digging trenches or other excavations that extend deeper than four feet below the Surface, Developer shall promptly, and before the following conditions are disturbed, notify the District, in writing, of any:

12.5.1.1 Material that Developer believes may be material that is hazardous waste, as defined in section 25117 of the Health and Safety Code, is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

12.5.1.2 Subsurface or latent physical conditions at the Site differing from those indicated.

12.5.1.3 Unknown physical conditions at the Project Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.

12.5.2 The District shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in Developer's cost of, or the time required for, performance of any part of the Work, shall issue a Change Order under the procedures described herein.

12.5.3 In the event that a dispute arises between District and Developer whether the conditions materially differ or cause a decrease or increase in Developer's cost of, or time required for, performance of any part of the Work, Developer shall not be excused from any scheduled completion date provided for by the Contract Documents but shall proceed with all work to be performed under the Contract Documents. Developer shall retain any and all rights provided either by the Contract Documents or by law that pertain to the resolution of disputes and protests.

13. Insurance and Bonds

13.1 Developer's Insurance

Developer shall comply with the insurance requirements as indicated in the Facilities Lease.

13.2 Contract Security – Bonds

13.2.1 Developer shall furnish two surety bonds issued by a California admitted surety insurer as follows:

13.2.1.1 Performance Bond

A bond in an amount at least equal to one hundred percent (100%) of Guaranteed Maximum Price as security for faithful performance of the Contract Documents.

13.2.1.2 Payment Bond

A bond in an amount at least equal to one hundred percent (100%) of the Guaranteed Maximum Price as security for payment of persons performing labor and/or furnishing materials in connection with this Contract.

13.2.2 Cost of bonds shall be included in the Guaranteed Maximum Price.

13.2.3 All bonds related to this Project shall be in the forms set forth in these Contract Documents and shall comply with all requirements of the Contract Documents, including, without limitation, the bond forms.

14. Warranty/Guarantee/Indemnity

14.1 Warranty/Guarantee

14.1.1 Developer shall obtain and preserve for the benefit of the District, manufacturer's warranties on materials, fixtures, and equipment incorporated into the Work.

14.1.2 In addition to guarantees and warranties required elsewhere, Developer shall, and hereby does guarantee and warrant all Work furnished on the job against all defects for a period of ONE (1) year after the later of the following dates, unless a longer period is provided for in the Contract Documents:

14.1.2.1 The acceptance by the District's governing board of the Work, subject to these General Conditions, or

14.1.2.2 The date that commissioning for the Project, if any, was completed.

14.1.3 If any work is not in compliance with the Drawings and Specifications, Developer shall repair or replace any and all of that Work, together with any other Work that may be displaced in so doing, that may prove defective in workmanship and/or materials within a ONE (1) year period from date of

completion as defined above, unless a longer period is provided for in the Contract Documents, without expense whatsoever to District.

14.1.4 In the event of failure of Developer and/or Surety to commence and pursue with diligence said replacements or repairs within ten (10) days after being notified in writing, Developer and Surety hereby acknowledge and agree that District is authorized to proceed to have defects repaired and made good at expense of Developer and/or Surety who hereby agree to pay costs and charges therefore immediately on demand.

14.1.5 If any work is not in compliance with the Drawings and Specifications and if in the opinion of District said defective work creates a dangerous condition or requires immediate correction or attention to prevent further loss to District or to prevent interruption of District operations, District will attempt to give the notice required above. If Developer or Surety cannot be contacted or neither complies with District's request for correction within a reasonable time as determined by District, District may, notwithstanding the above provision, proceed to make any and all corrections and/or provide attentions the District believes are necessary. The costs of correction or attention shall be charged against Developer and Surety of the guarantees or warranties provided in this Article or elsewhere in this Contract.

14.1.6 The above provisions do not in any way limit the guarantees or warranties on any items for which a longer guarantee or warranty is specified or on any items for which a manufacturer gives a guarantee or warranty for a longer period. Developer shall furnish to District all appropriate guarantee or warranty certificates as indicated in the Specifications or upon request by District.

14.1.7 Nothing herein shall limit any other rights or remedies available to District.

14.2 Indemnity

Developer shall indemnify the District as indicated in the Facilities Lease.

15. Time

15.1 Notice to Proceed with Construction

15.1.1 District may issue a Notice to Proceed with Construction ("NTP 2") within ninety (90) days from the date of the Notice of Award after Guaranteed Maximum Price. Once Developer has received the Notice to Proceed with Construction, Developer shall complete the Work within the period of time indicated in the Contract Documents.

15.1.2 In the event that the District desires to postpone issuing the Notice to Proceed with Construction beyond ninety (90) days from the date of the Notice of Award after Guaranteed Maximum Price, it is expressly understood that with reasonable notice to Developer, the District may postpone issuing the Notice to Proceed with Construction. It is further expressly understood by Developer that Developer shall not be entitled to any claim of additional compensation as a result of the postponement of the issuance of the Notice to Proceed with Construction.

15.1.3 If Developer believes that a postponement of issuance of the Notice to Proceed with Construction will cause a hardship to Developer, Developer may terminate the Contract. Developer's termination due to a postponement shall be by written notice to District within ten (10) days after receipt by Developer of District's notice of postponement. It is further understood by Developer that in the event that Developer terminates the Contract as a result of postponement by the District, the District shall only be obligated to pay Developer for the Work that Developer had performed at the time of notification of postponement.

15.2 Computation of Time / Adverse Weather

15.2.1 Developer will only be allowed a time extension for Adverse Weather conditions if requested by Developer in compliance with the time extension request procedures herein and only if all of the following conditions are met:

15.2.1.1 The weather conditions constitute Adverse Weather, as defined herein;

15.2.1.2 Developer can verify that the Adverse Weather caused delays in excess of five (5) hours of the indicated labor required to complete the scheduled tasks of Work on the day affected by the Adverse Weather;

15.2.1.3 Developer's crew is dismissed as a result of the Adverse Weather;

15.2.1.4 Said delay adversely affect the critical path in the Construction Schedule; and

15.2.1.5 Exceeds twelve (12) days of delay per year.

15.2.2 If the aforementioned conditions are met, a non-compensable day-for-day extension will only be allowed for those days in excess of those indicated herein.

15.2.3 Developer shall work seven (7) days per week, if necessary, irrespective of inclement weather, to maintain access and the Construction Schedule, and to protect the Work under construction from the effects of Adverse Weather, all at no further cost to the District.

15.2.4 The Contract Time has been determined with consideration given to the average climate weather conditions prevailing in the County in which the Project is located.

15.3 Hours of Work

15.3.1 Sufficient Forces

Developer and Subcontractors shall continuously furnish sufficient and competent work forces with the required levels of familiarity with the Project and skill, training and experience to ensure the prosecution of the Work in accordance with the Construction Schedule.

15.3.2 Performance During Working Hours

Work shall be performed during regular working hours as permitted by the appropriate governmental agency except that in the event of an emergency, or when required to complete the Work in accordance with job progress, Work may be performed outside of regular working hours with the advance written consent of the District and approval of any required governmental agencies.

15.3.3 No Work during State Testing

Developer shall, at no additional cost to the District and at the District's request, coordinate its Work to not disturb District students including, without limitation, not performing any Work when students at the Site are taking State or Federally-required tests. The District or District's Representative will provide Developer with a schedule of test dates concurrent with the District's issuance of the Notice to Proceed with Construction, or as soon as test dates are made available to the District.

15.4 Progress and Completion

15.4.1 Time of the Essence

Time limits stated in the Contract Documents are of the essence to the Contract Documents. By executing the Facilities Lease, Developer confirms that the Contract Time is a reasonable period for performing the Work.

15.4.2 No Commencement Without Insurance or Bonds

Developer shall not commence operations on the Project or elsewhere prior to the effective date of insurance and bonds. The date of commencement of the Work shall not be changed by the effective date of such insurance or bonds. If Developer commences Work without insurance and bonds, all Work is performed at Developer's peril and shall not be compensable until and unless Developer secures bonds and insurance pursuant to the terms of the Contract Documents and subject to District claim for damages.

15.5 Schedule

Developer shall provide to District, Construction Manager, and Architect a schedule in conformance with the Contract Documents and as required in these Construction Provisions.

15.6 Expeditious Completion

Developer shall proceed expeditiously with adequate forces and shall achieve Completion within the Contract Time.

16. Extensions of Time – Liquidated Damages, Excusable Delays

16.1 Liquidated Damages

Developer and District hereby agree that the exact amount of damages for failure to complete the Work within the time specified is extremely difficult or impossible to determine. If the Work is not completed within the time specified in the Contract Documents, it is understood that the District will suffer damage. It being impractical

and unfeasible to determine the amount of actual damage, it is agreed Developer shall pay to District as fixed and liquidated damages, and not as a penalty, the amount set forth in the Facilities Lease for each calendar day of delay in Completion. Developer and its Surety shall be liable for the amount thereof pursuant to Government Code section 53069.85.

16.2 Excusable Delay

16.2.1 Developer shall not be charged for liquidated damages because of any delays in completion of the Work which are not the fault of Developer or its Subcontractors, including without limitation acts of God as defined in Public Contract Code section 7105, acts of enemy, epidemics, and quarantine restrictions. Developer shall, within five (5) calendar days of beginning of any delay, including a Force Majeure event, notify District in writing of causes of delay including documentation and facts explaining the delay and the direct correlation between the cause and effect ("Notice of Delay"). If Developer fails to provide its written Notice of Delay within this timeframe, Developer waives, releases, and discharges any right to assert or claim any entitlement to an adjustment to the Guaranteed Maximum Price and/or the Contract Time based on circumstances giving rise to the asserted delay. District shall review the facts and extent of any delay and shall grant extension(s) of time for completing Work when, in its judgment, the findings of fact justify an extension. Extension(s) of time shall apply only to that portion of Work affected by delay and shall not apply to other portions of Work not so affected. An extension of time may only be granted if Developer has timely submitted the Construction Schedule as required herein.

16.2.2 Developer's Notice of Delay and request for a time extension pursuant to subparagraph 16.2 is a condition precedent to Developer's submittal of and/or entitlement to a claim pursuant to Article 25 of these Construction Provisions. Developer shall notify the District pursuant to the claims provisions in these Construction Provisions of any anticipated delay and its cause. Following submission of a claim, the District may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the Work might be delayed thereby.

16.2.3 In the event Developer requests an extension of Contract Time for unavoidable delay as set forth in subparagraph 16.2.1, such request shall be submitted in accordance with the provisions in the Contract Documents governing changes in Work, including without limitation, the time requirements set forth in subsection 17.5, below. When requesting time, requests must be submitted with full justification and documentation. If Developer fails to submit justification, it waives its right to a time extension at a later date. Such justification must be based on the official Construction Schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the Scope of Work. Any request for a time extension must include the following information as support, without limitation:

16.2.3.1 The duration of the activity relating to the changes in the Work and the resources (manpower, equipment, material, etc.) required to perform the activities within the stated duration.

16.2.3.2 Specific logical ties to the Contract Schedule for the proposed changes and/or delay showing the activity/activities in the Construction Schedule that are affected by the change and/or delay. In particular, Developer must show an actual impact to the schedule, after making a good faith effort to mitigate the delay by rescheduling the work, by providing an analysis of the schedule ("Time Impact Analysis"). Such Time Impact Analysis shall describe in detail the cause and effect of the delay and the impact on the critical dates in the Project schedule. (This information must be provided for any portion of any delay of seven (7) days or more.)

16.2.3.3 A recovery schedule must be submitted within twenty (20) calendar days of written notification to the District of causes of delay.

16.2.4 Developer must comply with requirements in subsection 16.2 for a Notice of Delay and supporting justification notwithstanding Developer contends the specific delay period is unknown and continuing. When submitting a Notice of Delay and supporting justification, Developer must provide an estimated delay duration to critical path activities at the time the Notice of Delay and supporting justification is required to be submitted. If Developer contends the delaying event(s) are continuing, Developer must update monthly the estimated delay period with supporting justification.

16.2.5 Developer's failure to timely submit a written Notice of Delay and/or provide the justification required in subparagraph 16.2 shall constitute Developer's waiver of any right to later submit a Proposed Change Order or pursue a Claim on the circumstances giving rise to the request, or to later pursue any additional money or time extensions in any manner related to that issue, regardless of the merits. Developer will not have satisfied a condition precedent or exhausted administrative remedies required to show entitlement to a Contract Time adjustment. Developer acknowledges that these written notices and justification requirements are critically important to District's Work, Project management, and evaluating potential options and alternatives to implement mitigation efforts to reduce or eliminate additional Project costs and delays.

16.3 No Additional Compensation for Delays within Developer's Control

16.3.1 Developer is aware that governmental agencies and utilities, including, without limitation, the Division of the State Architect, the Department of General Services, gas companies, electrical utility companies, water districts, and other agencies may have to approve Developer-prepared drawings or approve a proposed installation. Accordingly, Developer has included in the Guaranteed Maximum Price, time for possible review of its drawings and for reasonable delays and damages that may be caused by such agencies, including without limitation delays due to California Environmental Quality Act ("CEQA") compliance. Thus, Developer is not entitled to make a claim for damages for delays arising from the review of Developer's drawings.

16.3.2 Developer shall only be entitled to compensation for delay when all of the following conditions are met:

16.3.2.1 The District is responsible for the delay;

16.3.2.2 The delay is unreasonable under the circumstances involved;

16.3.2.3 The delay was not within the contemplation of the District and Developer;

16.3.2.4 The delay could not have been avoided or mitigated by reasonable diligence; and

16.3.2.5 Developer timely complies with the claims procedure of the Contract Documents.

16.3.3 Where a change in the Work extends the Contract Time, Developer may request and recover additional, actual direct costs, provided that Developer can demonstrate such additional costs are:

16.3.3.1 Actually incurred performing the Work;

16.3.3.2 Not compensated by the Markup allowed; and

16.3.3.3 Directly result from the extended Contract Time.

16.3.4 Developer shall comply with all required procedures, documentation and time requirements in the Contract Documents. Developer may not seek or recover such costs using formulas (e.g. Eichleay, labor factors).

16.4 Force Majeure

"Force Majeure" means any event or circumstance unknown at the time of contracting that is beyond the parties' control and makes performance of the contract impractical or impossible. The Party seeking to have its performance obligation(s) excused must demonstrate that there was such an insuperable interference occurring without the party's intervention as could not have been prevented by the exercise of prudence, diligence, and care, by providing prompt notice to the other Party, including full particulars of such event, of its inability to perform its obligations due to such event, following commencement of the claiming Party's inability to so perform its obligations. To the extent satisfying these conditions, Force Majeure events include the following: acts of God, war, civil unrest, epidemic, fire, smoke, volcanic eruption, earthquake, strike, unusually severe weather, flood, or shortage of transportation facilities, lock out, or commandeering of materials, product, plant, or facilities by the government. Force Majeure shall not be based on a Party's financial inability to perform under this Agreement unless there exists extreme and unreasonable difficulty, expense, injury, or loss involved. A Force Majeure event does not include an act of negligence or intentional wrongdoing by a Party. Any Party claiming a Force Majeure event shall use reasonable diligence to remove the condition that prevents performance and shall not be entitled to suspend performance of its obligations in any greater scope or for any longer duration than is required by the Force Majeure event. Each Party shall use its best efforts to mitigate the effects of such Force Majeure event, remedy its inability to perform, and resume full performance of its obligations hereunder. No obligation that arose before the Force Majeure event that could and should have been fully performed before such Force Majeure event is excused as a result of such Force Majeure event.

16.5 Float or Slack in the Schedule

Float or slack is the amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any of the activities in the

schedule. Float or slack is not for the exclusive use of or benefit of either the District or Developer, but its use shall be determined solely by the District.

17. Changes in the Work

17.1 No Changes without Prior Authorization

17.1.1 There shall be no change whatsoever in the Drawings, Specifications, or in the Work without an executed Change Order or a written Construction Change Directive authorized by the District as herein provided. District shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the District's governing board has authorized the same and the cost thereof has been approved in writing by Change Order or Construction Change Directive in advance of the changed Work being performed. No extension of time for performance of the Work shall be allowed hereunder unless a request for such extension is made at the time changes in the Work are ordered, and such time duly adjusted and approved in writing in the Change Order or Construction Change Directive. The provisions of the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications.

17.1.2 Developer shall perform immediately all work that has been authorized by a fully executed Change Order or Construction Change Directive. Developer shall be fully responsible for any and all delays and/or expenses caused by Developer's failure to expeditiously perform this Work.

17.1.3 Should any Change Order result in an increase in the Guaranteed Maximum Price or extend the Contract Time, the cost of or length of extension in that Change Order shall be agreed to, in writing, by the District in advance of the work by Developer. In the event that Developer proceeds with any change in Work without a Change Order executed by the District or Construction Change Directive, Developer waives any claim of additional compensation or time for that additional work. Under no circumstances shall Developer be entitled to any claim of additional compensation or time not expressly requested by Developer in a Proposed Change Order or approved by District in an executed Change Order.

17.1.4 A Change Order or Construction Change Directive will become effective when approved by the Board, notwithstanding that Developer has not signed it. A Change Order or Construction Change Directive will become effective without Developer's signature provided District indicates it as a "Unilateral Change Order". Any dispute as to the adjustment in the Guaranteed Maximum Price or Contract Time, if any, of the Unilateral Change Order shall be resolved pursuant to the Payment and Claims and Disputes provisions herein.

17.1.5 Developer understands, acknowledges, and agrees that the reason for District authorization is so that District may have an opportunity to analyze the Work and decide whether the District shall proceed with the Change Order or alter the Project so that a change in Work becomes unnecessary.

17.2 Architect Authority

The Architect will have authority to order minor changes in the Work not involving any adjustment in the Guaranteed Maximum Price, or an extension of the Contract Time, or a change that is inconsistent with the intent of the Contract Documents. These changes shall be effected by written Change Order, Construction Change Directive, or by Architect's response(s) to RFI(s), or by Architect's Supplemental Instructions ("ASI").

17.3 Change Orders

17.3.1 A Change Order is a written instrument prepared and issued by the District and/or the Architect and signed by the District (as authorized by the District's Board of Education), Developer, the Architect, and approved by the Project Inspector (if necessary) and DSA (if necessary), stating their agreement regarding all of the following:

17.3.1.1 A description of a change in the Work.

17.3.1.2 The amount of the adjustment in the Guaranteed Maximum Price, if any; and

17.3.1.3 The extent of the adjustment in the Contract Time, if any.

17.4 Proposed Change Order

17.4.1 Definition of Proposed Change Order

A Proposed Change Order ("PCO") is a written request prepared by the Developer requesting that the District and the Architect issue a Change Order based upon a proposed change to the Work, to the Guaranteed Maximum Price, and/or to the Contract Time.

17.4.2 Changes in Guaranteed Maximum Price

A PCO shall include breakdowns and backup documentation pursuant to the provisions herein and sufficient, in the District's judgment, to validate any change in Guaranteed Maximum Price. In no case shall Developer or any of its Subcontractors be permitted to reserve rights for additional compensation for Change Order Work.

17.4.3 Changes in Time

A PCO shall also include any changes in time required to complete the Project. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the critical path in the Construction Schedule as defined in the Contract Documents. Developer shall justify the proposed change in time by submittal of a schedule analysis that accurately shows the actual impact, if known, or the estimated impact if unknown, of the change on the critical path of the Construction Schedule ("Time Impact Analysis"). If Developer fails to request a time extension in a PCO, including the Time Impact Analysis, and/or fails to comply with these Construction Provisions including, without limitation, Articles 15, 16, or 17, then Developer is thereafter precluded from requesting, and waives any right to request, an adjustment to the Contract Time or Guaranteed Maximum Price

relating to the subject matter of the PCO. In no case shall Developer or any of its Subcontractors be permitted to reserve rights for additional time for Change Order Work. A PCO that leaves the amount of time requested blank, or states that such time requested is "to be determined," or otherwise not specifically identified, is not permitted and shall also constitute a waiver of any right to request additional time and/or claim a delay.

17.4.4 Allowances

If there is an Allowance, then Developer shall not bill for or be due any portion of an Allowance unless the District has identified specific work, Developer has submitted a price for that work or the District has proposed a price for that work, the District has accepted the cost for that work, and the District has executed an Allowance Expenditure Directive incorporating that work. Allowance Expenditure Directives shall be based on Developer's costs, without overhead and profit, for products, delivery, installation, labor, insurance, payroll, taxes, bonding and equipment rental will be included in Allowance Expenditure Directive authorizing expenditure of funds from the Allowance. No overhead and profit shall be added to the Allowance Expenditure Directive.

Any unused portion of the Allowance will revert to the District documented by a deductive Change Order. Developer authorizes the District to execute a unilateral deductive Change Order at or near the end of the Project for all or any portion of the Allowance not allocated.

17.4.5 Unknown and / or Unforeseen Conditions

Separate from what is provided in the Allowance, if requests an increase in Guaranteed Maximum Price and/or Contract Time that is based at least partially on Developer's assertion that Developer has encountered unknown and/or unforeseen condition(s) on the Project, then Developer shall base the PCO on provable information that, beyond a reasonable doubt and to the District's satisfaction, demonstrates that the unknown and/or unforeseen condition(s) were actually unknown and/or unforeseen and that the condition(s) were reasonably unknown and/or unforeseen. If not, the District shall deny the PCO as unsubstantiated, and the Developer shall complete the Project without any increase in Guaranteed Maximum Price and/or Contract Time based on that PCO.

17.4.6 Time to Submit Proposed Change Order

Developer shall submit its PCO, using the Proposed Change Order Form, within five (5) working days of the date Developer discovers, or reasonably should have discovered, the circumstances giving rise to the PCO, unless additional time to submit a PCO is granted in writing by the District. Time is of the essence in Developer's submission of PCOs so that the District can promptly investigate the basis for the PCO. Accordingly, if Developer fails to submit its PCO within this timeframe, Developer waives, releases, and discharges any right to assert or claim any entitlement to an adjustment of the Guaranteed Maximum Price and/or Contract Time based on circumstances giving rise to the PCO.

17.4.7 Proposed Change Order Certification

In submitting a PCO, Developer certifies and affirms that the cost and/or time request is submitted in good faith, that the cost and/or time request is accurate

and in accordance with the provisions of the Contract Documents, and Developer submits the cost and/or request for extension of time recognizing the significant civil penalties and treble damages which follow from making a false claim or presenting a false claim under Government Code section 12650 et seq.

It is expressly understood that the value of the extra Work or changes expressly includes any and all of Developer's costs and expenses, direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project including, without limitation, cumulative impacts. Developer is not entitled to separately recover amounts for overhead or other indirect costs. Any costs, expenses, damages, or time extensions not included are deemed waived.

17.5 Format for Proposed Change Order

17.5.1 The following format shall be used as applicable by the District and Developer (e.g. Change Orders, PCOs) to communicate proposed additions and/or deductions to the Contract, supported by attached documentation. Any spaces left blank will be deemed no change to cost or time.

| | WORK PERFORMED OTHER THAN BY DEVELOPER | ADD | DEDUCT |
|-----|---|----------------------------|---------------|
| (a) | Material (attach suppliers' invoice or itemized quantity and unit cost plus sales tax) | | |
| (b) | Add Labor (attach itemized hours and rates, fully Burdened, and specify the hourly rate for each additional labor burden, for example, payroll taxes, fringe benefits, etc.) | | |
| (c) | Add Equipment (attach suppliers' invoice) | | |
| (d) | Subtotal | | |
| (e) | Add Overhead and Profit for any and all tiers of Subcontractors , the total not to exceed ten percent (10%) of Item (d) | | |
| (f) | Subtotal | | |
| (g) | Add General Conditions Cost (if Time is Compensable) (attach supporting documentation) | | |
| (h) | Subtotal | | |
| (i) | Add Overhead and Profit for Developer , not to exceed _____ percent (____ %) of Item (h) | | |
| (j) | Subtotal | | |
| (k) | Add Bond and Insurance , not to exceed _____ percent (____ %) of Item (j) | | |
| (l) | TOTAL | | |
| (m) | Time (zero unless indicated; "TBD" not permitted) | _____ Calendar Days | |

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| | WORK PERFORMED BY DEVELOPER | ADD | DEDUCT |
|-----|---|------------|----------------------|
| (a) | Material (attach itemized quantity and unit cost plus sales tax) | | |
| (b) | Add Labor (attach itemized hours and rates, fully Burdened, and specify the hourly rate for each additional labor burden, for example, payroll taxes, fringe benefits, etc.) | | |
| (c) | Add Equipment (attach suppliers' invoice) | | |
| (d) | Add General Conditions Cost (if Time is Compensable) (attach supporting documentation) | | |
| (e) | Subtotal | | |
| (f) | Add Overhead and Profit for Developer , not to exceed _____ percent (____ %) of Item (e) | | |
| (g) | Subtotal | | |
| (h) | Add Bond and Insurance , not to exceed _____ percent (____ %) of Item (g) | | |
| (i) | TOTAL | | |
| (j) | Time (zero unless indicated; "TBD" not permitted) | | Calendar Days |

17.5.2 Mandatory Use of Forms

Developer shall only submit PCOs by completing the Proposed Change Order Form. Developer acknowledges and agrees that use of this specific and consistent format is essential to District's evaluation of PCOs. Accordingly, Developer waives, releases, and discharges any right to assert or claim any entitlement to an adjustment of the Guaranteed Maximum Price and/or Time for any purported PCO that does not comply with the Proposed Change Order Form.

17.5.3 Labor

Developer shall be compensated for the costs of labor actually and directly utilized in the performance of the Work. Such labor costs shall be the actual cost, use of any formulas (e.g. labor factors) is not allowed, not to exceed prevailing wage rates in the locality of the Site and shall be in the labor classification(s) necessary for the performance of the Work, fully Burdened. Labor costs shall exclude costs incurred by the Developer in preparing estimate(s) of the costs of the change in the Work, in the maintenance of records relating to the costs of the change in the Work, coordination and assembly of materials and information relating to the change in the Work or performance thereof, or the supervision and other overhead and general conditions costs associated with the change in the Work or performance thereof, including but not limited to the cost for the job superintendent. If applicable, District will pay Developer the reasonable costs for room and board, supported with appropriate backup documentation, without markup for profit or overhead as provided by U.S. General Services Administration per diem rates for California lodging, meals and incidentals, <https://www.gsa.gov/travel/plan-book/per-diem-rates/per-diem-rates-lookup>.

17.5.4 Materials

Developer shall be compensated for the costs of materials necessarily and actually used or consumed in connection with the performance of the change in the Work. Costs of materials may include reasonable costs of transportation from a source closest to the Site of the Work and delivery to the Site. If discounts by material suppliers are available for materials necessarily used in the performance of the change in the Work, they shall be credited to the District. If materials necessarily used in the performance of the change in the Work are obtained from a supplier or source owned in whole or in part by Developer, compensation therefor shall not exceed the current wholesale price for such materials. If, in the reasonable opinion of the District, the costs asserted by Developer for materials in connection with any change in the Work are excessive, or if Developer fails to provide satisfactory evidence of the actual costs of such materials from its supplier or vendor of the same, the costs of such materials and the District's obligation to pay for the same shall be limited to the then lowest wholesale price at which similar materials are available in the quantities required to perform the change in the Work. The District may elect to furnish materials for the change in the Work, in which event Developer shall not be compensated for the costs of furnishing such materials or any mark-up thereon.

17.5.5 Equipment

As a precondition to the District's duty to pay for Equipment rental or loading and transportation, Developer shall provide satisfactory evidence of the actual costs of Equipment from the supplier, vendor or rental agency of same. Developer shall be compensated for the actual cost of the necessary and direct use of Equipment in the performance of the change in the Work. Use of Equipment in the performance of the change in the Work shall be compensated in increments of fifteen (15) minutes. Rental time for Equipment moved by its own power shall include time required to move the Equipment to the site of the Work from the nearest available rental source of the same. If Equipment is not moved to the Site by its own power, Developer will be compensated for the loading and transportation costs in lieu of rental time. The foregoing notwithstanding, neither moving time or loading and transportation time shall be allowed if the Equipment is used for performance of any portion of the Work other than the change in the Work. Unless prior approval in writing is obtained by Developer from the Architect, the Project Inspector, the Construction Manager and the District, no costs or compensation shall be allowed for time while Construction Equipment is inoperative, idle or on standby, for any reason. Developer shall not be entitled to an allowance or any other compensation for Equipment or tools used in the performance of a change in the Work where the Equipment or tools have a replacement value of \$500.00 or less. Equipment costs claimed by Developer in connection with the performance of any Work shall not exceed rental rates established by distributors or construction equipment rental agencies in the locality of the Site; any costs asserted which exceed such rental rates shall not be allowed or paid. Unless otherwise specifically approved in writing by the Architect, the Project Inspector, Construction Manager and the District, the allowable rate for the use of Equipment in connection with the Work shall constitute full compensation to Developer for the cost of rental, fuel, power, oil, lubrication, supplies, necessary attachments, repairs or maintenance of any kind, depreciation, storage,

insurance, labor (exclusive of labor costs of the Equipment operator), and any and all other costs incurred by Developer incidental to the use of the Equipment.

17.5.6 General Conditions Cost.

The phrase "General Conditions Cost" shall mean, other than expressly limited or excluded herein, the costs of Developer during the construction phase, including but not limited to: payroll costs for project manager for Work conducted at the Site, payroll costs for the superintendent and full-time general foremen, workers not included as direct labor costs engaged in support functions (e.g., loading/unloading, clean-up), costs of offices and temporary facilities including office materials, office supplies, office equipment, minor expenses, utilities, fuel, sanitary facilities and telephone services at the Site, costs of consultants not in the direct employ of Developer or Subcontractors, and fees for permits and licenses.

17.5.7 Overhead and Profit.

The phrase "Overhead and Profit" shall include field and office supervisors and assistants, watchperson, use of small tools, consumable, insurance other than construction bonds and insurance required herein, and general conditions, field and home office expenses.

17.6 Change Order Certification

17.6.1 All Change Orders and PCOs must include the following certification by Developer, either in the form specifically or incorporated by this reference:

The undersigned Developer approves the foregoing as to the changes, if any, and to the Guaranteed Maximum Price specified for each item and as to the extension of time allowed, if any, for completion of the entire Work as stated herein, and agrees to furnish all labor, materials, and service, and perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of sums which have no basis in fact or which Developer knows are false are at the sole risk of Developer and may be a violation of the False Claims Act set forth under Government Code section 12650 et seq. and U.S. Criminal Code, 18 U.S.C. § 1001. It is understood that the changes herein to the Contract Documents shall only be effective when approved by the governing board of the District.

It is expressly understood that the value of the extra Work or changes expressly includes any and all of Developer's costs and expenses, both direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project, including, without limitation, cumulative impacts. Developer is not entitled to separately recover amounts for overhead or other indirect costs. Any costs, expenses, damages, or time extensions not included are deemed waived.

17.6.2 Accord and Satisfaction: Developer's execution of any Change Order shall constitute a full accord and satisfaction, and release, of all Developer (and if applicable, Subcontractor) claims for additional time, money or other relief arising from or relating to the subject matter of the change including, without

limitation, impacts of all types, cumulative impacts, inefficiency, overtime, delay and any other type of claim.

17.6.3 Mandatory Use of Forms: Developer shall only submit Change Orders by completing the Change Order Form. Developer acknowledges and agrees that use of this specific and consistent format is essential to District's processing of Change Orders. Accordingly, Developer waives, releases, and discharges any right to assert or claim any entitlement to an adjustment of the Guaranteed Maximum Price and/or Time for any change that does not comply with the Change Order Form.

17.7 Determination of Change Order Cost

17.7.1 The amount of the increase or decrease in the Guaranteed Maximum Price from a Change Order, if any, shall be determined in one or more of the following ways as applicable to a specific situation and at the District's discretion:

17.7.1.1 District acceptance of a COR or PCO.

17.7.1.2 By amounts contained in Developer's schedule of values, if applicable.

17.7.1.3 By agreement between District and Developer.

17.8 Deductive Change Orders

All deductive Change Order(s) must be prepared pursuant to the provisions herein. Where a portion of the Work is deleted from the Contract, the reasonable value of the deleted work less the value of any new work performed shall be considered the appropriate deduction. The value submitted on the Schedule of Values shall be used to calculate the credit amount unless the bid documentation is being held in escrow as part of the Contract Documents. Unit Prices, if any, may be used in District's discretion in calculating reasonable value. If Developer offers a proposed amount for a deductive Change Order(s) for work performed, Developer shall include a credit for total profit and overhead less proof of expended costs related to the deleted work with the Change Order(s). If Subcontractor work is involved, Subcontractors shall also include a credit for total profit and overhead less proof of expended costs related to the deleted work with the Change Order(s). Any deviation from this provision shall not be allowed.

17.9 Addition or Deletion of Alternate Bid Item(s)

If Developer's Proposal includes proposal(s) for Alternate Bid Item(s), during Developer's performance of the Work, the District may elect to add or delete any such Alternate Bid Item(s) if not included in the Contract at the time the Guaranteed Maximum Price is agreed upon. If the District elects to add or delete Alternate Bid Item(s) after Contract award, the cost or credit for such Alternate Bid Item(s) shall be as set forth in the Proposal unless the parties agree to a different price and the Contract Time shall be adjusted by the number of days allocated in the Contract Documents. If days are not allocated in the Contract Documents, the Contract Time shall be equitably adjusted.

17.10 Discounts, Rebates, and Refunds

For purposes of determining the cost, if any, of any change, addition, or omission to the Work hereunder, all trade discounts, rebates, refunds, and all returns from the sale of surplus materials and equipment shall accrue and be credited to Developer, Developer shall make provisions so that such discounts, rebates, refunds, and returns may be secured, and the amount thereof shall be allowed as a reduction of Developer's cost in determining the actual cost of construction for purposes of any change, addition, or omission in the Work as provided herein.

17.11 Construction Change Directives

17.11.1 A Construction Change Directive is a written order prepared and issued by the District, the Construction Manager, and/or the Architect and signed by the District and the Architect, directing a change in the Work. The District may, as provided by law, by Construction Change Directive and without invalidating the Contract, order changes in the Work consisting of additions, deletions, or other revisions. The adjustment to the Guaranteed Maximum Price or Contract Time, if any, is subject to the provision of this section regarding Changes in the Work. If all or a portion of the Project is being funded by funds requiring approval by the State Allocation Board ("SAB"), these revisions may be subject to compensation once approval of same is received and funded by the SAB, and funds are released by the Office of Public School Construction ("OPSC"). Any dispute as to the adjustment of the Guaranteed Maximum Price, if any, of the Construction Change Directive or timing of payment shall be resolved pursuant to the Payment and Claims and Disputes provisions herein.

17.11.2 The District may issue a Construction Change Directive in the absence of agreement on the terms of a Change Order.

17.12 Force Account Directives

17.12.1 When work, for which a definite price has not been agreed upon in advance, is to be paid for on a force account basis, all direct costs necessarily incurred and paid by Developer for labor, material, and equipment used in the performance of that Work, shall be subject to the approval of the District and compensation will be determined as set forth herein.

17.12.2 District will issue a Force Account Directive to proceed with the Work on a force account basis, and a not-to-exceed budget will be established by the District.

17.12.3 All requirements regarding direct cost for labor, labor burden, material, equipment, and markups on direct costs for overhead and profit described in this section shall apply to Force Account Directives. However, the District will only pay for actual costs verified in the field by the District or its authorized representative(s) on a daily basis.

17.12.4 Developer shall be responsible for all costs related to the administration of Force Account Directives. The markup for overhead and profit for Developer modifications shall be full compensation to Developer to administer Force Account Directives, and Developer shall not be entitled to separately recover additional amounts for overhead and/or profit.

17.12.5 Developer shall notify the District or its authorized representative(s) at least twenty-four (24) hours prior to proceeding with any of the force account work. Furthermore, Developer shall notify the District when it has consumed eighty percent (80%) of the budget and shall not exceed the budget unless specifically authorized in writing by the District. Developer will not be compensated for force account work in the event that Developer fails to timely notify the District regarding the commencement of force account work or exceeding the force account budget.

17.12.6 Developer shall diligently proceed with the work, and on a daily basis, submit a daily force account report using the Daily Force Account Report form no later than 5:00 p.m. each day. The report shall contain a detailed itemization of the daily labor, material, and equipment used on the force account work only. The names of the individuals performing the force account work shall be included on the daily force account reports. The type and model of equipment shall be identified and listed. The IOR or District representative will review the information contained in the reports, and sign the reports no later than the next work day, and return a copy of the report to Developer for its records. The District will not sign, nor will Developer receive compensation for, work the District cannot verify. Developer will provide a weekly force account summary indicating the status of each Force Account Directive in terms of percent complete of the not-to-exceed budget and the estimated percent complete of the work

17.12.7 In the event Developer and the District reach a written agreement on a set cost for the work while the work is proceeding based on a Force Account Directive, Developer's signed daily force account reports shall be discontinued and all previously signed reports shall be invalid.

17.13 Price Request

17.13.1 Definition of Price Request

A Price Request is a written request prepared by the Architect or Construction Manager requesting Developer submit to the District, the Construction Manager and the Architect an estimate of the effect of a proposed change in the Work on the Guaranteed Maximum Price and the Contract Time.

17.13.2 Scope of Price Request

A Price Request shall contain adequate information, including any necessary Drawings and Specifications, to enable Developer to provide the cost breakdowns required. Developer shall not be entitled to any additional compensation for preparing a response to a Price Request, whether ultimately accepted or not.

17.14 Accounting Records

With respect to portions of the Work performed by Change Orders and Construction Change Directives, Developer shall keep and maintain cost-accounting records satisfactory to the District, including, without limitation, Job Cost Reports as provided in these General Conditions, which shall be available to the District on the same terms as any other books and records Developer is required to maintain under the Contract Documents. Such records shall include without limitation hourly records for Labor and

Equipment and itemized records of materials and Equipment used that day in connection with the performance of any Work. All records maintained hereunder shall be subject to inspection, review and/or reproduction by the District, the Construction Manager and the Architect or the Project Inspector upon request. In the event that Developer fails or refuses, for any reason, to maintain or make available for inspection, review and/or reproduction such records, the District's determination of the extent of adjustment to the Guaranteed Maximum Price shall be final, conclusive, dispositive and binding upon Developer.

17.15 Notice Required

If Developer desires to make a claim for an increase in the Guaranteed Maximum Price, or any extension in the Contract Time for completion, it shall notify the District pursuant to the provisions herein, including the Article on Claims and Disputes. No claim shall be considered unless made in accordance with this subparagraph. Developer shall proceed to execute the Work even though the adjustment may not have been agreed upon. Any change in the Guaranteed Maximum Price or extension of the Contract Time resulting from such claim shall be authorized by a Change Order.

17.16 Applicability to Subcontractors

Any requirements under this Article shall be equally applicable to Change Orders or Construction Change Directives issued to Subcontractors by Developer to the extent required by the Contract Documents.

17.17 Alteration to Change Order Language

Developer shall not alter Change Orders or reserve time in Change Orders. Change Orders altered in violation of this provision, if in conflict with the terms set forth herein, shall be construed in accordance with the terms set forth herein. Developer shall execute finalized Change Orders and proceed under the provisions herein with proper notice.

17.18 Failure of Developer to Execute Change Order

Developer shall be in default of the Contract Documents if Developer fails to execute a Change Order when Developer agrees with the addition and/or deletion of the Work in that Change Order.

18. Requests For Information

18.1 Any Request for Information shall reference all applicable Contract Document(s), including Specification section(s), detail(s), page number(s), drawing number(s), and sheet number(s), etc. Developer shall make suggestions and interpretations of the issue raised by each Request for Information. A Request for Information cannot modify the Guaranteed Maximum Price, Contract Time, or the Contract Documents.

18.2 Developer may be responsible for any costs incurred for professional services that District may deduct from any amounts owing to Developer, if a Request for Information requests an interpretation or decision of a matter where the information sought is equally available to the party making the request. District may deduct from and/or invoice Developer for professional services arising therefrom.

19. Payments

19.1 Guaranteed Maximum Price

As compensation for Developer's construction of the Project, the District shall pay Developer pursuant to the terms of **Exhibit C** to the Facilities Lease. This is the total amount payable by the District to Developer for performance of the Work under the Contract.

19.2 Applications for Tenant Improvement Payments

19.2.1 Procedure for Applications for Tenant Improvement Payments

19.2.1.1 Not before the fifth (5th) day of each calendar month during the progress of the Work, Developer shall submit to the District and the Architect an itemized Application for Payment for operations completed in accordance with the Schedule of Values. Such application shall be on a form approved by the District and shall be notarized, if required, and supported by the following or each portion thereof unless waived by the District in writing:

19.2.1.1.1 The amount paid to the date of the Application for Payment to Developer, to all its Subcontractors, and all others furnishing labor, material, or equipment under the Contract Documents.

19.2.1.1.2 The amount being requested under the Application for Payment by Developer on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract Documents.

19.2.1.1.3 The balance that will be due to each of such entities after said payment is made.

19.2.1.1.4 A certification that the As-Built Drawings and annotated Specifications are current.

19.2.1.1.5 Itemized breakdown of work done for the purpose of requesting partial payment.

19.2.1.1.6 An updated and acceptable construction schedule in conformance with the provisions herein.

19.2.1.1.7 The additions to and subtractions from the Guaranteed Maximum Price and Contract Time.

19.2.1.1.8 A total of the retentions held.

19.2.1.1.9 Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the District may require from time to time.

19.2.1.1.10 The percentage of completion of Developer's Work by line item.

19.2.1.1.11 Schedule of Values updated from the preceding Application for Payment.

19.2.1.1.12 A duly completed and executed conditional waiver and release upon Tenant Improvement Payment compliant with Civil Code section 8132 from Developer and each subcontractor of any tier and supplier to be paid from the current Tenant Improvement Payment.

19.2.1.1.13 A duly completed and executed unconditional waiver and release upon Tenant Improvement Payment compliant with Civil Code section 8134 from Developer and each subcontractor of any tier and supplier that was paid from the previous Tenant Improvement Payment submitted 60 days prior; and

19.2.1.1.14 A certification by Developer of the following:

Developer warrants title to all Work performed as of the date of this payment application and that all such Work has been completed in accordance with the Contract Documents for the Project. Developer further warrants that all Work performed as of the date of this payment application is free and clear of liens, claims, security interests, or encumbrances in favor of Developer, Subcontractors, material and equipment suppliers, workers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work, except those of which the District has been informed. Submission of sums which have no basis in fact or which Developer knows are false are at the sole risk of Developer and may be a violation of the False Claims Act set forth under Government Code section 12650 et seq.

19.2.1.1.15 Developer shall be subject to the False Claims Act set forth in Government Code section 12650 et seq. for information provided with any Application for Tenant Improvement Payments.

19.2.1.1.16 All remaining certified payroll records ("CPR(s)") for each journeyman, apprentice, worker, or other employee employed by Developer and/or each Subcontractor in connection with the Work for the period of the Application for Payment. As indicated herein, the District shall not make any payment to Developer until:

19.2.1.1.16.1 Developer and/or its Subcontractor(s) provide electronic CPRs directly to the DIR on no less than every 30 days while Work is being performed and within 30 days after the final day of Work performed on the Project for any journeyman, apprentice, worker or other employee was employed in connection with the Work, or within ten (10) days of any request by the District or the DIR to the requesting entity; and

19.2.1.1.16.2 Any delay in Developer and/or its Subcontractor(s) providing CPRs in a timely manner may directly delay Developer's payment.

19.2.1.1.17 Applications received after June 20th will not be paid until the second week of July and applications received after December 12th will not be paid until the first week of January.

19.2.2 Prerequisites for Tenant Improvement Payments

19.2.2.1 First Payment Request

The following items, if applicable, must be completed before the District will accept and/or process Developer's first payment request:

19.2.2.1.1 Installation of the Project sign.

19.2.2.1.2 Installation of field office.

19.2.2.1.3 Installation of temporary facilities and fencing.

19.2.2.1.4 Schedule of Values.

19.2.2.1.5 Developer's Preliminary Construction Schedule for the first ninety (90) days.

19.2.2.1.6 Schedule of unit prices, if applicable.

19.2.2.1.7 Submittal Schedule.

19.2.2.1.8 Receipt by Architect of all submittals due as of the date of the payment application.

19.2.2.1.9 List of Subcontractors, with names, license numbers, telephone numbers, and Scope of Work.

19.2.2.1.10 All bonds and insurance endorsements; and

19.2.2.1.11 Resumes of Developer's project manager, and if applicable, job site secretary, record documents recorder, and job site superintendent.

19.2.3 Subsequent Payment Requests

The District will not process subsequent payment requests until and unless submittals and Shop Drawings necessary to maintain the Project schedule have been submitted to the Architect.

19.2.4 No Waiver of Criteria

Any payments made to Developer where criteria set forth herein have not been met shall not constitute a waiver of said criteria by District. Instead, such payment shall be construed as a good faith effort by District to resolve differences so Developer may pay its Subcontractors and suppliers. Developer agrees that failure to submit such items may constitute a breach of contract by Developer and may subject Developer to termination.

19.3 District's Approval of Application for Payment

19.3.1 Upon receipt of an Application for Payment, The District shall act in accordance with both of the following:

19.3.1.1 Each Application for Payment shall be reviewed by the District as soon as practicable after receipt for the purpose of determining that the Application for Payment is a proper Application for Payment.

19.3.1.2 Any Application for Payment determined not to be a proper Application for Payment suitable for payment shall be returned to Developer as soon as practicable, but not later than seven (7) days, after receipt. An Application for Payment returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the Application for Payment is not proper. The number of days available to the District to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which the District exceeds this seven-day return requirement.

19.3.2 An Application for Payment shall be considered properly executed if funds are available for payment of the Application for Payment, and payment is not delayed due to an audit inquiry by the financial officer of the District.

19.3.3 District's review of the Developer's Application for Payment will be based on the District's and the Architect's observations at the Site and the data comprising the Application for Payment that the Work has progressed to the point indicated and that, to the best of the District's and the Architect's knowledge, information, and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to:

19.3.3.1 Observation of the Work for general conformance with the Contract Documents.

19.3.3.2 Results of subsequent tests and inspections.

19.3.3.3 Minor deviations from the Contract Documents correctable prior to completion; and

19.3.3.4 Specific qualifications expressed by the Architect.

19.3.4 District's approval of the certified Application for Payment shall be based on Developer complying with all requirements for a fully complete and valid certified Application for Payment.

19.3.5 Payments to Developer

19.3.5.1 Within thirty (30) days after approval of the Application for Payment, Developer shall be paid a sum equal to ninety-five percent (95%), of the value of the Tenant Improvement Payment (as verified by Architect and Inspector and certified by Developer) up to the last day of the previous month, less the aggregate of previous payments and amount to be withheld. The value of the Work completed shall be Developer's best estimate. No inaccuracy or error in said estimate shall operate to release Developer, or any Surety upon any bond, from damages arising from such Work, or from the District's right to enforce

each and every provision of the Contract Documents, and the District shall have the right subsequently to correct any error made in any estimate for payment.

19.3.5.2 Developer may not be entitled to have payment requests processed, or may be entitled to have only partial payment made for Work performed, so long as any direction given by the District concerning the Work, or any portion thereof, remains incomplete.

19.3.6 No Waiver

No payment by District hereunder shall be interpreted so as to imply that District has inspected, approved, or accepted any part of the Work. Notwithstanding any payment, the District may enforce each and every provision of this Contract. The District may correct or require correction of any error subsequent to any payment

19.3.7 Warranty of Title

19.3.7.1 If a lien or a claim based on a stop payment notice of any nature should at any time be filed against the Work or any District property, by any entity that has supplied material or services at the request of Developer, Developer and Developer's Surety shall promptly, on demand by District and at Developer's and Surety's own expense, take any and all action necessary to cause any such lien or a claim based on a stop payment notice to be released or discharged immediately therefrom.

19.3.7.2 If Developer fails to furnish to the District within ten (10) calendar days after demand by the District satisfactory evidence that a lien or a claim based on a stop payment notice has been released, discharged, or secured, the District may discharge such indebtedness and deduct the amount required therefor, together with any and all losses, costs, damages, and attorney's fees and expenses incurred or suffered by District from any sum payable to Developer under the Contract.

19.4 Decisions to Withhold Payment

19.4.1 Reasons to Withhold Payment

The District shall withhold payment in whole, or in part, as required by statute. In addition, the District may withhold payment in whole, or in part, to the extent reasonably necessary to protect the District if, in the District's opinion, the representations to the District required herein cannot be made. Payment, in whole, or in part, will be withheld based on the need to protect the District from loss because of, but not limited to, any of the following:

19.4.1.1 Defective Work not remedied within FORTY-EIGHT (48) hours of written notice to Developer.

19.4.1.2 Stop Payment Notices or other liens served upon the District as a result of the Contract.

19.4.1.3 Failure to comply with the requirements of Public Contract Code section 2600 et seq. ("Skilled and Trained Workforce Requirements").

19.4.1.4 Liquidated damages assessed against Developer.

19.4.1.5 Reasonable doubt that the Work can be completed for the unpaid balance of the Guaranteed Maximum Price or by the Contract Time.

19.4.1.6 Damage to the District or other contractor(s).

19.4.1.7 Unsatisfactory prosecution of the Work by Developer.

19.4.1.8 Failure to store and properly secure materials.

19.4.1.9 Failure of Developer to submit, on a timely basis, proper, sufficient, and acceptable documentation required by the Contract Documents, including, without limitation, a Construction Schedule, Schedule of Submittals, Schedule of Values, Monthly Progress Schedules, Shop Drawings, Product Data and samples, Proposed product lists, executed Change Orders, and/or verified reports.

19.4.1.10 Failure of Developer to maintain As-Built Drawings.

19.4.1.11 Erroneous estimates by Developer of the value of the Work performed, or other false statements in an Application for Payment.

19.4.1.12 Unauthorized deviations from the Contract Documents.

19.4.1.13 Failure of Developer to prosecute the Work in a timely manner in compliance with the Construction Schedule, established progress schedules, and/or completion dates.

19.4.1.14 Failure to provide acceptable electronic certified payroll records, as required by the Labor Code, by these Contract Documents or by written request for each journeyman, apprentice, worker, or other employee employed by Developer and/or by each Subcontractor in connection with the Work for the period of the Application for Payment or if payroll records are delinquent or inadequate.

19.4.1.15 Failure to properly pay prevailing wages as required in Labor Code section 1720 et seq., failure to comply with any other Labor Code requirements, and/or failure to comply with labor compliance monitoring and enforcement by the DIR.

19.4.1.16 Allowing an unregistered subcontractor, as described in Labor Code section 1725.5, to engage in the performance of any work under this Contract.

19.4.1.17 Failure to comply with any, if applicable federal requirements regarding minimum wages, withholding, payrolls and basic records, apprentice and trainee employment requirements, equal employment opportunity requirements, Copeland Act requirements,

Davis-Bacon Act and related requirements, Contract Work Hours and Safety Standards Act requirements.

19.4.1.18 Failure to properly maintain or clean up the Site.

19.4.1.19 Failure to timely indemnify, defend, or hold harmless the District.

19.4.1.20 Failure to perform any implementation and/or monitoring required by the General Permit, including without limitation any SWPPP for the Project and/or the imposition of any penalties or fines therefore whether imposed on the District or Developer.

19.4.1.21 Any payments due to the District, including but not limited to payments for failed tests, utilities changes, or permits.

19.4.1.22 Failure to pay any royalty, license or similar fees.

19.4.1.23 Failure to pay Subcontractor(s) or supplier(s) as required by law and Developer's subcontract agreement and by the Contract Documents; and

19.4.1.24 Developer is otherwise in breach, default, or in substantial violation of any provision of the Contract Documents.

19.4.2 Reallocation of Withheld Amounts

19.4.2.1 After prior written notice to Developer with details regarding the District's proposed application of withheld amounts, District may, in its discretion, apply any withheld amount to pay outstanding claims or obligations as defined herein. In so doing, District shall make such payments on behalf of Developer. If any payment is so made by District, then that amount shall be considered a payment made under the Contract Documents by District to Developer and District shall not be liable to Developer for any payment made in good faith. These payments may be made without prior judicial determination of claim or obligation. District will render Developer an accounting of funds disbursed on behalf of Developer.

19.4.2.2 If Developer defaults or neglects to carry out the Work in accordance with the Contract Documents or fails to perform any provision thereof, District may, after FORTY-EIGHT (48) hours' written notice to Developer and opportunity to commence and pursue cure of default, and, without prejudice to any other remedy, make good such deficiencies. The District shall adjust the total Guaranteed Maximum Price by reducing the amount thereof by the cost of making good such deficiencies. If District deems it inexpedient to correct Work that is damaged, defective, or not done in accordance with the provisions of the Contract Documents, an equitable reduction in the Guaranteed Maximum Price (up to one hundred fifty percent (150%) of the estimated reasonable value of the nonconforming Work) shall be made therefor.

19.4.3 Payment After Cure

When Developer removes the grounds for declining approval, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of Developer to perform in accordance with the terms and conditions of the Contract Documents.

19.5 Subcontractor Payments

19.5.1 Payments to Subcontractors

No later than seven (7) days after receipt of any Tenant Improvement Payment, or pursuant to Business and Professions Code section 7108.5 and Public Contract Code section 7107, Developer shall pay to each Subcontractor, out of the amount paid to Developer on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled. Developer shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to its Sub-subcontractors in a similar manner.

19.5.2 No Obligation of District for Subcontractor Payment

The District shall have no obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

19.5.3 Joint Checks

District shall have the right in its sole discretion, if necessary for the protection of the District, to issue joint checks made payable to Developer and Subcontractors and/or material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint check payment be construed to create any contract between the District and a Subcontractor of any tier, or a material or equipment supplier, or any obligation from the District to such Subcontractor or a material or equipment supplier or rights in such Subcontractor against the District.

20. Completion of the Work

20.1 Completion

20.1.1 District will accept completion of Project and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of District.

20.1.2 The Work may only be accepted as complete by action of the governing board of the District.

20.1.3 District, at its sole option, may accept completion of Project and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of District, except for minor corrective items, as distinguished from incomplete items. If Developer fails to complete all minor corrective items within fifteen (15) days after the date of the District's acceptance of completion, District shall withhold from the final payment one hundred fifty percent (150%) of an estimate of the amount sufficient to

complete the corrective items, as reasonably determined by District, until the item(s) are completed.

20.1.4 At the end of the fifteen (15) day period, if there are any items remaining to be corrected, District may elect to proceed as provided herein related to adjustments to Guaranteed Maximum Price, and/or District's right to perform the Work of Developer.

20.2 Close-Out/Certification Procedures

20.2.1 Punch List

Developer shall notify the Architect when Developer considers the Work complete. Upon notification, Architect will prepare a list of minor items to be completed or corrected ("Punch List"). Developer and/or its Subcontractors shall proceed promptly to complete and correct items on the Punch List. Failure to include an item on Punch List does not alter the responsibility of Developer to complete all Work in accordance with the Contract Documents.

20.2.2 Close-Out/Certification Requirements

20.2.2.1 Utility Connections

Buildings shall be connected to water, gas, sewer, electric, phone, and internet services, complete and ready for use. Service connections shall be made and existing services reconnected.

20.2.2.2 As-Built/Record Drawings and Record Specifications

20.2.2.2.1 Developer shall provide exact "as-built" drawings of the Work upon completion of the Project as indicated in the Contract Documents, including but not limited to the Specifications ("As-Built Drawings") as a condition precedent to approval of final payment.

20.2.2.2.2 Developer is liable and responsible for any and all inaccuracies in the As-Built Drawings, even if inaccuracies become evident at a future date.

20.2.2.2.3 Upon completion of the Work and as a condition precedent to approval of final payment, Developer shall obtain the Inspector's approval of the corrected prints and deliver the same to Architect in a form acceptable to the Architect as part of closeout.

20.2.2.3 Construction Storm Water Permit, if applicable

Developer shall submit to District all electric and hard copy records required by the Construction Storm Water Permit, if applicable, within seven (7) days of Completion of the Project.

20.2.3 Maintenance Manuals

Developer shall prepare all operation and maintenance manuals and date as indicated in the Specifications.

20.2.4 Source Programming

Developer shall provide all source programming for all items in the Project.

20.2.5 Verified Reports

Developer shall completely and accurately fill out and file forms DSA 6-C or DSA 152 (or most current version applicable at the time the Work is performed), as appropriate. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

20.3 Final Inspection

20.3.1 Developer shall comply with Punch List procedures as provided herein and maintain the presence of its District-approved project superintendent and project manager until the Punch List is complete to ensure proper and timely completion of the Punch List. Under no circumstances shall Developer demobilize its forces prior to completion of the Punch List without District's prior written approval. Upon receipt of Developer's written notice that all of the Punch List items have been fully completed and the Work is ready for final inspection and District acceptance, Architect and Project Inspector will inspect the Work and shall submit to Developer and District a final inspection report noting the Work, if any, required in order to complete in accordance with the Contract Documents. Absent unusual circumstances, this report shall consist of the Punch List items not yet satisfactorily completed.

20.3.2 Upon Developer's completion of all items on the Punch List and any other uncompleted portions of the Work, Developer shall notify the District and Architect, who shall again inspect such Work. If the Architect finds the Work complete and acceptable under the Contract Documents, the Architect will notify Developer, who shall then jointly submit to the Architect and the District its final Application for Payment.

20.3.3 Final Inspection Requirements

20.3.3.1 Before calling for final inspection, Developer shall determine that the following have been performed:

20.3.3.1.1 The Work has been completed.

20.3.3.1.2 All life safety items are completed and in working order.

20.3.3.1.3 Mechanical and electrical Work, including, without limitation, security system, data, fire alarm, are complete and tested, fixtures are in place, connected, and ready for tryout.

20.3.3.1.4 Electrical circuits scheduled in panels and disconnect switches labeled.

20.3.3.1.5 Painting and special finishes complete.

20.3.3.1.6 Doors complete with hardware, cleaned of protective film, relieved of sticking or binding, and in working order.

20.3.3.1.7 Tops and bottoms of doors sealed.

20.3.3.1.8 Floors waxed and polished as specified.

20.3.3.1.9 Broken glass replaced and glass cleaned.

20.3.3.1.10 Grounds cleared of Developer's equipment, raked clean of debris, and trash removed from Site.

20.3.3.1.11 Work cleaned, free of stains, scratches, and other foreign matter, damaged and broken material replaced.

20.3.3.1.12 Finished and decorative work shall have marks, dirt, and superfluous labels removed.

20.3.3.1.13 Final cleanup, as provided herein.

20.4 Costs of Multiple Inspections

More than two (2) requests of the District to make a final inspection shall be considered an additional service of District, Architect, Construction Manager, and/or Project Inspector, and all subsequent costs will be invoiced to Developer and if funds are available, withheld from remaining payments.

20.5 Partial Occupancy or Use Prior to Completion

20.5.1 District's Rights to Occupancy

The District may occupy or use any completed or partially completed portion of the Work at any stage, and such occupancy shall not constitute the District's Final Acceptance of any part of the Work. Neither the District's Final Acceptance, the making of Final Payment, any provision in Contract Documents, nor the use or occupancy of the Work, in whole or in part, by District shall constitute acceptance of Work not in accordance with the Contract Documents nor relieve Developer or Developer's Performance Bond Surety from liability with respect to any warranties or responsibility for faulty or defective Work or materials, equipment and workmanship incorporated therein. The District and Developer shall agree in writing to the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract Documents. Any dispute as to responsibilities shall be resolved pursuant to the Claims and Disputes provisions herein, with the added provision that during the dispute process, the District shall have the right to occupy or use any portion of the Work that it needs or desires to use.

20.5.2 Inspection Prior to Occupancy or Use

Immediately prior to partial occupancy or use, the District, Developer, and the Architect 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.

20.5.3 No Waiver

Unless otherwise agreed upon, partial or entire occupancy or use of a portion or portions of the Work shall not constitute beneficial occupancy or District's acceptance of the Work not complying with the requirements of the Contract Documents.

21. Final Payment and Retention

21.1 Final Payment

Upon receipt of a final Application for Payment from Developer, the Architect will notify the District whether the Work is complete so that joint inspection of the Work can be scheduled. Thereafter, the District shall jointly inspect the Work and either accept the Work as complete or notify the Architect and Developer in writing of reasons why the Work is not complete. Upon District's acceptance of the Work of Developer as fully complete (that, absent unusual circumstances, will occur when the Punch List items have been satisfactorily completed), the District shall record a Notice of Completion with the County Recorder, and Developer shall, upon receipt of final payment from the District, pay the amount due Subcontractors.

21.2 Prerequisites for Final Payment

The following conditions must be fulfilled prior to Final Payment:

21.2.1 A full release of all Stop Payment Notices served in connection with the Work shall be submitted by Developer.

21.2.2 A duly completed and executed conditional waiver and release upon final payment compliant with Civil Code section 8136 from each subcontractor of any tier and supplier to be paid from the final Tenant Improvement Payment.

21.2.3 A duly completed and executed unconditional waiver and release upon Tenant Improvement Payment compliant with Civil Code section 8134 from each subcontractor of any tier and supplier that was paid from the previous Tenant Improvement Payment(s).

21.2.4 A duly completed and executed "AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS" from Developer.

21.2.5 Developer shall have made all corrections to the Work that are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of District required under the Contract Documents.

21.2.6 Each Subcontractor shall have delivered to Developer all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work.

21.2.7 Developer must have completed all requirements set forth under "Close-Out/Certification Procedures," including, without limitation, submission of an approved set of complete Record Drawings.

21.2.8 Architect shall have issued its written approval that final payment can be made.

21.2.9 Developer shall have delivered to the District all manuals and materials required by the Contract Documents, which must be approved by the District.

21.2.10 Developer shall have completed final clean up as provided herein.

21.3 Retention

21.3.1 The retention, less any amounts disputed by the District or that the District has the right to withhold pursuant to provisions herein, shall be paid:

21.3.1.1 After approval by the District of the Architect of the Application and Certificate of Payment.

21.3.1.2 After the satisfaction of the conditions set forth herein.

21.3.1.3 No less than forty-five (45) days after the recording of the Notice of Completion by District; and

21.3.1.4 After receipt of a duly completed and executed unconditional waiver and release upon Final Payment compliant with Civil Code section 8138 from each subcontractor of any tier and supplier that was paid from the Final Payment.

21.3.2 No interest shall be paid on any retention, or on any amounts withheld due to a failure of Developer to perform, in accordance with the terms and conditions of the Contract Documents, except as provided to the contrary in any Escrow Agreement between the District and Developer pursuant to Public Contract Code section 22300.

21.4 Substitution of Securities

The District will permit the substitution of securities in accordance with the provisions of Public Contract Code section 22300.

22. Uncovering of Work

If a portion of the Work is covered without Inspector or Architect approval or not in compliance with the Contract Documents, it must, if required in writing by the District, the Project Inspector, or the Architect, be uncovered for the Project Inspector's or the Architect's observation and be corrected, replaced and/or recovered at Developer's expense without change in the Guaranteed Maximum Price or Contract Time.

23. Nonconforming Work and Correction of Work

23.1 Nonconforming Work

23.1.1 Developer shall promptly remove from Premises all Work identified by District as failing to conform to the Contract Documents whether incorporated or not. Developer shall promptly replace and re-execute its own Work to comply with the Contract Documents without additional expense to the District and shall bear the expense of making good all work of other contractors destroyed or damaged by any removal or replacement pursuant hereto and/or any delays to the District or other contractors caused thereby.

23.1.2 If Developer does not commence to remove Work that District has identified as failing to conform to the Contract Documents within a reasonable time, not to exceed FORTY-EIGHT (48) hours after written notice and complete removal of work within a reasonable time, District may remove it and may store any material at Developer's expense. If Developer does not pay expense(s) of that removal within ten (10) days' time thereafter, District may, upon ten (10) days' written notice, sell any material at auction or at private sale and shall deduct all costs and expenses incurred by the District and/or District may withhold those amounts from payment(s) to Developer.

23.2 Correction of Work

23.2.1 Correction of Rejected Work

Pursuant to the notice provisions herein, Developer shall promptly correct the Work rejected by the District, the Architect, or the Project Inspector as failing to conform to the requirements of the Contract Documents, whether observed before or after Completion and whether or not fabricated, installed, or completed. Developer shall bear costs of correcting the rejected Work, including additional testing, inspections, and compensation for the Inspector's or the Architect's services and expenses made necessary thereby.

23.2.2 One-Year Warranty Corrections

If, within one (1) year after the date of Completion of the Work or a designated portion thereof, or after the date for commencement of warranties established hereunder, or by the terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, Developer shall correct it promptly after receipt of written notice from the District to do so. This period of one (1) year shall be extended with respect to portions of the Work first performed after Completion by the period of time between Completion and the actual performance of the Work. This obligation hereunder shall survive District's acceptance of the Work under the Contract Documents and termination of the Contract Documents. The District shall give such notice promptly after discovery of the condition.

23.3 District's Right to Perform Work

23.3.1 If Developer should neglect to prosecute the Work properly or fail to perform any provisions of the Contract Documents, the District, after providing FORTY-EIGHT (48) hours' written notice and an opportunity to cure the failure, to Developer, may, without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due Developer.

23.3.2 If it is found at any time, before or after completion of the Work, that Developer has varied from the Drawings and/or Specifications, including, but not limited to, variation in material, quality, form, or finish, or in the amount or value of the materials and labor used, District may require at its option:

23.3.2.1 That all such improper Work be removed, remade or replaced, and all work disturbed by these changes be made good by Developer at no additional cost to the District.

23.3.2.2 That the District deduct from any amount due Developer the sum of money equivalent to the difference in value between the work performed and that called for by the Drawings and Specifications; or

23.3.2.3 That the District exercise any other remedy it may have at law or under the Contract Documents, including but not limited to the District hiring its own forces or another contractor to replace Developer's nonconforming Work, in which case the District shall either issue a deductive Change Order, a Construction Change Directive, or invoice Developer for the cost of that work. Developer shall pay any invoices within thirty (30) days of receipt of same or District may withhold those amounts from payment(s) to Developer.

24. Termination And Suspension

The Parties' rights to terminate the Project are as indicated in the Facilities Lease. In the event of a termination of the Facilities Lease and notwithstanding any other provision in the Contract Documents, the Surety shall remain liable to all obligees under the Payment Bond and to the District under the Performance Bond for any claim related to the Project.

25. Claims Process

25.1 Obligation to File Claims for Disputed Work

25.1.1 Should Developer otherwise seek extra time or compensation for any reason whatsoever ("Disputed Work"), then Developer shall first follow procedures set forth in the Contract Documents including, without limitation, Articles 15, 16 and 17, all of which are conditions precedent to submitting a Claim pursuant to Article 25. A Notice of Delay or Proposed Change Order are less formal procedures that proceed the formal claim and do not constitute a Claim. A Claim also does not include correspondence, RFIs, vouchers, invoices, progress payment applications, or other routine or authorized form of requests for progress payments in compliance with the Contract. If a dispute remains, then Developer shall give written notice to District that expressly invokes this Article 25 within the time limits set forth herein.

25.1.2 Developer's sole and exclusive remedy for Disputed Work is to file a written claim setting forth Developer's position as required herein within the time limits set forth herein.

25.2 Duty to Perform during Claim Process

Developer and its subcontractors shall continue to perform its Work under the Contract, including the Disputed Work, and shall not cause a delay of the Work during any dispute, claim, negotiation, mediation, or arbitration proceeding, except by written agreement by the District.

25.3 Definition of Claim

25.3.1 Pursuant to Public Contract Code section 9204, the term "Claim" means a separate demand by Developer sent by registered mail or certified mail with return receipt requested, for one or more of the following:

25.3.1.1 A time extension, including without limitation, for relief of damages or penalties for delay assessed by the District under the Contract;

25.3.1.2 Payment by the District of money or damages arising from work done by, or on behalf of, Developer pursuant to the Contract and payment of which is not otherwise expressly provided for or to which Developer is not otherwise entitled to; or

25.3.1.3 An amount of payment disputed by the District.

25.4 Claims Presentation

25.4.1 Form and Contents of Claim

25.4.1.1 If Developer intends to submit a Claim for an increase in the Guaranteed Maximum Price and/or Contract Time for any reason including, without limitation, the acts of District or its agents, Developer shall, within thirty (30) days after the event giving rise to the Claim, give notice of the Claim ("Notice of Potential Claim") in writing, specifically identifying Developer is invoking this Article 25 Claims Presentation. The Notice of Potential Claim shall provide Developer's preliminary request for an adjustment to the Guaranteed Maximum Price and/or Contract Time, with a description of the grounds therefore.

25.4.1.2 Within thirty (30) days after serving the written Notice of Potential Claim, Developer shall provide a Claim including an itemized statement of the details and amounts of its Claim for any increase in the Guaranteed Maximum Price or Contract Time, as provided below, including a Time Impact Analysis and any and all other documentation substantiating Developer's claimed damages:

25.4.1.2.1 The issues, events, conditions, circumstances and/or causes giving rise to the dispute;

25.4.1.2.2 Citation to provisions in the Contract Documents, statute sections, and/or case law entitling Developer to an increase in the Guaranteed Maximum Price or Contract Time;

25.4.1.2.3 The pertinent dates and/or durations and actual and/or anticipated effects on the Guaranteed Maximum Price, Contract Schedule milestones and/or Contract Time adjustments;

25.4.1.2.4 The Time Impact Analysis of all time delays that shows actual time impact on the critical path; and

25.4.1.2.5 The line-item costs for labor, material, and/or equipment, if applicable, for all cost impacts priced like a change order according to Article 17 and must be updated monthly as to cost and entitlement if a continuing claim.

25.4.1.3 The Claim shall include the following certification by Developer:

25.4.1.3.1 The undersigned Developer certifies under penalty of perjury that the attached dispute is made in good faith; that the supporting data is accurate and complete to the best of my knowledge and belief; that the amount requested accurately reflects the adjustment for which Developer believes the District is liable; and that I am duly authorized to certify the claim on behalf of Developer.

25.4.1.3.2 Furthermore, Developer understands that the value of the attached dispute expressly includes any and all of Developer's costs and expenses, direct and indirect, resulting from the Work performed on the Project, additional time required on the Project and/or resulting from delay to the Project including, without limitation, cumulative impacts. Any costs, expenses, damages, or time extensions not included are deemed waived.

25.4.2 Developer shall bear all costs incurred in the preparation and submission of a Claim.

25.4.3 Failure to timely submit a Claim and the requisite supporting documentation shall constitute a waiver of Developer's claim(s) against the District and Developer's Claim(s) for compensation or an extension of time shall be deemed waived, released, and discharged as to any entitlement for adjustment to Guaranteed Maximum Price and/or Contract Time.

25.5 Claim Resolution pursuant to Public Contract Code section 9204

Developer may request to waive the claims procedure under Public Contract Code section 9204 and proceed directly to the commencement of a civil action or binding arbitration. If Developer chooses to proceed, Developer shall comply with the following steps:

25.5.1 STEP 1:

25.5.1.1 Upon receipt of a Claim by registered or certified mail, return receipt requested, including the documents necessary to substantiate it, the District shall conduct a reasonable review of the Claim and, within a period not to exceed 45 days, shall provide Developer a written statement identifying what portion of the Claim is disputed and what portion is undisputed. Upon receipt of a Claim, the District and Developer may, by mutual agreement, extend the time period to provide a written statement. If the District needs approval from its governing body to provide Developer a written statement identifying the disputed portion and the undisputed portion of the Claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of Claim sent by registered mail or certified mail, return receipt requested, the District shall have up to three (3) days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide Developer a written statement identifying the disputed portion and the undisputed portion.

25.5.1.1.1 Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the District issues its written statement. Amounts not paid in a timely manner as required by this section, shall bear interest at seven percent (7%) per annum.

25.5.1.2 Upon receipt of a Claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable. In this instance, District and Developer must comply with the sections below regarding Public Contract Code section 20104 et seq. and Government Code Claim Act Claims.

25.5.1.3 If the District fails to issue a written statement, or to otherwise meet the time requirements of this section, this shall result in the Claim being deemed rejected in its entirety. A claim that is denied by reason of the District's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of Developer.

25.5.2 STEP 2:

25.5.2.1 If Developer disputes the District's written response, or if the District fails to respond to a Claim within the time prescribed, Developer may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the District shall schedule a meet and confer conference within 30 days for settlement of the dispute. Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the District shall provide Developer a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed.

25.5.2.2 Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the District issues its written statement. Amounts not paid in a timely manner as required by this section, shall bear interest at seven percent (7%) per annum.

25.5.3 STEP 3:

25.5.3.1 Any disputed portion of the claim, as identified by Developer in writing, shall be submitted to nonbinding mediation, with the District and Developer sharing the associated costs equally. The District and Developer shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

25.5.3.1.1 For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

25.5.3.2 Unless otherwise agreed to by the District and Developer in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Public Contract Code section 20104.4 to mediate after litigation has been commenced.

25.5.4 STEP 4:

25.5.4.1 If mediation under this section does not resolve the parties' dispute, the District may, but does not require arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program.

25.6 Subcontractor Pass-Through Claims

25.6.1 If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a District because privity of contract does not exist, the contractor may present to the District a Claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that Developer present a Claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the Claim be presented to the District shall furnish reasonable documentation to support the Claim.

25.6.2 Within 45 days of receipt of this written request from a subcontractor, Developer shall notify the subcontractor in writing as to whether Developer presented the Claim to the District and, if Developer did not present the Claim, provide the subcontractor with a statement of the reasons for not having done so.

25.6.3 Developer shall bind all its Subcontractors to the provisions of this section and will hold the District harmless against Claims by Subcontractors.

25.7 Government Code Claim Act Claim

25.7.1 If a Claim, or any portion thereof, remains in dispute upon satisfaction of all applicable Claim Resolution requirements, including those pursuant to Public Contract Code section 9204, Developer shall comply with all claims presentation requirements as provided in Chapter 1 (commencing with section 900) and Chapter 2 (commencing with section 910) of Part 3 of Division 3.6 of Title 1 of Government Code as a condition precedent to Developer's right to bring a civil action against the District.

25.7.2 Developer shall bear all costs incurred in the preparation, submission and administration of a Claim. Any claims presented in accordance with the Government Code must affirmatively indicate Developer's prior compliance with the claims procedure herein of the claims asserted.

25.7.3 For purposes of those provisions, the running of the time within which a claim pursuant to Public Contract Code section 20104.2 only must be presented to the District shall be tolled from the time the Developer submits its written claim pursuant to subdivision (a) until the time that the claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

25.8 Claim Resolution pursuant to Public Contract Code section 20104 et seq.

25.8.1 In the event of a disagreement between the parties as to performance of the Work, the interpretation of this Contract, or payment or nonpayment for Work performed or not performed, the parties shall attempt to resolve all claims of three hundred seventy-five thousand dollars (\$375,000) or less which arise between Developer and District by those procedures set forth in Public Contract Code section 20104 et seq., to the extent applicable.

25.8.1.1 Developer shall file with the District any written Claim, including the documents necessary to substantiate it, upon the application for final payment.

25.8.1.2 For claims of less than fifty thousand dollars (\$50,000), the District shall respond in writing within forty-five (45) days of receipt of the Claim or may request in writing within thirty (30) days of receipt of the Claim any additional documentation supporting the claim or relating to defenses or claims the District may have against Developer.

25.8.1.2.1 If additional information is required, it shall be requested and provided by mutual agreement of the parties.

25.8.1.2.2 District's written response to the documented Claim shall be submitted to Developer within fifteen (15) days after receipt of the further documentation or within a period of time no greater than that taken by Developer to produce the additional information, whichever is greater.

25.8.1.3 For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the District shall respond in writing to all written Claims within sixty (60) days of receipt of the claim, or may request, in writing, within thirty (30) days of receipt of the Claim any additional documentation supporting the Claim or relating to defenses or claims the District may have against Developer.

25.8.1.3.1 If additional information is required, it shall be requested and provided upon mutual agreement of the District and Developer.

25.8.1.3.2 The District's written response to the claim, as further documented, shall be submitted to Developer within thirty (30) days after receipt of the further documentation, or within a period of time no greater than that taken by Developer to produce the additional information or requested documentation, whichever is greater.

25.8.1.4 If Developer disputes the District's written response, or the District fails to respond within the time prescribed, Developer may so notify the District, in writing, either within fifteen (15) days of receipt of the District's response or within fifteen (15) days of the District's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the District shall schedule a meet and confer conference within thirty (30) days for settlement of the dispute.

25.8.1.5 Following the meet and confer conference, if the claim or any portion of it remains in dispute, Developer shall file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions the running of the time within which a claim must be filed shall be tolled from the time Developer submits its written Claim until the time the Claim is denied, including any period of time utilized by the meet and confer process.

25.8.1.6 For any civil action filed to resolve claims filed pursuant to this section, within sixty (60) days, but no earlier than thirty (30) days, following the filing of responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within fifteen (15) days by both parties of a disinterested third person as mediator, shall be commenced within thirty (30) days of the submittal, and shall be concluded within fifteen (15) days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

25.8.1.7 If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of the Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act, (commencing with Section 2016) of Chapter 1 of Title 4 of part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

25.8.1.8 The District shall not fail to pay money as to any portion of a Claim which is undisputed except as otherwise provided in the Contract Documents. In any suit filed pursuant to this section, the District shall pay interest at the legal rate on any arbitration award or judgment. Interest shall begin to accrue on the date the suit is filed in a court of law.

25.8.2 Developer shall bind its Subcontractors to the provisions of this Section and will hold the District harmless against disputes by Subcontractors.

25.9 Claims Procedure Compliance

25.9.1 Failure to submit and administer claims as required in Article 25 shall waive Developer's right to claim on any specific issues not included in a timely

submitted claim. Claim(s) not raised in a timely protest and timely claim submitted under this Article 25 may not be asserted in any subsequent litigation, Government Code Claim, or legal action.

25.9.2 District shall not be deemed to waive any provision under this Article 25, if at District's sole discretion, a claim is administered in a manner not in accord with this Article 25. Waivers or modifications of this Article 25 may only be made by a signed change order approved as to form by legal counsel for both District and Developer; oral or implied modifications shall be ineffective.

25.10 Claim Resolution Non-Applicability

25.10.1 The procedures for dispute and claim resolution set forth in this Article shall not apply to the following:

25.10.1.1 Personal injury, wrongful death or property damage claims.

25.10.1.2 Latent defect or breach of warranty or guarantee to repair.

25.10.1.3 Stop payment notices.

25.10.1.4 District's rights set forth in the Article on Suspension and Termination.

25.10.1.5 Disputes arising out of labor compliance enforcement by the Department of Industrial Relations; or

25.10.1.6 District rights and obligations as a public entity set forth in applicable statutes; provided, however, that penalties imposed against a public entity by statutes, including, but not limited to, Public Contract Code sections 20104.50 and 7107, shall be subject to the Claim Resolution requirements provided in this Article.

25.11 Attorney's Fees

25.11.1 Should litigation be necessary to enforce any terms or provisions of this Contract, then each party shall bear its own litigation and collection expenses, witness fees, court costs and attorney's fees.

26. State Labor, Wage & Hour, Apprenticeship, And Related Provisions

26.1 Labor Compliance and Enforcement

Since this Project is subject to labor compliance and enforcement by the Department of Industrial Relations ("DIR"), Developer specifically acknowledges and understands that it shall perform the Work of this Agreement while complying with all the applicable provisions of Division 2, Part 7, Chapter 1, of the Labor Code and Title 8 of the California Code of Regulations, including, without limitation, the requirement that Developer and all Subcontractors shall timely furnish complete and accurate electronic certified payroll records directly to the DIR. The District may not issue payment if this requirement is not met.

26.2 Wage Rates, Travel, and Subsistence

26.2.1 Pursuant to the provisions of Article 2 (commencing at section 1770), Chapter 1, Part 7, Division 2, of the Labor Code of California, the general

prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public work is to be performed for each craft, classification, or type of worker needed to execute the Contract Documents are on file at the District's principal office and copies will be made available to any interested party on request. Developer shall obtain and post a copy of these wage rates at the job site.

26.2.2 Holiday and overtime work, when permitted by law, shall be paid for at a rate of at least one and one-half times the above specified rate of per diem wages, unless otherwise specified. The holidays upon which those rates shall be paid need not be specified by the District but shall be all holidays recognized in the applicable collective bargaining agreement. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code.

26.2.3 Developer shall pay and shall cause to be paid each worker engaged in Work on the Project not less than the general prevailing rate of per diem wages determined by the Director of the Department of Industrial Relations ("DIR") ("Director"), regardless of any contractual relationship which may be alleged to exist between Developer or any Subcontractor and such workers.

26.2.4 If, prior to execution of the Facilities Lease, the Director determines that there has been a change in any prevailing rate of per diem wages in the locality in which the Work under the Contract Documents is to be performed, such change shall not alter the wage rates in the Contract Documents subsequently awarded.

26.2.5 Pursuant to Labor Code section 1775, Developer shall, as a penalty, forfeit the statutory amount (believed by the District to be currently two hundred dollars (\$200) to District for each calendar day, or portion thereof, for each worker paid less than the prevailing rates, determined by the District and/or the Director, for the work or craft in which that worker is employed for any public work done under Contract by Developer or by any Subcontractor under it. The difference between such prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing wage rate, shall be paid to each worker by Developer.

26.2.6 Any worker employed to perform Work on the Project, which Work is not covered by any classification listed in the general prevailing wage rate of per diem wages determined by the Director, shall be paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to Work to be performed by him, and that minimum wage rate shall be retroactive to time of initial employment of the person in that classification.

26.2.7 Pursuant to Labor Code section 1773.1, per diem wages are deemed to include employer payments for health and welfare, pension, vacation, travel time, subsistence pay, and apprenticeship or other training programs authorized by Labor Code section 3093, and similar purposes.

26.2.8 Developer shall post at appropriate conspicuous points on the Project Site a schedule showing all determined minimum wage rates and all authorized deductions, if any, from unpaid wages actually earned. In addition, Developer

shall post a sign-in log for all workers and visitors to the Site, a list of all Subcontractors of any tier on the Site, and the required Equal Employment Opportunity poster(s).

26.3 Hours of Work

26.3.1 As provided in Article 3 (commencing at section 1810), Chapter 1, Part 7, Division 2, of the Labor Code, eight (8) hours of labor shall constitute a legal day of work. The time of service of any worker employed at any time by Developer or by any Subcontractor on any subcontract under the Contract Documents upon the Work or upon any part of the Work contemplated by the Contract Documents shall be limited and restricted by Developer to eight (8) hours per day, and forty (40) hours during any one week, except as hereinafter provided. Notwithstanding the provisions hereinabove set forth, Work performed by employees of Developer in excess of eight (8) hours per day and forty (40) hours during any one week, shall be permitted upon this public work upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half times the basic rate of pay.

26.3.2 Developer shall keep and shall cause each Subcontractor to keep an accurate record showing the name of and actual hours worked each calendar day and each calendar week by each worker employed by Developer in connection with the Work or any part of the Work contemplated by the Contract Documents. The record shall be kept open at all reasonable hours to the inspection of District and to the Division of Labor Standards Enforcement of the DIR.

26.3.3 Pursuant to Labor Code section 1813, Developer shall, as a penalty, forfeit the statutory amount (believed by the District to be currently twenty-five dollars (\$25)) to the District for each worker employed in the execution of the Contract Documents by Developer or by any Subcontractor for each calendar day during which a worker is required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of the provisions of Article 3 (commencing at section 1810), Chapter 1, Part 7, Division 2, of the Labor Code.

26.3.4 Any Work necessary to be performed after regular working hours, or on Sundays or other holidays shall be performed without additional expense to the District.

26.4 Payroll Records

26.4.1 Developer shall upload, and shall cause each Subcontractor performing any portion of the Work under this Contract to upload, an accurate and complete certified payroll record ("CPR") electronically using DIR's eCPR System by uploading the CPRs by electronic XML file or entering each record manually using the DIR's iform (or current form) online no less than every 30 days while Work is being performed and within 30 days after the final day of Work performed on the Project and within ten (10) days of any request by the District or Labor Commissioner at <http://www.dir.ca.gov/Public-Works/Certified/Payroll-Reporting.html> or current application and URL, showing the name, address, social security number, work classification, straight time, and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee

employed by Developer and/or each Subcontractor in connection with the Work.

26.4.1.1 The CPRs enumerated hereunder shall be filed directly with the DIR on a weekly basis or to the requesting party, whether the District or DIR, within ten (10) days after receipt of each written request. The CPRs from Developer and each Subcontractor for each week shall be provided on or before ten (10) days after the end of the Sunday to Saturday conventional week covered by the CPRs. District may not make any payment to Developer until:

26.4.1.1.1 Developer and/or its Subcontractor(s) provide CPRs acceptable to the District and DIR.

26.4.1.1.2 Any delay in Developer and/or its Subcontractor(s) providing CPRs to the District or DIR in a timely manner may directly delay the District's review and/or audit of the CPRs and Developer's payment.

26.4.2 All CPRs shall be available for inspection at all reasonable hours at the principal office of Developer on the following basis:

26.4.2.1 A certified copy of an employee's CPR shall be made available for inspection or furnished to the employee or his/her authorized representative on request.

26.4.2.2 CPRs shall be made available for inspection or furnished upon request or as required by regulation to a representative of the District, Division of Labor Standards Enforcement, Division of Apprenticeship Standards, and/or the DIR.

26.4.2.3 CPRs shall be made available upon request by the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through the District, Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested CPRs have not been provided pursuant to the provisions herein, the requesting party shall, prior to being provided the records, reimburse the costs of preparation by Developer, Subcontractors, and the entity through which the request was made. The public shall not be given access to the records at the principal office of Developer.

26.4.3 Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by District, Division of Apprenticeship Standards, Division of Labor Standards Enforcement, or DIR shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address, and social security number. The name and address of Developer awarded the Project under the Contract Documents or performing under the Contract Documents shall not be marked or obliterated.

26.4.4 Developer shall inform District of the location of the records enumerated hereunder, including the street address, city, and county, and shall, within five (5) working days of a change in location of the records, provide a notice of change of location and address.

26.4.5 In the event of noncompliance with the requirements of this section, Developer shall have ten (10) days in which to comply subsequent to receipt of written notice specifying in what respects Developer must comply with this section. Should noncompliance still be evident after the ten (10) day period, Developer shall, as a penalty, forfeit up to one hundred dollars (\$100) to District for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Labor Commissioner, these penalties shall be withheld from Tenant Improvement Payments then due.

26.4.6 [Reserved]

26.5 [Reserved]

26.6 Apprentices

26.6.1 Developer acknowledges and agrees that, if the Contract Documents involve a dollar amount greater than or a number of working days greater than that specified in Labor Code section 1777.5, then this Contract is governed by the provisions of Labor Code Section 1777.5 and 29 CFR part 5. It shall be the responsibility of Developer to ensure compliance with this Article and with Labor Code section 1777.5 for all apprenticeship occupations.

26.6.2 Apprentices of any crafts or trades may be employed and, when required by Labor Code section 1777.5, shall be employed provided they are properly registered in full compliance with the provisions of the Labor Code.

26.6.3 Every apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he/she is employed and shall be employed only at the work of the craft or trade to which she/he is registered.

26.6.4 Only apprentices, as defined in section 3077 of the Labor Code, who are in training under apprenticeship standards and written apprentice agreements under Chapter 4 (commencing at section 3070), Division 3, of the Labor Code, are eligible to be employed. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which he/she is training.

26.6.5 Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Developer and any Subcontractors employing workers in any apprenticeable craft or trade in performing any Work under this Contract shall apply to the applicable joint apprenticeship committee for a certificate approving Developer or Subcontractor under the applicable apprenticeship standards and fixing the ratio of apprentices to journeymen employed in performing the Work.

26.6.6 Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Developer and any Subcontractor may be required to make contributions to the apprenticeship program.

26.6.7 If Developer or Subcontractor willfully fails to comply with Labor Code section 1777.5, then, upon a determination of noncompliance by the Administrator of Apprenticeship, it shall:

26.6.7.1 Be denied the right to bid on any subsequent project for one (1) year from the date of such determination.

26.6.7.2 Forfeit, as a penalty, to District the full amount stated in Labor Code section 1777.7. Interpretation and enforcement of these provisions shall be in accordance with the rules and procedures of the California Apprenticeship Council and under the authority of the Chief of the Division of Apprenticeship Standards.

26.6.7.3 Developer and all Subcontractors shall comply with Labor Code section 1777.6, which section forbids certain discriminatory practices in the employment of apprentices.

26.6.7.4 Developer shall become fully acquainted with the law regarding apprentices prior to commencement of the Work. Special attention is directed to sections 1777.5, 1777.6, and 1777.7 of the Labor Code, and Title 8, California Code of Regulations, Section 200 et seq. Questions may be directed to the State Division of Apprenticeship Standards, 455 Golden Gate Avenue, 9th Floor, San Francisco, California 94102.

26.7 Skilled and Trained Workforce

26.7.1 Developer and its subcontractors at every tier hereby provide an enforceable commitment to comply with Public Contract Code section 2600 et seq., which requires use of a skilled and trained workforce to perform all work on the Contract or Project that falls within an apprenticeable occupation in the building and construction trades.

26.7.1.1 "Apprenticeable Occupation" means an occupation for which the Chief of the Division of Apprenticeship Standards of the Department of Industrial Relations ("Chief") had approved an apprenticeship program pursuant to Section 3075 of the Labor Code before January 1, 2014.

26.7.1.2 "Skilled and Trained Workforce" means a workforce that meets all of the following conditions:

26.7.1.2.1 All of the workers are either skilled journeypersons or apprentices registered in an apprenticeship program approved by the Chief.

26.7.1.2.2 That either (A) the number of the skilled journeypersons employed to perform work on the Contract or Project by Developer or its subcontractors at every tier are graduates of an apprenticeship program for the applicable occupation that was either approved by the Chief pursuant to Labor Code section 3075 or located outside California and approved for federal purposes pursuant to the apprenticeship regulations adopted by the federal Secretary of Labor, or (B) the hours of work performed by skilled journeypersons who have graduated from an approved apprenticeship program meet at least the percentages set forth in the following chart:

| REQUIREMENT | EXCLUDED OCCUPATIONS |
|--------------|--|
| 0% | Teamster |
| At least 30% | Acoustical installer, bricklayer, carpenter, cement mason, drywall installer or lather, marble mason, finisher, or setter, modular furniture or systems installer, operating engineer, pile driver, plasterer, roofer or waterproofer, stone mason, surveyor, terrazzo worker or finisher, and tile layer, setter, or finisher |
| At least 60% | All remaining apprenticeable occupations |

26.7.1.2.3 For an apprenticeable occupation in which no apprenticeship program has been approved by the Chief before January 1, 1995, up to one-half of the above graduation percentage requirements set forth in the above chart may be satisfied by skilled journeypersons who commenced working in the apprenticeable occupation before the Chief's approval of an apprenticeship program for that occupation in the county in which the Project is located.

26.7.1.2.4 The contractor or subcontractor need not meet the apprenticeship graduation requirements if:

26.7.1.2.4.1 During a calendar month, Developer or subcontractor employs skilled journeypersons to perform fewer than 10 hours of work on the Contract or Project; or

26.7.1.2.4.2 The subcontractor was not a listed subcontractor under Public Contract Code section 4104 or a substitute for a listed subcontractor, and the subcontract does not exceed one-half of one percent (0.5%) of the price of the prime contract.

26.7.1.3 "Skilled Journeyperson" means a worker who either:

26.7.1.3.1 Graduated from an apprenticeship program for the applicable occupation that was approved by the Chief or located outside of California and approved for federal purposes pursuant to the apprenticeship regulations adopted by the federal Secretary of Labor; or

26.7.1.3.2 Has at least as many hours of on-the-job experience in the applicable occupation as would be required to graduate from an apprenticeship program for the applicable occupation that is approved by the Chief.

26.7.2 Developer and its subcontractors will demonstrate its compliance with the Skilled and Trained Workforce requirements by either of the following:

26.7.2.1 Provide monthly reports to the District demonstrating that Developer and its subcontractors are complying with the requirements of Public Contract Code section 2600 et seq., which shall be a public

record under California Public Records Act, Government Code section 6250 et seq.; or

26.7.2.2 Provide evidence that Developer and its subcontractors have agreed to be bound by: (1) a project labor agreement entered into by the District that binds all contractors and all its subcontractors at every tier performing work on the Project to use a skilled and trained workforce; (2) the extension or renewal of a project labor agreement entered into by the District prior to January 1, 2017; or (3) a project labor agreement that binds all contractors and all its subcontractors at every tier performing work on the Project to use a skilled and trained workforce.

26.8 [Reserved]

26.9 Non-Discrimination

26.9.1 Developer herein agrees to comply with the provisions of the California Fair Employment and Housing Act as set forth in Part 2.8 of Division 3 of Title 2 of the California Government Code, commencing at section 12900; the Federal Civil Rights Act of 1964, as set forth in Public Law 88-352, and all amendments thereto; Executive Order 11246; and all administrative rules and regulations found to be applicable to Developer and Subcontractor.

26.9.2 Special requirements for Federally Assisted Construction Contracts: During the performance of the requirement of the Contract Documents, Developer agrees to incorporate in all subcontracts the provisions set forth in Chapter 60-1.4(b) of Title 41 published in Volume 33 No. 104 of the Federal Register dated May 28, 1968.

26.10 Labor First Aid

Developer shall maintain emergency first aid treatment for Developer's laborers and mechanics on the Project which complies with the Federal Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 et seq.) and the California Occupational Safety and Health Act of 1973 (Lab. Code, § 6300 et seq.; 8 Cal. Code of Regs., § 330 et seq.).

27. [Reserved]

28. Miscellaneous

28.1 Assignment of Antitrust Actions

Although this project may not have been formally bid, the following provisions may apply:

28.1.1 Section 7103.5(b) of the Public Contract Code states:

In entering into a public works contract or subcontract to supply goods, services, or materials pursuant to a public works contract, the contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and

Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the contractor, without further acknowledgment by the parties.

28.1.2 Section 4552 of the Government Code states in pertinent part:

In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder.

28.1.3 Section 4553 of the Government Code states in pertinent part:

If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

28.1.4 Section 4554 of the Government Code states in pertinent part:

Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action.

28.1.5 Under this Article, "public purchasing body" is District and "bidder" is Developer.

28.2 Excise Taxes

If, under Federal Excise Tax Law, any transaction hereunder constitutes a sale on which a Federal Excise Tax is imposed and the sale is exempt from such Federal Excise Tax because it is a sale to a State or Local Government for its exclusive use, District, upon request, will execute documents necessary to show (1) that District is a political subdivision of the State for the purposes of such exemption, and (2) that the sale is for the exclusive use of District. No Federal Excise Tax for such materials shall be included in any Guaranteed Maximum Price.

28.3 Taxes

Guaranteed Maximum Price is to include any and all applicable sales taxes or other taxes that may be due in accordance with section 7051 et seq. of the Revenue and Taxation Code, Regulation 1521 of the State Board of Equalization or any other tax code that may be applicable.

28.4 Shipments

Developer is responsible for any or all damage or loss to shipments until delivered and accepted on Site, as indicated in the Contract Documents. There must be no charge for containers, packing, unpacking, drayage, or insurance. The total Guaranteed Maximum Price shall be all inclusive (including sales tax) and no additional costs of any type will be considered.

28.5 Compliance with Government Reporting Requirements

If this Contract is subject to federal or other governmental reporting requirements because of federal or other governmental financing in whole or in part for the Project of which it is part, or for any other reason, Developer shall comply with those reporting requirements at the request of the District at no additional cost.

[END OF DOCUMENT]

SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Access Conditions and Requirements;
- B. Special Conditions.

1.02 SUMMARY OF WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of this Contract consists of the following:
 - Replacement of existing mechanical units with new all-electric Heat Pump HVAC units in buildings B and C. Installation of fencing enclosure for exterior units, and associate site work.
 - Upgrade of existing Fire Alarm system in Buildings A, B, C and D (MPR).

1.03 CONTRACTS

- A. Perform the Work under a single, fixed-price Contract.

1.04 CODES, REGULATIONS, AND STANDARDS

- A. The codes, regulations, and standards adopted by the state and federal agencies having jurisdiction shall govern minimum requirements for this Project. Where codes, regulations, and standards conflict with the Contract Documents, these conflicts shall be brought to the immediate attention of the District and the Architect.
- B. Codes, regulations, and standards shall be as published effective as of date of bid opening, unless otherwise specified or indicated.

1.05 PROJECT RECORD DOCUMENTS

- A. Contractor shall maintain on Site one set of the following record documents; Contractor shall record actual revisions to the Work:
 - (1) Contract Drawings.
 - (2) Specifications.
 - (3) Addenda.

- (4) Change Orders and other modifications to the Contract.
 - (5) Reviewed shop drawings, product data, and samples.
 - (6) Field test records.
 - (7) Inspection certificates.
 - (8) Manufacturer's certificates.
- B. Contractor shall store Record Documents separate from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.
- C. Contractor shall record information concurrent with construction progress.
- D. Specifications: Contractor shall legibly mark and record at each product section of the Specifications the description of the actual product(s) installed, including the following:
 - (1) Manufacturer's name and product model and number.
 - (2) Product substitutions or alternates utilized.
 - (3) Changes made by Addenda and Change Orders and written directives.

1.06 EXAMINATION OF EXISTING CONDITIONS

- A. Contractor shall be held to have examined the Project Site and acquainted itself with the conditions of the Site and of the streets or roads approaching the Site.
- B. Prior to commencement of Work, Contractor shall survey the Site and existing buildings and improvements to observe existing damage and defects such as cracks, sags, broken, missing or damaged glazing, other building elements and Site improvements, and other damage.
- C. Should Contractor observe cracks, sags, and other damage to and defects of the Site and adjacent buildings, paving, and other items not indicated in the Contract Documents, Contractor shall immediately report same to the District and the Architect.

1.07 CONTRACTOR'S USE OF PREMISES

- A. If unoccupied and only with District's prior written approval, Contractor may use the building(s) at the Project Site without limitation for its operations, storage, and office facilities for the performance of the Work. If the District chooses to beneficially occupy any building(s), Contractor must obtain the District's written approval for Contractor's use of spaces and types of operations to be performed within the building(s) while so occupied. Contractor's access to the building(s) shall be limited to the areas indicated.

- B. If the space at the Project Site is not sufficient for Contractor's operations, storage, office facilities and/or parking, Contractor shall arrange and pay for any additional facilities needed by Contractor.
- C. Contractor shall not interfere with use of or access to occupied portions of the building(s) or adjacent property.
- D. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.
- E. No one other than those directly involved in the demolition and construction, or specifically designated by the District or the Architect shall be permitted in the areas of work during demolition and construction activities.
- F. The Contractor shall install the construction fence and maintain that it will be locked when not in use. Keys to this fencing will be provided to the District.

1.08 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The Drawings show above-grade and below-grade structures, utility lines, and other installations that are known or believed to exist in the area of the Work. Contractor shall locate these existing installations before proceeding with excavation and other operations that could damage same; maintain them in service, where appropriate; and repair damage to them caused by the performance of the Work. Should damage occur to these existing installations, the costs of repair shall be at the Contractor's expense and made to the District's satisfaction.
- B. Contractor shall be alert to the possibility of the existence of additional structures and utilities. If Contractor encounters additional structures and utilities, Contractor will immediately report to the District for disposition of same as indicated in the General Conditions.

1.09 UTILITY SHUTDOWNS AND INTERRUPTIONS

- A. Contractor shall give the District a minimum of three (3) days written notice in advance of any need to shut off existing utility services or to effect equipment interruptions. The District will set exact time and duration for shutdown, and will assist Contractor with shutdown. Work required to re-establish utility services shall be performed by the Contractor.
- B. Contractor shall obtain District's written approval as indicated in the General Conditions in advance of deliveries of material or equipment or other activities that may conflict with District's use of the building(s) or adjacent facilities.

1.10 STRUCTURAL INTEGRITY

- A. Contractor shall be responsible for and supervise each operation and work that could affect structural integrity of various building elements, both permanent and temporary.
- B. Contractor shall include structural connections and fastenings as indicated or required for complete performance of the Work.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

ALLOWANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-specified work.

1.2 RELATED SECTIONS

A. Document 01 10 00 (Summary of Work)

B. Document 01 29 00 (Payments and Completion)

C. Document 01 32 19 (Submittal Procedures)

1.3 ALLOWANCES

- A. Included in the Contract, a stipulated sum/price of **[INSERT AMOUNT]** as an allowance for Unforeseen Conditions within the limits set forth in the Contract Documents. This Allowance shall not be utilized without written approval by the District.
- B. Contractor's costs, without overhead and profit, for products, delivery, installation, labor, insurance, payroll, taxes, bonding and equipment rental will be included in Allowance Expenditure Directive authorizing expenditure of funds from this Allowance. No overhead and profit shall be added to the Allowance Expenditure Directive.
- C. Funds will be drawn from Allowance only with District approval evidenced by an Allowance Expenditure Directive.
- D. At Contract closeout, funds remaining in Allowance will be credited to District by Change Order.
- E. Whenever costs are more than the Allowance, the amount covered by the Allowance will be approved at cost. The Contract Price shall be adjusted by Change Order for amounts in excess of the Allowance.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF DOCUMENT

ALTERNATES AND UNIT PRICING

PART 1 – ALTERNATES

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A.** General Conditions;
- B.** Special Conditions;
- C.** Bid Form and Proposal;
- D.** Instruction to Bidders.

1.02 DESCRIPTION

The items of work indicated below propose modifications to, substitutions for, additions to and/or deletions from the various parts of the Work specified in other Sections of the Specifications. The acceptance or rejection of any of the alternates is strictly at the option of the District subject to District's acceptance of Contractor's stated prices contained in this Proposal.

1.03 GENERAL

Where an item is omitted, or scope of Work is decreased, all Work pertaining to the item whether specifically stated or not, shall be omitted and where an item is added or modified or where scope of Work is increased, all Work pertaining to that required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

1.04 BASE BID

The Base Bid includes all work required to construct the Project completely and in accordance with the Contract Documents.

1.05 ALTERNATES

- A.** _____
- B.** _____

The above Alternate descriptions are general in nature and for reference purposes only. The Contract Documents, including, without limitation, the Drawings and Specifications, must be referred to for the complete scope of Work.

PART 2 - UNIT PRICING

2.01 GENERAL

Contractor shall completely state all required figures based on Unit Prices listed below. Where scope of Work is decreased, all Work pertaining to the item, whether specifically stated or not, shall be omitted and where scope of Work is increased, all work pertaining to that item required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

2.02 UNIT PRICES

Furnish unit prices for each of the named items on a square foot, lineal foot, or per each basis, as applies. Unit prices shall include all labor, materials, services, profit, overhead, insurance, bonds, taxes, and all other incidental costs of Contractor, subcontractors, and supplier(s).

A. _____

B. _____

END OF DOCUMENT

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. Instructions to Bidders;
- B. General Conditions, including, without limitation, Substitutions For Specified Items; and
- C. Special Conditions.

1.02 SUBSTITUTIONS OF MATERIALS AND EQUIPMENT

- A. Catalog numbers and specific brands or trade names followed by the designation "or equal" are used in conjunction with material and equipment required by the Specifications to establish the standards of quality, utility, and appearance required. Substitutions which are equal in quality, utility, and appearance to those specified may be reviewed subject to the provisions of the General Conditions.
- B. Wherever more than one manufacturer's product is specified, the first-named product is the basis for the design used in the work and the use of alternative-named manufacturers' products or substitutes may require modifications in that design. If such alternatives are proposed by Contractor and are approved by the District and/or the Architect, Contractor shall assume all costs required to make necessary revisions and modifications of the design resulting from the substitutions requested by the Contractor.
- C. When materials and equipment are specified by first manufacturer's name and product number, second manufacturer's name and "or approved equal," supporting data for the second product, if proposed by Contractor, shall be submitted in accordance with the requirements for substitutions. The District's Board has found and determined that certain item(s) shall be used on this Project based on the purpose(s) indicated pursuant to Public Contract Code section 3400(c). These findings, as well as the products and brand or trade names, have been identified in the Notice to Bidders.
- D. The Contractor will not be allowed to substitute specified items unless the request for substitution is submitted as follows:
 - (1) District must receive any notice of request for substitution of a specified item a minimum of ten (10) calendar days prior to bid opening.

- (2) Within 35 days after the date of the Notice of Award, the Contractor shall submit data substantiating the request(s) for all substitution(s) containing sufficient information to assess acceptability of product or system and impact on Project, including, without limitation, the requirements specified in the Special Conditions and the technical Specifications. Insufficient information shall be grounds for rejection of substitution.
- E. If the District and/or Architect, in reviewing proposed substitute materials and equipment, require revisions or corrections to be made to previously accepted Shop Drawings and supplemental supporting data to be resubmitted, Contractor shall promptly do so. If any proposed substitution is judged by the District and/or Architect to be unacceptable, the specified material or equipment shall be provided.
- F. Samples may be required. Tests required by the District and/or Architect for the determination of quality and utility shall be made at the expense of Contractor, with acceptance of the test procedure first given by the District.
- G. In reviewing the supporting data submitted for substitutions, the District and/or Architect will use for purposes of comparison all the characteristics of the specified material or equipment as they appear in the manufacturer's published data even though all the characteristics may not have been particularly mentioned in the Contract Documents. If more than two (2) submissions of supporting data are required, the cost of reviewing the additional supporting data shall be borne by Contractor, and the District will deduct the costs from the Contract Price. The Contractor shall be responsible for any re-design costs occasioned by District's acceptance and/or approval of any substitute.
- H. The Contractor shall, in the event that a substitute is less costly than that specified, credit the District with one hundred percent (100%) of the net difference between the substitute and the originally specified material. In this event, the Contractor agrees to execute a deductive Change Order to reflect that credit. In the event Contractor furnishes a material, process, or article more expensive than that specified, the difference in the cost of that material, process, or article so furnished shall be borne by Contractor.
- I. In no event shall the District be liable for any increase in Contract Price or Contract Time due to any claimed delay in the evaluation of any proposed substitute or in the acceptance or rejection of any proposed substitute.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 26 00

CHANGES IN THE WORK

CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE PROVISIONS IN THE AGREEMENT, GENERAL CONDITIONS, AND SPECIAL CONDITIONS, IF USED, RELATED TO CHANGES AND/OR REQUESTS FOR CHANGES.

END OF DOCUMENT

SRCS SAN PEDRO ELEMENTARY SCHOOL
HVAC & FIRE ALARM UPGRADE
SAN RAFAEL, CALIFORNIA
DSA SUBMITTAL
01 OCTOBER 2024

SECTION 01 26 73 – DSA CONSTRUCTION CHANGE DOCUMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing DSA Construction Change Documents for modifications of portions of the project affecting the Structural Safety, Access Compliance, and Fire and Life Safety.

1.02 DEFINITIONS

- A. DSA: Division of the State Architect.

1.03 CONSTRUCTION CHANGE DOCUMENT

- A. Construction Change Document: Architect will submit a Construction Change Document on DSA Form 140 Application for Approval of Construction Change Document to DSA. Upon DSA approval of a Construction Change Document, Architect will notify Contractor to proceed with the change in the Work, for subsequent inclusion in a Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

HMC Architects

3584003000

DSA CONSTRUCTION CHANGE
DOCUMENT PROCEDURES
01 26 73 - 1

PROJECT MEETINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions; and
- B. Special Conditions.

1.02 PROGRESS MEETINGS:

- A. Contractor shall schedule and hold regular weekly progress meetings after a minimum of one week's prior written notice of the meeting date and time to all Invitees as indicated below.
- B. Location: Contractor's field office.
- C. The Contractor shall notify and invite the following entities ("Invitees"):
 - (1) District Representative.
 - (2) Contractor.
 - (3) Contractor's Project Manager.
 - (4) Contractor's Superintendent.
 - (5) Subcontractors, as appropriate to the agenda of the meeting.
 - (6) Suppliers, as appropriate to the agenda of the meeting.
 - (7) Construction Manager, if any.
 - (8) Architect
 - (9) Engineer(s), if any and as appropriate to the agenda of the meeting.
 - (10) Others, as appropriate to the agenda of the meeting.
- D. The District's and/or the Architect's Consultants will attend at their discretion, in response to the agenda.
- E. The District representative, the Construction Manager, and/or another District Agent shall take and distribute meeting notes to attendees and other concerned parties. If exceptions are taken to anything in the meeting notes,

those exceptions shall be stated in writing to the District within five (5) working days following District's distribution of the meeting notes.

1.03 PRE-INSTALLATION/PERFORMANCE MEETING:

- A. Contractor shall schedule a meeting prior to the start of each of the following portions of the Work: cutting and patching of plaster and roofing, and other weather-exposed and moisture-resistant products. Contractor shall invite all Invitees to this meeting, and others whose work may affect or be affected by the quality of the cutting and patching work.
- B. Contractor shall review in detail prior to this meeting, the manufacturer's requirements and specifications, applicable portions of the Contract Documents, Shop Drawings, and other submittals, and other related work. At this meeting, invitees shall review and resolve conflicts, incompatibilities, or inadequacies discovered or anticipated.
- C. Contractor shall review in detail Project conditions, schedule, requirements for performance, application, installation, and quality of completed Work, and protection of adjacent Work and property.
- D. Contractor shall review in detail means of protecting the completed Work during the remainder of the construction period.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

SCHEDULING OF WORK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions;
- C. Summary of Work; and
- D. Submittals.

1.02 SECTION INCLUDES

- A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of this Section.
 - (1) Development of schedule, cost and resource loading of the schedule, monthly payment requests, and project status reporting requirements of the Contract shall employ computerized Critical Path Method ("CPM") scheduling ("CPM Schedule").
 - (2) CPM Schedule shall be cost loaded based on Schedule of Values as approved by District.
 - (3) Submit schedules and reports as specified in the General Conditions.
- B. Upon Award of Contract, Contractor shall immediately commence development of Initial and Original CPM Schedules to ensure compliance with CPM Schedule submittal requirements.

1.03 CONSTRUCTION SCHEDULE

- A. Within ten (10) days of issuance of the Notice to Proceed and before request for first progress payment, the Contractor shall prepare and submit to the Project Manager a construction progress schedule conforming to the Milestone Schedule below.
- B. The Construction Schedule shall be continuously updated, and an updated schedule shall be submitted with each application for progress payment. Each revised schedule shall indicate the work actually accomplished during the previous period and the schedule for completion of the remaining work.

C. Milestone Schedule:

ACTIVITY DESCRIPTION

REQUIRED COMPLETION

CONSTRUCTION STARTS

[DATE]

FINAL PROJECT COMPLETION

[DATE]

1.04 QUALIFICATIONS

- A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of [i.e., Primavera Project Planner]. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose.
- (1) The written statement shall identify the individual who will perform CPM scheduling.
 - (2) Capability and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.
 - (3) Required level of experience shall include at least two (2) projects of similar nature and scope with value not less than three fourths ($\frac{3}{4}$) of the Total Bid Price of this Project. The written statement shall provide contact persons for referenced projects with current telephone and address information.
- B. District reserves the right to approve or reject Contractor's scheduler or consultant at any time. District reserves the right to refuse replacing of Contractor's scheduler or consultant, if District believes replacement will negatively affect the scheduling of Work under this Contract.

1.05 GENERAL

- A. Progress Schedule shall be based on and incorporate milestone and completion dates specified in Contract Documents.
- B. Overall time of completion and time of completion for each milestone shown on Progress Schedule shall adhere to times in the Contract, unless an earlier (advanced) time of completion is requested by Contractor and agreed to by District. Any such agreement shall be formalized by a Change Order.
- (1) District is not required to accept an early completion schedule, i.e., one that shows an earlier completion date than the Contract Time.
 - (2) Contractor shall not be entitled to extra compensation in event agreement is reached on an earlier completion schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in its early completion schedule but within the Contract Time.

- (3) A schedule showing the work completed in less than the Contract Time, and that has been accepted by District, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the work and the Completion Date. Project Float is a resource available to both District and the Contractor.
- C. Ownership Project Float: Neither the District nor Contractor owns Project Float. The Project owns the Project Float. As such, liability for delay of the Completion Date rests with the party whose actions, last in time, actually cause delay to the Completion Date.
 - (1) For example, if Party A uses some, but not all of the Project Float and Party B later uses remainder of the Project Float as well as additional time beyond the Project Float, Party B shall be liable for the time that represents a delay to the Completion Date.
 - (2) Party A would not be responsible for the time since it did not consume the entire Project Float and additional Project Float remained; therefore, the Completion Date was unaffected by Party A.
- D. Progress Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. Responsibility for developing Contract CPM Schedule and monitoring actual progress as compared to Progress Schedule rests with Contractor.
- E. Failure of Progress Schedule to include any element of the Work, or any inaccuracy in Progress Schedule, will not relieve Contractor from responsibility for accomplishing the Work in accordance with the Contract. District's acceptance of schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests and shall not, in any manner, impose a duty of care upon District, or act to relieve Contractor of its responsibility for means and methods of construction.
- F. Software: Use **[i.e., District Project Planner for Windows, latest version]**. Such software shall be compatible with Windows operating system. Contractor shall transmit contract file to District on compact disk at times requested by District.
- G. Transmit each item under the form approved by District.
 - (1) Identify Project with District Contract number and name of Contractor.
 - (2) Provide space for Contractor's approval stamp and District's review stamps.
 - (3) Submittals received from sources other than Contractor will be returned to the Contractor without District's review.

1.06 INITIAL CPM SCHEDULE

- A. Initial CPM Schedule submitted for review at the pre-construction conference shall serve as Contractor's schedule for up to ninety (90) calendar days after the Notice to Proceed.

- B. Indicate detailed plan for the Work to be completed in first ninety (90) days of the Contract; details of planned mobilization of plant and equipment; sequence of early operations; procurement of materials and equipment. Show Work beyond ninety (90) calendar days in summary form.
- C. Initial CPM Schedule shall be time scaled.
- D. Initial CPM Schedule shall be cost and resource loaded. Accepted cost and resource loaded schedule will be used as basis for monthly progress payments until acceptance of the Original CPM Schedule. Use of Initial CPM Schedule for progress payments shall not exceed ninety (90) calendar days.
- E. District and Contractor shall meet to review and discuss the Initial CPM Schedule within seven (7) calendar days after it has been submitted to District.
 - (1) District's review and comment on the schedule shall be limited to Contract conformance (with sequencing, coordination, and milestone requirements).
 - (2) Contractor shall make corrections to schedule necessary to comply with Contract requirements and shall adjust schedule to incorporate any missing information requested by District. Contractor shall resubmit Initial CPM Schedule if requested by District.
- F. If, during the first ninety (90) days after Notice to Proceed, the Contractor is of the opinion that any of the Work included on its Initial CPM Schedule has been impacted, the Contractor shall submit to District a written Time Impact Evaluation ("TIE") in accordance with Article 1.12 of this Section. The TIE shall be based on the most current update of the Initial CPM Schedule.

1.07 ORIGINAL CPM SCHEDULE

- A. Submit a detailed proposed Original CPM Schedule presenting an orderly and realistic plan for completion of the Work in conformance with requirements as specified herein.
- B. Progress Schedule shall include or comply with following requirements:
 - (1) Time scaled, cost and resource (labor and major equipment) loaded CPM schedule.
 - (2) No activity on schedule shall have duration longer than fifteen (15) work days, with exception of submittal, approval, fabrication and procurement activities, unless otherwise approved by District.
 - (a) Activity durations shall be total number of actual work days required to perform that activity.
 - (3) The start and completion dates of all items of Work, their major components, and milestone completion dates, if any.

- (4) District furnished materials and equipment, if any, identified as separate activities.
- (5) Activities for maintaining Project Record Documents.
- (6) Dependencies (or relationships) between activities.
- (7) Processing/approval of submittals and shop drawings for all material and equipment required per the Contract. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.
 - (a) Include time for submittals, re-submittals and reviews by District. Coordinate with accepted schedule for submission of Shop Drawings, samples, and other submittals.
 - (b) Contractor shall be responsible for all impacts resulting from re-submittal of Shop Drawings and submittals.
- (8) Procurement of major equipment, through receipt and inspection at jobsite, identified as separate activity.
 - (a) Include time for fabrication and delivery of manufactured products for the Work.
 - (b) Show dependencies between procurement and construction.
- (9) Activity description; what Work is to be accomplished and where.
- (10) The total cost of performing each activity shall be total of labor, material, and equipment, excluding overhead and profit of Contractor. Overhead and profit of the General Contractor shall be shown as a separate activity in the schedule. Sum of cost for all activities shall equal total Contract value.
- (11) Resources required (labor and major equipment) to perform each activity.
- (12) Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.
- (13) Identify the activities which constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to (10) days.
- (14) Twenty (20) workdays for developing punch list(s), completion of punch-list items, and final clean up for the Work or any designated portion thereof. No other activities shall be scheduled during this period.
- (15) Interface with the work of other contractors, District, and agencies such as, but not limited to, utility companies.

- (16) Show detailed Subcontractor Work activities. In addition, furnish copies of Subcontractor schedules upon which CPM was built.
 - (a) Also furnish for each Subcontractor, as determined by District, submitted on Subcontractor letterhead, a statement certifying that Subcontractor concurs with Contractor's Original CPM Schedule and that Subcontractor's related schedules have been incorporated, including activity duration, cost and resource loading.
 - (b) Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.
 - (c) In addition to Contractor's schedule and resource loading, obtain from electrical, mechanical, and plumbing Subcontractors, and other Subcontractors as required by District, productivity calculations common to their trades, such as units per person day, feet of pipe per day per person, feet of wiring per day per person, and similar information.
 - (d) Furnish schedule for Contractor/Subcontractor CPM schedule meetings which shall be held prior to submission of Original CPM schedule to District. District shall be permitted to attend scheduled meetings as an observer.
- (17) Activity durations shall be in Work days.
- (18) Submit with the schedule a list of anticipated non-Work days, such as weekends and holidays. The Progress Schedule shall exclude in its Work day calendar all non-Work days on which Contractor anticipates critical Work will not be performed.
- C. Original CPM Schedule Review Meeting: Contractor shall, within sixty (60) days from the Notice to Proceed date, meet with District to review the Original CPM Schedule submittal.
 - (1) Contractor shall have its Project Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by District, in attendance. The meeting will take place over a continuous one (1) day period.
 - (2) District's review will be limited to submittal's conformance to Contract requirements including, but not limited to, coordination requirements. However, review may also include:
 - (a) Clarifications of Contract Requirements.
 - (b) Directions to include activities and information missing from submittal.
 - (c) Requests to Contractor to clarify its schedule.

- (3) Within five (5) days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by District at the Meeting.

1.08 ADJUSTMENTS TO CPM SCHEDULE

- A. Adjustments to Original CPM Schedule: Contractor shall have adjusted the Original CPM Schedule submittal to address all review comments from original CPM Schedule review meeting and resubmit network diagrams and reports for District's review.
 - (1) District, within ten (10) days from date that Contractor submitted the revised schedule, will either:
 - (a) Accept schedule and cost and resource loaded activities as submitted, or
 - (b) Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for District to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.
 - (2) District may accept schedule with conditions that the first monthly CPM Schedule update be revised to correct deficiencies identified.
 - (3) When schedule is accepted, it shall be considered the "Original CPM Schedule" which will then be immediately updated to reflect the current status of the work.
 - (4) District reserves right to require Contractor to adjust, add to, or clarify any portion of schedule which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.
- B. Acceptance of Contractor's schedule by District will be based solely upon schedule's compliance with Contract requirements.
 - (1) By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.
 - (2) Upon submittal of schedule update, updated schedule shall be considered "current" CPM Schedule.
 - (3) Submission of Contractor's schedule to District shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply with requirements of Contract Documents, including adverse effects such as delays resulting from ill-timed Work.

- C. Submittal of Original CPM Schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the Schedule meets requirements of Contract Documents and that Work shall be executed in sequence indicated on the schedule.
- D. Contractor shall distribute Original CPM Schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterheads to Contractor and transmitted to District for the record.

1.09 MONTHLY CPM SCHEDULE UPDATE SUBMITTALS

- A. Following acceptance of Contractor's Original CPM Schedule, Contractor shall monitor progress of Work and adjust schedule each month to reflect actual progress and any anticipated changes to planned activities.
 - (1) Each schedule update submitted shall be complete, including all information requested for the Original CPM Schedule submittal.
 - (2) Each update shall continue to show all Work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed.
- B. A meeting will be held on approximately the twenty-fifth (25th) of each month to review the schedule update submittal and progress payment application.
 - (1) At this meeting, at a minimum, the following items will be reviewed: Percent (%) complete of each activity; Time Impact Evaluations for Change Orders and Time Extension Request; actual and anticipated activity sequence changes; actual and anticipated duration changes; and actual and anticipated Contractor delays.
 - (2) These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, these meetings shall be attended by Contractor's General Superintendent and Scheduler.
 - (3) Contractor shall plan on the meeting taking no less than four (4) hours.
- C. Within five (5) working days after monthly schedule update meeting, Contractor shall submit the updated CPM Schedule update.
- D. Within five (5) work days of receipt of above noted revised submittals, District will either accept or reject monthly schedule update submittal.
 - (1) If accepted, percent (%) complete shown in monthly update will be basis for Application for Payment by the Contractor. The schedule update shall be submitted as part of the Contractor's Application for Payment.

- (2) If rejected, update shall be corrected and resubmitted by Contractor before the Application for Payment is submitted.
- E. Neither updating, changing or revising of any report, curve, schedule, or narrative submitted to District by Contractor under this Contract, nor District's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying in any way the Completion Date or milestone dates or of modifying or limiting in any way Contractor's obligations under this Contract.

1.10 SCHEDULE REVISIONS

- A. Updating the Schedule to reflect actual progress shall not be considered revisions to the Schedule. Since scheduling is a dynamic process, revisions to activity durations and sequences are expected on a monthly basis.
- B. To reflect revisions to the Schedule, the Contractor shall provide District with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram which compares the original sequence to the revised sequence of work. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.
- C. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by District. District may request further information and justification for schedule revisions and Contractor shall, within three (3) days, provide District with a complete written narrative response to District's request.
- D. If the Contractor's revision is still not accepted by District, and the Contractor disagrees with District's position, the Contractor has seven (7) calendar days from receipt of District's letter rejecting the revision to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of District's written rejection of a schedule revision shall be contractually interpreted as acceptance of District's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding District's position.
- E. At District's discretion, the Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

1.11 RECOVERY SCHEDULE

- A. If the Schedule Update shows a completion date twenty-one (21) calendar days beyond the Contract Completion Date, or individual milestone completion dates, the Contractor shall submit to District the proposed revisions to recover the lost time within seven (7) calendar days. As part of this submittal, the Contractor shall provide a written narrative for each revision made to recapture the lost time. If the revisions include sequence changes, the Contractor shall provide a schedule diagram comparing the original sequence to the revised sequence of work.

- B. The revisions shall not be incorporated into any schedule update until the revisions have been reviewed by District.
- C. If the Contractor's revisions are not accepted by District, District and the Contractor shall follow the procedures in paragraph 1.09.C, 1.09.D and 1.09.E above.
- D. At District's discretion, the Contractor can be required to provide Subcontractor certifications for revisions affecting said Subcontractors.

1.12 TIME IMPACT EVALUATION ("TIE") FOR CHANGE ORDERS, AND OTHER DELAYS

- A. When Contractor is directed to proceed with changed Work, the Contractor shall prepare and submit within fourteen (14) calendar days from the Notice to Proceed a TIE which includes both a written narrative and a schedule diagram depicting how the changed Work affects other schedule activities. The schedule diagram shall show how the Contractor proposes to incorporate the changed Work in the schedule and how it impacts the current schedule-update critical path. The Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable District to evaluate the impact of changed Work to the scheduled critical path.
- B. Contractor shall be required to comply with the requirements of Paragraph 1.09.A for all types of delays such as, but not limited to, Contractor/Subcontractor delays, adverse weather delays, strikes, procurement delays, fabrication delays, etc.
- C. Contractor shall be responsible for all costs associated with the preparation of TIEs, and the process of incorporating them into the current schedule update. The Contractor shall provide District with four (4) copies of each TIE.
- D. Once agreement has been reached on a TIE, the Contract Time will be adjusted accordingly. If agreement is not reached on a TIE, the Contract Time may be extended in an amount District allows, and the Contractor may submit a claim for additional time claimed by contractor.

1.13 TIME EXTENSIONS

- A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current schedule update. Notice of time impacts shall be given in accord with the General Conditions.
- B. Where an event for which District is responsible impacts the projected Completion Date, the Contractor shall provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment, and material the Contractor would expend to mitigate District-caused time impact. The Contractor shall submit its mitigation plan to District within fourteen (14)

calendar days from the date of discovery of the impact. The Contractor is responsible for the cost to prepare the mitigation plan.

- C. Failure to request time, provide TIE, or provide the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.
- D. No time will be granted under this Contract for cumulative effect of changes.
- E. District will not be obligated to consider any time extension request unless the Contractor complies with the requirements of Contract Documents.
- F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.
- G. If the Contractor does not submit a TIE within the required fourteen (14) calendar days for any issue, it is mutually agreed that the Contractor does not require a time extension for said issue.

1.14 SCHEDULE REPORTS

- A. Submit four (4) copies of the following reports with the Initial CPM Schedule, the Original CPM Schedule, and each monthly update.
- B. Required Reports:
 - (1) Two activity listing reports: one sorted by activity number and one by total Project Float. These reports shall also include each activity's early/late and actual start and finish dates, original and remaining duration, Project Float, responsibility code, and the logic relationship of activities.
 - (2) Cost report sorted by activity number including each activity's associated cost, percentage of Work accomplished, earned value- to date, previous payments, and amount earned for current update period.
 - (3) Schedule plots presenting time-scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.
 - (4) Cash flow report calculated by early start, late start, and indicating actual progress. Provide an exhibit depicting this information in graphic form.
 - (5) Planned versus actual resource (i.e., labor) histogram calculated by early start and late start.
- C. Other Reports:

In addition to above reports, District may request, from month to month, any two of the following reports. Submit four (4) copies of all reports.

- (1) Activities by early start.
 - (2) Activities by late start.
 - (3) Activities grouped by Subcontractors or selected trades.
 - (4) Activities with scheduled early start dates in a given time frame, such as fifteen (15) or thirty (30) day outlook.
- D. Furnish District with report files on compact disks containing all schedule files for each report generated.

1.15 PROJECT STATUS REPORTING

- A. In addition to submittal requirements for CPM scheduling identified in this Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each CPM Schedule as specified herein. Status reporting shall be in form specified below.
- B. Contractor shall prepare monthly written narrative reports of status of Project for submission to District. Written status reports shall include:
- (1) Status of major Project components (percent (%) complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.
 - (2) Progress made on critical activities indicated on CPM Schedule.
 - (3) Explanations for any lack of work on critical path activities planned to be performed during last month.
 - (4) Explanations for any schedule changes, including changes to logic or to activity durations.
 - (5) List of critical activities scheduled to be performed next month.
 - (6) Status of major material and equipment procurement.
 - (7) Any delays encountered during reporting period.
 - (8) Contractor shall provide printed report indicating actual versus planned resource loading for each trade and each activity. This report shall be provided on weekly and monthly basis.
 - (a) Actual resource shall be accumulated in field by Contractor, and shall be as noted on Contractor's daily reports. These reports will be basis for information provided in computer-generated monthly and weekly printed reports.
 - (b) Contractor shall explain all variances and mitigation measures.

- (9) Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by District at no additional cost.
- (10) Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.

1.16 WEEKLY SCHEDULE REPORT

At the Weekly Progress Meeting, the Contractor shall provide and present a time-scaled three (3) week look-ahead schedule that is based and correlated by activity number to the current schedule (i.e., Initial, Original CPM, or Schedule Update).

1.17 DAILY CONSTRUCTION REPORTS

On a daily basis, Contractor shall submit a daily activity report to District for each workday, including weekends and holidays when worked. Contractor shall develop the daily construction reports on a computer-generated database capable of sorting daily Work, manpower, and man-hours by Contractor, Subcontractor, area, sub-area, and Change Order Work. Upon request of District, furnish computer disk of this data base. Obtain District's written approval of daily construction report data base format prior to implementation. Include in report:

- A. Project name and Project number.
- B. Contractor's name and address.
- C. Weather, temperature, and any unusual site conditions.
- D. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work of Subcontractors. Descriptions shall be referenced to CPM scheduled activities.
- E. Worker quantities for its own Work force and for Subcontractors of any tier.
- F. Equipment, other than hand tools, utilized by Contractor and Subcontractors.

1.18 PERIODIC VERIFIED REPORTS

Contractor shall complete and verify construction reports on a form prescribed by the Division of the State Architect and file reports on the first day of February, May, August, and November during the preceding quarter year; at the completion of the Contract; at the completion of the Work; at the suspension of Work for a period of more than one (1) month; whenever the services of Contractor or any of Contractor's Subcontractors are terminated for any reason; and at any time a special verified report is required by the Division of the State Architect. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Contractor's Submittals and Schedules, Drawings and Specifications;
- B. Special Conditions.

1.02 SECTION INCLUDES:

- A. Definitions:
 - (1) Shop Drawings and Product Data are as indicated in the General Conditions and include, but are not limited to, fabrication, erection, layout and setting drawings, formwork and falsework drawings, manufacturers' standard drawings, descriptive literature, catalogues, brochures, performance and test data, wiring and control diagrams. In addition, there are other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and all positions conform to the requirement of the Contract Documents, including, without limitation, the Drawings.
 - (2) "Manufactured" applies to standard units usually mass-produced; "fabricated" means specifically assembled or made out of selected materials to meet design requirements. Shop Drawings shall establish the actual detail of manufactured or fabricated items, indicated proper relation to adjoining work and amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure.
 - (3) Manufacturer's Instructions: Where any item of Work is required by the Contract Documents to be furnished, installed, or performed, at a minimum, in accordance with a specified product manufacturer's instructions, the Contractor shall procure and distribute copies of these to the District, the Architect, and all other concerned parties and shall furnish, install, or perform the work, at a minimum, in accordance with those instructions.
- B. Samples, Shop Drawings, Product Data, and other items as specified, in accordance with the following requirements:
 - (1) Contractor shall submit all Shop Drawings, Product Data, and Samples to the District, the Architect, the Project Inspector, and the Construction Manager.

- (2) Contractor shall comply with all time frames herein and in the General Conditions and, in any case, shall submit required information in sufficient time to permit proper consideration and action before ordering any materials or items represented by such Shop Drawings, Product Data, and/or Samples.
- (3) Contractor shall allow sufficient time so that no delay occurs due to required lead time in ordering or delivery of any item to the Site. Contractor shall be responsible for any delay in progress of Work due to its failure to observe these requirements.
- (4) Time for completion of Work shall not be extended on account of Contractor's failure to promptly submit Shop Drawings, Product Data, and/or Samples.
- (5) Reference numbers on Shop Drawings shall have Architectural and/or Engineering Contract Drawings reference numbers for details, sections, and "cuts" shown on Shop Drawings. These reference numbers shall be in addition to any numbering system that Contractor chooses to use or has adopted as standard.
- (6) When the magnitude or complexity of submittal material prevents a complete review within the stated time frame, Contractor shall make this submittal in increments to avoid extended delays.
- (7) Contractor shall certify on submittals for review that submittals conform to Contract requirements. Also certify that Contractor-furnished equipment can be installed in allocated space. In event of any variance, Contractor shall specifically state in transmittal and on Shop Drawings, portions vary and require approval of a substitute. Submittals shall not be used as a means of requesting a substitution.
- (8) Unless specified otherwise, sampling, preparation of samples, and tests shall be in accordance with the latest standard of the American Society for Testing and Materials.
- (9) Upon demand by Architect or District, Contractor shall submit samples of materials and/or articles for tests or examinations and consideration before Contractor incorporates same in Work. Contractor shall be solely responsible for delays due to sample(s) not being submitted in time to allow for tests. Acceptance or rejection will be expressed in writing. Work shall be equal to approved samples in every respect. Samples that are of value after testing will remain the property of Contractor.

C. Submittal Schedule:

- (1) Contractor shall prepare its proposed submittal schedule that is coordinated with the proposed construction schedule and submit both to the District within ten (10) days after the date of the Notice to Proceed. Contractor's proposed schedules shall become the Project Construction Schedule and the Project Submittal Schedule after each is approved by the District.

- (2) Contractor is responsible for all lost time should the initial submittal be rejected, marked "revise and resubmit", etc.
- (3) All Submittals shall be forwarded to the District by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those Submittals shall be forwarded to the District so as not to delay the Construction Schedule.
- (4) Contractor may be assessed \$100 a day for each day it is late in submitting a shop drawing or sample. No extensions of time will be granted to Trade Contractor or any Subcontractor because of its failure to have shop drawings and samples submitted in accordance with the Schedule.

1.03 SHOP DRAWINGS:

- A. Contractor shall submit one reproducible transparency and six (6) opaque reproductions. The District will review and return the reproducible copy and one (1) opaque reproduction to Contractor.
- B. Before commencing installation of any Work, the Contractor shall submit and receive approval of all drawings, descriptive data, and material list(s) as required to accomplish Work.
- C. Review of Shop Drawings is regarded as a service to assist Contractor and in all cases original Contract Documents shall take precedence as outlined under General Conditions.
- D. No claim for extra time or payment shall be based on work shown on Shop Drawings unless the claim is (1) noted on Contractor's transmittal letter accompanying Shop Drawings and (2) Contractor has complied with all applicable provisions of the General Conditions, including, without limitation, provisions regarding changes and payment, and all required written approvals.
- E. District shall not review Shop Drawings for quantities of materials or number of items supplied.
- F. District's and/or Architect's review of Shop Drawing will be general. District and/or Architect review does not relieve Contractor of responsibility for dimensions, accuracy, proper fitting, construction of Work, furnishing of materials, or Work required by Contract Documents and not indicated on Shop Drawings. The District's and/or Architect's review of Shop Drawings is not to be construed as approving departures from Contract Documents.
- G. Review of Shop Drawings and Schedules does not relieve Contractor from responsibility for any aspect of those Drawings or Schedules that is a violation of local, County, State, or Federal laws, rules, ordinances, or rules and regulations of commissions, boards, or other authorities or utilities having jurisdiction.
- H. Before submitting Shop Drawings for review, Contractor shall check Shop Drawings of its subcontractors for accuracy, and confirm that all Work

contiguous with and having bearing on other work shown on Shop Drawings is accurately drawn and in conformance with Contract Documents.

- I. Submitted drawings and details must bear stamp of approval of Contractor:
 - (1) Stamp and signature shall clearly certify that Contractor has checked Shop Drawings for compliance with Drawings.
 - (2) If Contractor submits a Shop Drawing without an executed stamp of approval, or whenever it is evident (despite stamp) that Drawings have not been checked, the District and/or Architect will not consider them and will return them to the Contractor for revision and resubmission. In that event, it will be deemed that Contractor has not complied with this provision and Contractor shall bear risk of all delays to same extent as if it had not submitted any Shop Drawings or details.
- J. Submission of Shop Drawings (in either original submission or when resubmitted with correction) constitutes evidence that Contractor has checked all information thereon and that it accepts and is willing to perform Work as shown.
- K. Contractor shall pay for cost of any changes in construction due to improper checking and coordination. Contractor shall be responsible for all additional costs, including coordination. Contractor shall be responsible for costs incurred by itself, the District, the Architect, the Project Inspector, the Construction Manager, any other Subcontractor or contractor, etc., due to improperly checked and/or coordination of submittals.
- L. Shop Drawings must clearly delineate the following information:
 - (1) Project name and address.
 - (2) Specification number and description.
 - (3) Architect's name and project number.
 - (4) Shop Drawing title, number, date, and scale.
 - (5) Names of Contractor, Subcontractor(s) and fabricator.
 - (6) Working and erection dimensions.
 - (7) Arrangements and sectional views.
 - (8) Necessary details, including complete information for making connections with other Work.
 - (9) Kinds of materials and finishes.
 - (10) Descriptive names of materials and equipment, classified item numbers, and locations at which materials or equipment are to be installed in the Work. Contractor shall use same reference identification(s) as shown on Contract Drawings.

- M. Contractor shall prepare composite drawings and installation layouts when required to solve tight field conditions.
- (1) Shop Drawings shall consist of dimensioned plans and elevations and must give complete information, particularly as to size and location of sleeves, inserts, attachments, openings, conduits, ducts, boxes, structural interferences, etc.
 - (2) Contractor shall coordinate these composite Shop Drawings and installation layouts in the field between itself and its Subcontractor(s) for proper relationship to the Work, the work of other trades, and the field conditions. The Contractor shall check and approve all submittal(s) before submitting them for final review.

1.04 PRODUCT DATA OR NON REPRODUCIBLE SUBMITTALS:

- A. Contractor shall submit manufacturer's printed literature in original form. Any fading type of reproduction will not be accepted. Contractor must submit a minimum of six (6) each, to the District. District shall return one (1) to the Contractor, who shall reproduce whatever additional copies it requires for distribution.
- B. Contractor shall submit six (6) copies of a complete list of all major items of mechanical, plumbing, and electrical equipment and materials in accordance with the approved Submittal Schedule, except as required earlier to comply with the approved Construction Schedule. Other items specified are to be submitted prior to commencing Work. Contractor shall submit items of like kind at one time in a neat and orderly manner. Partial lists will not be acceptable.
- C. Submittals shall include manufacturer's specifications, physical dimensions, and ratings of all equipment. Contractor shall furnish performance curves for all pumps and fans. Where printed literature describes items in addition to that item being submitted, submitted item shall be clearly marked on sheet and superfluous information shall be crossed out. If highlighting is used, Contractor shall mark all copies.
- D. Equipment submittals shall be complete and include space requirements, weight, electrical and mechanical requirements, performance data, and supplemental information that may be requested.
- E. Imported Materials Certification must be submitted at least ten (10) days before material is delivered.

1.05 SAMPLES:

- A. Contractor shall submit for approval Samples as required and within the time frame in the Contract Documents. Materials such as concrete, mortar, etc., which require on-site testing will be obtained from Project Site.
- B. Contractor shall submit four (4) samples except where greater or lesser number is specifically required by Contract Documents including, without limitation, the Specifications.

- (1) Samples must be of sufficient size and quality to clearly illustrate functional characteristics, with integrally related parts and attachment devices.
 - (2) Samples must show full range of texture, color, and pattern.
- C. Contractor shall make all Submittals, unless it has authorized Subcontractor(s) to submit and Contractor has notified the District in writing to this effect.
- D. Samples to be shipped prepaid or hand-delivered to the District.
- E. Contractor shall mark samples to show name of Project, name of Contractor submitting, Contract number and segment of Work where representative Sample will be used, all applicable Specifications Sections and documents, Contract Drawing Number and detail, and ASTM or FS reference, if applicable.
- F. Contractor shall not deliver any material to Site prior to receipt of District's and/or Architect's completed written review and approval. Contractor shall furnish materials equal in every respect to approved Samples and execute Work in conformance therewith.
- G. District's and/or Architect's review, acceptance, and/or approval of Sample(s) will not preclude rejections of any material upon discovery of defects in same prior to final acceptance of completed Work.
- H. After a material has been approved, no change in brand or make will be permitted.
- I. Contractor shall prepare its Submittal Schedule and submit Samples of materials requiring laboratory tests to specified laboratory for testing not less than ninety (90) days before such materials are required to be used in Work.
- J. Samples which are rejected must be resubmitted promptly after notification of rejection and be marked "Resubmitted Sample" in addition to other information required.
- K. Field Samples and Mock-Ups are to be removed by Contractor at District's direction:
 - (1) Size: As Specified.
 - (2) Furnish catalog numbers and similar data, as requested.

1.06 REVIEW AND RESUBMISSION REQUIREMENTS:

- A. The District will arrange for review of Sample(s), Shop Drawing(s), Product Data, and other submittal(s) by appropriate reviewer and return to Contractor as provided below within twenty-one (21) days after receipt or within twenty-one (21) days after receipt of all related information necessary for such review, whichever is later.
- B. One (1) copy of product or materials data will be returned to Contractor with the review status.

- C. Samples to be incorporated into the Work will be returned to Contractor, together with a written notice designating the Sample with the appropriate review status and indicating errors discovered on review, if any. Other Samples will not be returned, but the same notice will be given with respect thereto, and that notice shall be considered a return of the Sample.
- D. Contractor shall revise and resubmit any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) as required by the reviewer. Such resubmittals will be reviewed and returned in the same manner as original Sample(s), Shop Drawing(s), Product Data, and other submittal(s), within fourteen (14) days after receipt thereof or within fourteen (14) days after receipt of all related information necessary for such review. Such resubmittal shall not delay the Work.
- E. Contractor may proceed with any of the Work covered by Sample(s), Shop Drawing(s), Product Data, and other submittal(s) upon its return if designated as no exception taken, or revise as noted, provided the Contractor proceeds in accordance with the District and/or the Architect's notes and comments.
- F. Contractor shall not begin any of the work covered by a Sample(s), Shop Drawing(s), Product Data, and other submittal(s), designated as revise and resubmit or rejected, until a revision or correction thereof has been reviewed and returned to Contractor.
- G. Sample(s), Shop Drawing(s), Product Data, and other submittal(s) designated as revise and resubmit or rejected and requiring resubmittal, shall be revised or corrected and resubmitted to the District no later than fourteen (14) days or a shorter period as required to comply with the approved Construction Schedule, after its return to Contractor.
- H. Neither the review nor the lack of review of any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) shall waive any of the requirements of the Contract Documents, or relieve Contractor of any obligation thereunder.
- I. District's and/or Architect's review of Shop Drawings does not relieve the Contractor of responsibility for any errors that may exist. Contractor is responsible for the dimensions and design of adequate connections and details and for satisfactory construction of all the Work.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

SITE STANDARDS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including without limitation, Site Access, Conditions, and Regulations;
- B. Special Conditions;
- C. Drug-Free Workplace Certification;
- D. Tobacco-Free Environment Certification;
- E. Criminal Background Investigation/Fingerprinting Certification;
- F. Temporary Facilities and Controls.

1.02 REQUIREMENTS OF THE DISTRICT:

- A. Drug-Free Schools and Safety Requirements:
 - (1) All school sites and other District Facilities have been declared "Drug-Free Zones." No drugs, alcohol and/or smoking are allowed at any time in any buildings and/or grounds on District property. No students, staff, visitors, or contractors are to use drugs on these sites.
 - (2) Smoking and the use of tobacco products by all persons is prohibited on or in District property. District property includes school buildings, school grounds, school-owned vehicles and vehicles owned by others while on District property. Contractor shall post: "Non-Smoking Area" in a highly visible location in each work area, staging area, and parking area. Contractor may designate a smoking area outside of District property within the public right-of-way, provided that this area remains quiet and unobtrusive to adjacent neighbors. This smoking area is to be kept clean at all times.
 - (3) Contractor shall ensure that no alcohol, firearms, weapons, or controlled substances enter or are used at the Site. Contractor shall immediately remove from the Site and terminate the employment of any employee(s) found in violation of this provision.
- B. Language: Profanity or other unacceptable and/or loud language will not be tolerated, "Cat calls" or other derogatory language toward students, staff, volunteers, parents or public will not be allowed.

C. Disturbing the Peace (Noise and Lighting):

- (1) Contractor shall observe the noise ordinance of the Site at all times including, without limitation, all applicable local, city, and/or state laws, ordinances, and/or regulations regarding noise and allowable noise levels.
- (2) The use of radios, etc., shall be controlled to keep all sound at a level that cannot be heard beyond the immediate area of use. District reserves the right to prohibit the use of radios at the Site, except for mobile phones or other handheld communication radios.
- (3) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

D. Traffic:

- (1) Driving on the Premises shall be limited to periods when students and public are not present. If driving or deliveries must be made during the school hours, two (2) or more ground guides shall lead the vehicle across the area of travel. In no case shall driving take place across playgrounds or other pedestrian paths during recess, lunch, and/or class period changes. The speed limit on-the Premises shall be five (5) miles per hour (maximum) or less if conditions require.
- (2) All paths of travel for deliveries, including without limitation, material, equipment, and supply deliveries, shall be reviewed and approved by District in advance. Any damage will be repaired to the pre-damaged condition by the Contractor.
- (3) District shall designate a construction entry to the Site. If Contractor requests, District determines it is required, and to the extent possible, District shall designate a staging area so as not to interfere with the normal functioning of school facilities. Location of gates and fencing shall be approved in advance with District and at Contractor's expense.
- (4) Parking areas shall be reviewed and approved by District in advance. No parking is to occur under the drip line of trees or in softscape areas that could otherwise be damaged.

- E. All of the above shall be observed and complied with by the Contractor and all workers on the Site. Failure to follow these directives could result in individual(s) being suspended or removed from the work force at the discretion of the District. The same rules and regulations shall apply equally to delivery personnel, inspectors, consultants, and other visitors to the Site.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Obtaining of Permits, Licenses and Registrations and Work to Comply with All Applicable Laws and Regulations;
- B. Special Conditions; and
- C. Quality Control.

1.02 DESCRIPTION:

This section covers the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

1.03 REQUIREMENTS OF REGULATORY AGENCIES:

- A. All statutes, ordinances, laws, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction over the Work, are hereby incorporated into these Contract Documents as if repeated in full herein and are intended to be included in any reference to Code or Building Code, unless otherwise specified, including, without limitation, the references in the list below. Contractor shall make available at the Site copies of all the listed documents applicable to the Work as the District and/or Architect may request, including, without limitation, applicable portions of the California Code of Regulations ("CCR").
 - (1) California Building Standards Administrative Code, Part 1, Title 24, CCR.
 - (2) California Building Code (CBC), Part 2, Title 24, CCR; (International Building Code volumes 1-2 and California Amendments).
 - (3) California Electrical Code (CEC), Part 3, Title 24, CCR; (National Electrical Code and California Amendments).
 - (4) California Mechanical Code (CMC), Part 4, Title 24, CCR; (Uniform Mechanical Code and California Amendments).
 - (5) California Plumbing Code (CPC), Part 5, Title 24, CCR; (Uniform Plumbing Code and California Amendments).

- (6) California Fire Code (CFC), Part 9, Title 24, CCR; (International Fire Code and California Amendments).
- (7) California Green Building Standards Code (CALGreen), Part 11, Title 24, CCR.
- (8) California Referenced Standards Code, Part 12, Title 24, CCR.
- (9) State Fire Marshal Regulations, Public Safety, Title 19, CCR.
- (10) Partial List of Applicable National Fire Protection Association (NFPA) Standards:
 - (a) NFPA 13 - Automatic Sprinkler System.
 - (b) NFPA 14 - Standpipes Systems.
 - (c) NFPA 17A - Wet Chemical System
 - (d) NFPA 24 - Private Fire Mains.
 - (e) (California Amended) NFPA 72 - National Fire Alarm Codes.
 - (f) NFPA 253 - Critical Radiant Flux of Floor Covering System.
 - (g) NFPA 2001 - Clean Agent Fire Extinguishing Systems.
- (11) California Division of the State Architect interpretation of Regulations ("DSA IR"), including, without limitation:
 - (a) DSA IR A-6 — Construction Change Document Submittal and Approval Processes.
 - (b) DSA IR A-7 — Project Inspector Certification and Approval.
 - (c) DSA IR A-8 — Project Inspector and Assistant Inspector Duties and Performance.
 - (d) DSA IR A-12 — Assistant Inspector Approval.
- (12) DSA Procedures ("DSA PR")
 - (a) DSA PR 13-01 – Construction Oversight Process
 - (b) DSA PR 13-02 – Project Certification Process

B. This Project shall be governed by applicable regulations, including, without limitation, the State of California's Administrative Regulations for the Division of the State Architect-Structural Safety (DSA/SS), Chapter 4, Part 1, Title 24, CCR, and the most current version on the date the bids are opened and as it pertains to school construction including, without limitation:

- (1) Test and testing laboratory per Section 4-335. District shall pay for the testing laboratory.
- (2) Special inspections per Section 4-333(c).
- (3) Deferred Approvals per section 4-317(g).
- (4) Verified reports per Sections 4-336 & 4-343(c).
- (5) Duties of the Architect & Engineers shall be per Sections 4-333(a) and 4-341.
- (6) Duties of the Contractor shall be per Section 4-343.
- (7) Duties of Project Inspector shall be per Section 4-334.
- (8) Addenda and Construction Change Documents per Section 4-338.

Contractor shall keep and make available all applicable parts of the most current version of Title 24 referred to in the plans and specifications at the Site during construction.

C. Items of deferred approval shall be clearly marked on the first sheet of the Architect's and/or Engineer's approved Drawings. All items later submitted for approval shall be per Title 24 requirements to the DSA.

- (1) Contractor shall submit the following to Architect for review and endorsement:
 - (a) Product information on proposed material/system supplier.
 - (b) Drawings, specifications, and calculations prepared, signed, and stamped by an architect or engineer licensed in the State of California for that portion of the Work.
 - (c) All other requirements as may be required by DSA.
- (2) Cost of preparing and submitting documentation per DSA Deferred Approval requirements including required modifications to Drawings and Specifications, whether or not indicated in the Contract Documents, shall be borne by Contractor.
- (3) Contractor shall not begin fabrication and installation of deferred approval items without first obtaining DSA approval of Drawings and Specifications.
- (4) Schedule of Work Subject to DSA Deferred Approval: None

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

ABBREVIATIONS AND ACRONYMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions including without limitation, Definitions;
- B. Special Conditions.

1.02 DOCUMENT INCLUDES:

- A. Abbreviations used throughout the Contract Documents.
- B. Reference to a technical society, organization, or body is by abbreviation, as follows:

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|-----|--------|---|
| 1. | AA | The Aluminum Association |
| 2. | AASHTO | American Association of State Highway and Transportation Officials |
| 3. | ABPA | Acoustical and Board Products Association |
| 4. | ACI | American Concrete Institute |
| 5. | AGA | American Gas Association |
| 6. | AGC | Associated General Contractors of America |
| 7. | AHC | Architectural Hardware Consultant |
| 8. | AHRI | Air Conditioning, Heating, Refrigeration Institute |
| 9. | AI | Asphalt Institute |
| 10. | AIA | American Institute of Architects |
| 11. | AISC | American Institute of Steel Construction |
| 12. | AISI | American Iron and Steel Institute |
| 13. | AMCA | Air Movement and Control Association |
| 14. | ANSI | American National Standards Institute |
| 15. | APA | APA – The Engineered Wood Association |
| 16. | ASCE | American Society of Civil Engineers |
| 17. | ASHRAE | American Society of Heating, Refrigeration and Air Conditioning Engineers |
| 18. | ASME | American Society of Mechanical Engineers |
| 19. | ASTM | American Society of Testing and Materials International |
| 20. | AWPA | American Wood Protection Association |
| 21. | AWPI | American Wood Preservers Institute |
| 22. | AWS | American Welding Society |
| 23. | AWSC | American Welding Society Code |
| 24. | AWI | Architectural Woodwork Institute |
| 25. | AWWA | American Water Works Association |
| 26. | BIA | The Brick Industry Association |

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| 27. | CCR | California Code of Regulations |
| 28. | CLFMI | Chain Link Fence Manufacturers Institute |
| 29. | CRA | California Redwood Association |
| 30. | CRSI | Concrete Reinforcing Steel Institute |
| 31. | CS | Commercial Standards |
| 32. | CSI | Construction Specifications Institute |
| 33. | CTI | Cooling Technology Institute |
| 34. | FGIA | Fenestration and Glazing Industry Alliance |
| 35. | FGMA | Flat Glass Manufacturers' Association |
| 36. | FIA | Factory Insurance Association |
| 37. | FM | Factory Mutual Global |
| 38. | FS/FED SPEC | Federal Specification |
| 39. | FTI | Facing Title Institute |
| 40. | GA | Gypsum Association |
| 41. | IAPMO | International Association of Plumbing and Mechanical Officials |
| 42. | ICC | International Code Council |
| 43. | IEEE | Institute of Electrical and Electronics Engineers |
| 44. | IES | Illuminating Engineering Society |
| 45. | MCAC | Mason Contractors Association of California |
| 46. | MIMA | Mineral Wool Insulation Manufacturers Association |
| 47. | MLMA | Metal Lath Manufacturers Association |
| 48. | MS/MIL SPEC | Military Specifications |
| 49. | NAAMM | National Association of Architectural Metal Manufacturers |
| 50. | NBHA | National Builders Hardware Association |
| 51. | NCMA | National Concrete Masonry Association |
| 52. | NCSEA | National Council of Structural Engineers Associations |
| 53. | NEC | National Electrical Code |
| 54. | NEMA | National Electrical Manufacturers Association |
| 55. | NIST | National Institute of Standards and Technology |
| 56. | NSI | Natural Stone Institute |
| 57. | NTMA | National Terrazzo and Mosaic Association, Inc. |
| 58. | ORS | Office of Regulatory Services (California) |
| 59. | OSHA | Occupational Safety and Health Act |
| 60. | PCI | Precast/Prestressed Concrete Institute |
| 61. | PCA | Portland Cement Association |
| 62. | PCA | Painting Contractors Association |
| 63. | PDI | Plumbing Drainage Institute |
| 64. | PEI | Porcelain Enamel Institute, Inc. |
| 65. | PG&E | Pacific Gas & Electric Company |
| 66. | PS | Product Standards |
| 67. | SDI | Steel Door Institute; Steel Deck Institute |
| 68. | SJI | Steel Joist Institute |
| 69. | SSPC | Society for Protective Coatings |
| 70. | TCNA | Tile Council of North America, Inc. |
| 71. | TPI | Truss Plate Institute |
| 72. | UBC | Uniform Building Code |
| 73. | UL | Underwriters Laboratories Code |

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| 74. | UMC | Uniform Mechanical Code |
| 75. | USDA | United States Department of Agriculture |
| 76. | VI | Vermiculite Institute |
| 77. | WCLIB | West Coast Lumber Inspection Bureau |
| 78. | WDMA | Window and Door Manufacturers Association |
| 79. | WEUSER | Western Electric Utilities Service Engineering Requirements |
| 80. | WIC | Woodwork Institute of California |

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

DEFINITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions including without limitation, Definitions;
- B. Special Conditions.

1.02 QUALITY ASSURANCE

- A. For products or workmanship specified by association, trade, or Federal Standards, Contractor shall comply with requirements of the standard, except when more rigid requirements are specified in the Contract Documents, or are required by applicable codes.
- B. Contractor shall conform to current reference standard publication date in effect on the date of bid opening.
- C. Contractor shall obtain copies of standards unless specifically required not to by the Contract Documents.
- D. Contractor shall maintain a copy of all standards at jobsite during submittals, planning, and progress of the specific Work, until final completion, unless specifically required not to by the Contract Documents.
- E. Should specified reference standards conflict with Contract Documents, Contractor shall request clarification from the District and/or the Architect before proceeding.
- F. The contractual relationship of the parties to the Contract shall not be altered from the contractual relationship as indicated in the Contract Documents by mention or inference otherwise in any referenced document.
- G. Governing Codes shall be as shown in the Contract Documents including, without limitation, the Specifications.

END OF DOCUMENT

REFERENCES**PART 1 - GENERAL****1.01 SCHEDULE OF REFERENCES:**

The following information is intended only for the general assistance of the Contractor, and the District does not represent that all of the information is current. It is the Contractor's responsibility to verify the correct information for each of the entities listed.

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| AA | The Aluminum Association 1400 Crystal Drive, Suite 430 Arlington, VA 22202 www.aluminum.org | 703/358-2960 |
| AABC | Associated Air Balance Council 2401 Pennsylvania Avenue NW, Suite 330 Washington, DC 20037 www.aabc.com | 202/737-0202 |
| AASHTO | American Association of State Highway and Transportation Officials 555 12th St. NW - Suite 1000 Washington, DC 20004 www.transportation.org | 202/624-5800 |
| AATCC | American Association of Textile Chemists and Colorists P.O. Box 12215 Research Triangle Park, NC 27709-2215 www.aatcc.org | 919/549-8141 |
| ACA | American Coatings Association 901 New York Ave., NW, Suite 300 West Washington, DC 20001 www.paint.org | 202/462-6272 |
| ACI | American Concrete Institute 38800 Country Club Dr. Farmington Hills, MI 48331-3439 www.concrete.org | 248/848-3800 |
| ACPA | American Concrete Pipe Association 5605 N. MacArthur Blvd., Suite 340 Irving, TX 75038 www.concrete-pipe.org | 972/506-7216 |

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| ADC | Air Duct Council 1901 N. Roselle Road, Suite 800 Schaumburg, IL 60195 www.flexibleduct.org | 847/706-6750 |
| AF&PA | American Forest and Paper Association 1101 K Street, NW, Suite 700 Washington, DC 20005 www.afandpa.org | 202/463-2700 |
| AGA | American Gas Association 400 North Capitol Street, NW, Suite 450 Washington, DC 20001 www.aga.org | 202/824-7000 |
| AGC | Associate General Contractors of America 2300 Wilson Blvd., Suite 300 Arlington, VA 22201 www.agc.org | 703/548-3118 |
| AHA | American Hardboard Association 1210 West Northwest Highway Palatine, IL 60067 http://domensino.com/AHA/default.htm | 847/934-8800 |
| AI | Asphalt Institute 2696 Research Park Drive Lexington, KY 40511-8480 www.asphaltinstitute.org | 859/288-4960 |
| AIA | The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006-5292 www.aia.org | 202/626-7300 |
| AISC | American Institute of Steel Construction 130 East Randolph Street, Suite 2000 Chicago, IL 60601 www.aisc.org | 312.670.2400 |
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| AISI | American Iron and Steel Institute 25 Massachusetts Ave., NW, Suite 800 Washington, DC 20001 www.steel.org | 202/452-7100 |
| AITC | American Institute of Timber Construction 1010 South 336th Street, #210 Federal Way, WA 98003-7394 https://www.plib.org/aitc/ | 253/835-3344 |

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| ALI | Associated Laboratories, Inc. P.O. Box 152837 Dallas, TX 75315 www.assoc-labs.com | 214/565-0593 |
| ALSC | American Lumber Standards Committee, Inc. 7470 New Technology Way, Suite F Frederick, MD 21703 www.alsc.org | 301/972-1700 |
| AMCA | Air Movement and Control Association International, Inc. 30 W. University Drive Arlington Heights, IL 60004 www.amca.org | 847/394-0150 |
| AMPP (formerly SSPC) | Association for Materials Protection and Performance (merger of Society for Protective Coatings and National Association of Corrosion Engineers International) (formerly Steel Structures Painting Council) 800 Trumbull Drive Pittsburgh, PA 15205 www.sspc.org | 412/281-2331 877/281-7772 |
| ANLA | AmericanHort (merger of American Nursery & Landscape Association and OFA – The Association of Horticultural Professionals) 2130 Stella Court Columbus, OH 43215 www.americanhort.org | 614/487-1117 |
| ANSI | American National Standards Institute 1899 L Street, NW, 11th Floor Washington, DC 20036 www.ansi.org | 202/293-8020 |
| APA | APA-The Engineered Wood Association 7011 S. 19th Street Tacoma, WA 98466-5333 www.apawood.org | 253/565-6600 |

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| APA | Architectural Precast Association 325 John Knox Rd, Suite L-103 Tallahassee, FL 32303 www.archprecast.org | 850/205-5637 |
| APCIA | American Property Casualty Insurance Association (merger of American Insurance Association (formerly the National Board of Fire Underwriters) with the Property Casualty Insurers Association of America) 555 12th St, NW, Suite 550 Washington DC 20004 www.apci.org | 202/828-7100 |
| AHRI | Air Conditioning and Refrigeration Institute (now Air-Conditioning, Heating, & Refrigeration Institute) 2311 Wilson Blvd, Suite 400 Arlington, VA 22201 www.ahrinet.org | 703/524-8800 |
| ARMA | Asphalt Roofing Manufacturers Association 2331 Rock Spring Road Forest Hill, MD 21050 www.asphaltroofing.org | 443/640-1075 |
| ASA | The Acoustical Society of America Suite 300 1305 Walt Whitman Road Melville, NY 11747-4300 https://acousticalsociety.org/ | 516/576-2360 |
| ASCE | American Society of Civil Engineers 1801 Alexander Bell Drive Reston, VA 20191 www.asce.org | 800/548-2723 703/295-6300 |
| ASHRAE | American Society of Heating, Refrigerating and Air Conditioning Engineers 180 Technology Parkway Peachtree Corners, GA 30092 www.ashrae.org | 800/527-4723 404/636-8400 |
| ASLA | American Society of Landscape Architects 636 Eye Street, NW Washington, DC 20001-3736 www.asla.org | 202/898-2444 |
| ASME | American Society of Mechanical Engineers Two Park Avenue New York, NY 10016-5990 www.asme.org | 800/834-2763 |

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| ASPE | American Society of Plumbing Engineers 6400 Shafer Court, Suite 350 Rosemont, IL 60018 http://aspe.org | 847/296-0002 |
| ASQ | American Society for Quality P.O. Box 3005 Milwaukee, WI 53201-3005 or 600 North Plankinton Avenue Milwaukee, WI 53203 http://asq.org | 800/248-1946 414/272-8575 |
| ASSE | American Society of Sanitary Engineering 18927 Hickory Creek Dr., Suite 220 Mokena, IL 60448 www.asse-plumbing.org | 708/995-3019 |
| ASTM | ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken, PA, 19428-2959 www.astm.org | 610/832-9500 |
| AWCI | Association of the Wall and Ceiling Industry 513 West Broad Street, Suite 210 Falls Church, VA 22046 www.awci.org | 703/538-1600 |
| AWPA | American Wood Protection Association (formerly American Wood Preservers Institute) P.O. Box 361784 Birmingham, AL 35236-1784 www.awpa.com | 205/733-4077 |
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| AWS | American Welding Society 8669 NW 36 Street, Suite 130 Miami, FL 33166 www.aws.org | 800/443-9353 305/443-9353 |
| AWI | Architectural Woodwork Institute 46179 Westlake Drive, Suite 120 Potomac Falls, VA 20165-5874 www.awinet.org | 571/323-3636 |
| AWWA | American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 www.awwa.org | 800/926-7337 303/794-7711 |

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| BHMA | Builders Hardware Manufacturers Association 355 Lexington Avenue, 15th Floor New York, NY 10017 www.buildershardware.com | 212/297-2122 |
| BIA | The Brick Industry Association 12007 Sunrise Valley Drive, Suite 430 Reston, VA 20191 www.gobrick.com | 703/620-0010 |
| CGA | Compressed Gas Association 8484 Westpark Drive, Suite 220 McLean, VA 22102 www.cganet.com | 703/788-2700 |
| CISCA | Ceilings & Interior Systems Construction Association 1010 Jorie Blvd, Suite 30 Oak Brook, IL 60523 www.cisca.org | 630/584-1919 |
| CISPI | Cast Iron Soil Pipe Institute 2401 Fieldcrest Dr. Mundelein, IL 60060 www.cispi.org | 224/864-2910 |
| CLFMI | Chain Link Fence Manufacturers Institute 10015 Old Columbia Road, Suite B-215 Columbia, MD 21046 chainlinkinfo.org | 301/596-2583 |
| CPA | Composite Panel Association 19465 Deerfield Avenue, Suite 306 Leesburg, VA 20176 www.compositepanel.org | 703/724-1128 |
| CPSC | Consumer Product Safety Commission 4330 East-West Highway Bethesda, MD 20814 www.cpsc.gov | 800/638-2772 |
| CRA | California Redwood Association 818 Grayson Road, Suite 201 Pleasant Hill, CA 94523 www.calredwood.org | 925/935-1499 |

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| CRI | Carpet and Rug Institute 100 S. Hamilton Street Dalton, GA 30722-2048 www.carpet-rug.org | 706/278-3176 |
| CRSI | Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173-4758 www.crsi.org | 847/517-1200 |
| CSI | The Construction Specifications Institute 123 North Pitt St, Suite 450 Alexandria, VA 22314 www.csinet.org | 800/689-2900 |
| CTIOA | Ceramic Tile Institute of America 12061 Jefferson Blvd. Culver City, CA 90230-6219 www.ctioa.org | 310/574-7800 |
| DHA | Decorative Hardwoods Association (formerly Hardwood Plywood & Veneer Association) 42777 Trade West Dr. Sterling, VA 20166 https://www.decorativehardwoods.org/ | 703/435-2900 |
| DHI | Door and Hardware Institute (formerly National Builders Hardware Association) 2001 K Street NW, 3rd Floor North Washington, DC 20006 www.dhi.org | 202/367-1134 |
| DIPRA | Ductile Iron Pipe Research Association P.O. Box 190306 Birmingham, AL 35219 www.dipra.org | 205/402-8700 |
| DOC | U.S. Department of Commerce 1401 Constitution Ave., NW Washington, DC 20230 www.commerce.gov | 202/482-2000 |
| DOT | U.S. Department of Transportation 1200 New Jersey Avenue, SE Washington, DC 20590 www.dot.gov | 855/368-4200 |
| EJMA | Expansion Joint Manufacturers Association, Inc. 25 North Broadway Tarrytown, NY 10591 www.ejma.org | 914/332-0040 |

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| EPA | Environmental Protection Agency Ariel Rios Building 1200 Pennsylvania Avenue, N.W. Washington, DC 20460 www.epa.gov | 202/272-0167 |
| FCICA | Floor Covering Installation Contractors Association 800 Roosevelt Rd., Bldg. C, Suite 312 Glen Ellyn, IL 60137 www.fcica.com | 630/672-3702 |
| FGIA | Fenestration and Glazing Industry Alliance 1900 E Golf Rd, Suite 1250 Schaumburg, IL 60173 https://fgiaonline.org/ | 847/303-5664 |
| FM Global | Factory Mutual Insurance Company Amy Daley Global Practice Leader – Education, Public Entities, Health Care FM Global 270 Central Avenue Johnston, RI 02919-4949 www.fmglobal.com | 401/275-3000 401/275-3029 |
| FS | General Services Administration (GSA) Index of Federal Specifications, Standards and Commercial Item Descriptions 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407 www.gsa.gov | 202/619-8925 |
| GA | The Gypsum Association 962 Wayne Ave., Suite 620 Silver Spring, MD 20910 www.gypsum.org | 301/277-8686 |
| HMA | Hardwood Manufacturers Association One Williamsburg Place, Suite 108 Warrendale, PA 15086 http://hmamembers.org | 412/244-0440 |

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| IAPMO | International Association of Plumbing and Mechanical Officials (formerly the Western Plumbing Officials Association) 4755 E. Philadelphia St. Ontario, CA 91761 www.iapmo.org | 909/472-4100 |
| ICC | International Code Council 500 New Jersey Avenue, NW, 6th Floor Washington, DC 20001 www.iccsafe.org | 888/422-7233 |
| IEEE | Institute of Electrical and Electronics Engineers 3 Park Avenue, 17th Floor New York, NY 10016-5997 www.ieee.org | 212/419-7900 |
| IES | Illuminating Engineering Society 120 Wall Street, Floor 17 New York, NY 10005-4001 www.ies.org | 212/248-5000 |
| ITRK | Intertek Testing Services 3933 US Route 11 Cortland, NY 13045 www.intertek.com | 607/753-6711 |
| MCAA | Mechanical Contractors Association of America 1385 Piccard Drive Rockville, MD 20850 www.mcaa.org | 301/869-5800 |
| MMPA (formerly WMMPA) | Moulding & Millwork Producers Association (formerly Wood Moulding & Millwork Producers Association) 507 First Street Woodland, CA 95695 www.wmmpa.com | 530/661-9591 800/550-7889 |
| MSS | Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc. 127 Park Street, NE Vienna, VA 22180-4602 http://mss-hq.org | 703/281-6613 |
| NAAMM | National Association of Architectural Metal Manufacturers 800 Roosevelt Rd. Bldg. C, Suite 312 Glen Ellyn, IL 60137 www.naamm.org | 630/942-6591 |

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| NAIMA | North American Insulation Manufacturers Association P.O. Box 1906 Alexandria, VA 22313 https://insulationinstitute.org/ | 703/684-0084 |
| NALP | National Association of Landscape Professionals (formerly Professional Landcare Network) 12500 Fair Lakes Circle, Suite 200 Fairfax, VA 22033 https://www.landscap Professionals.org/ | 703/736-9666 |
| NAPA | National Asphalt Pavement Association 6406 Ivy Lane, Suite 350 Greenbelt, MD 20770-1441 www.asphalt pavement.org | 888/468-6499 301/731-4748 |
| NCSPA | National Corrugated Steel Pipe Association 14070 Proton Road, Suite 100 Dallas, TX 75244 www.ncspa.org | 972/850-1907 |
| NCMA | National Concrete Masonry Association 13750 Sunrise Valley Drive Herndon, VA 20171-4662 www.ncma.org | 703/713-1900 |
| NEBB | National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877 www.nebb.org | 301/977-3698 |
| NECA | National Electrical Contractors Association 1201 Pennsylvania Ave. NW Washington, D.C., 20004 www.necanet.org | 202/991-6300 |
| NEMA | National Electrical Manufacturers Association 1300 North 17th Street N, Suite 900 Rosslyn, VA 22209 www.nema.org | 703/841-3200 |
| NEII | National Elevator Industry, Inc. 5537 SW Urish Road Topeka, KS 66610 https://nationalelevatorindustry.org/ | 703/589-9985 |
| NFPA | National Fire Protection Association 1 Batterymarch Park Quincy, MA 02169-7471 www.nfpa.org | 800/344-3555 855/274-8525 |

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| NGA (formerly GANA) | National Glass Association (merged with Glass Association of North America) 1945 Old Gallows Road Suite 750 Vienna, VA 22182 www.glass.org | 866/342-5642 Ext 127 |
| NHLA | National Hardwood Lumber Association PO Box 34518 Memphis, TN 38184 www.nhla.com | 901/377-1818 |
| NIA | National Insulation Association 516 Herndon Pkwy., Ste. D Herndon, VA 20170 www.insulation.org | 703/464-6422 |
| NRCA | National Roofing Contractors Association 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018-5607 www.nrca.net | 847/299-9070 |
| NSF | NSF International 789 N. Dixboro Road Ann Arbor, MI 48113-0140 www.nsf.org | 800/673-6275 734/769-8010 |
| NSI | Natural Stone Institute (formerly Marble Institute of America) 380 E. Lorain St. Oberlin, OH 44074 https://www.naturalstoneinstitute.org/ | 440/250-9222 |
| NTMA | National Terrazzo and Mosaic Association 209 N. Crockett Street, Suite 2 PO Box 2605 Fredericksburg, TX 78624 www.ntma.com | 800/323-9736 |
| OSHA | Occupational Safety and Health Act U.S. Department of Labor Occupational Safety & Health Administration 200 Constitution Ave., NW Washington, DC 20210 www.osha.gov | 800/321-OSHA (6742) |

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| PCA | Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077 or 200 Massachusetts Ave NW, Suite 200 Washington, DC 20001 www.cement.org | 847/966-6200 202/408-9494 |
| PCA | Painting Contractors Association (formerly Painting and Decorating Contractors of America) 2316 Millpark Drive Maryland Heights, MO 63043 https://www.pcapainted.org/ | 800/322-7322 |
| PCI | Precast/Prestressed Concrete Institute 8770 W. Bryn Mawr Ave., Suite 1150 Chicago, IL 60631 www.pci.org | 312/786-0300 |
| PDI | Plumbing & Drainage Institute 800 Turnpike Street, Suite 300 North Andover, MA 01845 http://pdionline.org | 978/557-0720 800/589-8956 |
| PEI | Porcelain Enamel Institute, Inc. P.O. Box 920220 Norcross, GA 30010 www.porcelainenamel.com | 770/676-9366 |
| PG&E | Pacific Gas & Electric Company P.O. Box 997300 Sacramento, CA 95899-7300 www.pge.com | 800/743-5000 |
| PLIB | Pacific Lumber Inspection Bureau (formerly West Coast Lumber Inspection Bureau) 1010 South 336th Street, Suite 210 Federal Way, WA 98003-7394 https://www.plib.org/ | 253/835-3344 |
| RFCI | Resilient Floor Covering Institute 115 Broad Street, Suite 201 La Grange, GA 30240 www.rfci.com | 706/882-3833 |
| SDI | Steel Deck Institute P.O. Box 426 Glenshaw, PA 15116 www.sdi.org | 412/487-3325 |

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| SDI | Steel Door Institute 30200 Detroit Road Westlake, OH 44145 www.steeldoor.org | 440/899-0010 |
| SJI | Steel Joist Institute 140 West Evans Street, Suite 203 Florence, SC 29501 http://steeljoist.org | 843/407-4091 |
| SMA | Stucco Manufacturers Association 5753 E Santa Ana Cyn Rd, #G-156 Anaheim, CA 92807 www.stuccomfgassoc.com | 714/473-9579 |
| SMACNA | Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Drive Chantilly, VA 20151-1219 www.smacna.org | 703/803-2980 |
| SPI | SPI: The Plastics Industry Trade Association, Inc. 1425 K St. NW, Suite 500 Washington, DC 20005 www.plasticsindustry.org | 202/974-5200 |
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| TCA | The Tile Council of North America 100 Clemson Research Blvd. Anderson, SC 29625 www.tcnatile.com | 864/646-8453 |
| TPI | Truss Plate Institute 2670 Crain Highway, Suite 203 Waldorf, MD 20601 www.tpinst.org | 240/587-5582 |
| TPI | Turfgrass Producers International 444 E. Roosevelt Road #346 Lombard, IL 60148 www.turfgrasssod.org | 800/405-8873 847/649-5555 |
| TCIA | Tree Care Industry Association (formerly the National Arborist Association) 670 N Commercial Street, Suite 201 Manchester, NH 03101 www.tcia.org | 603/314-5380 800/733-2622 |

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| TVI | The Vermiculite Institute c/o The Schundler Company 10 Central Street Nahant, MA 01908 www.vermiculiteinstitute.org | 732/287-2244 |
| UL | Underwriters Laboratories Inc. 333 Pfingsten Road Northbrook, IL 60062-2096 www.ul.com | 847/272-8800 877/854-3577 |
| UNI | Uni-Bell PVC Pipe Association 201 E. John Carpenter Freeway, Suite 750 Irving, TX 75062 www.uni-bell.org | 972/243-3902 |
| USDA | U.S. Department of Agriculture 1400 Independence Ave., S.W. Washington, DC 20250 www.usda.gov | 202/720-2791 |
| WA | Wallcoverings Association 35 E Wacker Dr., Suite 850 Chicago, IL 60601 www.wallcoverings.org | 312/224-2574 |
| WCMA | Window Covering Manufacturers Association 355 Lexington Avenue 15th Floor New York, NY 10017 www.wcmanet.org | 212/297-2122 |
| WDMA | Window & Door Manufacturers Association 2001 K Street NW, 3rd Floor North Washington, D.C. 20006 www.wdma.com | 202/367-1157 |
| WI | Woodwork Institute 1455 Response Road, Suite 110 Sacramento, CA 95815 www.wicnet.org | 916/372-9943 |
| WRI | Wire Reinforcement Institute 942 Main Street, Suite 300 Hartford, CT 06103 www.wirereinforcementinstitute.org | 860/240-9545 |
| WWCA | Western Wall & Ceiling Contractors Association 1910 N. Lime St. Orange, CA 92865 www.wwcca.org | 714/221-5520 |

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| WWPA | Western Wood Products Association (formerly Redwood Inspection Service) 1500 SW First Ave., Suite 870 Portland, OR 97201 www.wwpa.org | 503/224-3930 |
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PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Purchase of Materials and Equipment;
- B. Special Conditions;
- C. Imported Materials Certification.

1.02 MATERIAL AND EQUIPMENT

- A. Only items approved by the District and/or Design Professional shall be used.
- B. Contractor shall submit lists of products and other product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

1.03 MATERIAL AND EQUIPMENT COLORS

- A. The District and/or Architect will provide a schedule of colors.
- B. No individual color selections will be made until after approval of all pertinent materials and equipment and after receipt of appropriate samples in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.
- C. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall deliver manufactured materials in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer.
- B. Contractor shall deliver fabrications in as large assemblies as practicable; where specified as shop-primed or shop-finished, package or crate as required to preserve such priming or finish intact and free from abrasion.
- C. Contractor shall store materials in such a manner as necessary to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt, or from any other cause will not be accepted.

- D. Materials are not acceptable that have been warehoused for long periods of time, stored or transported in improper environment, improperly packaged, inadequately labeled, poorly protected, excessively shipped, deviated from normal distribution pattern, or reassembled.
- E. Contractor shall store material so as to cause no obstructions of sidewalks, roadways, access to the Site or buildings, and underground services. Contractor shall protect material and equipment furnished under Contract.
- F. Contractor may store materials on Site with prior written approval by the District, all material shall remain under Contractor's control and Contractor shall remain liable for any damage to the materials. Should the Project Site not have storage area available, the Contractor shall provide for off-site storage at a bonded warehouse and with appropriate insurance coverage at no cost to District.
- G. When any room in Project is used as a shop or storeroom, the Contractor shall be responsible for any repairs, patching, or cleaning necessary due to that use. Location of storage space shall be subject to prior written approval by District.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers listed in various sections of Contract Documents are names of those manufacturers that are believed to be capable of supplying one or more of items specified therein.
- B. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable as meeting the requirements of the Contract Documents.

2.02 FACILITIES AND EQUIPMENT

Contractor shall provide, install, maintain, and operate a complete and adequate facility for handling, the execution, disposal, and distribution of material and equipment as required for proper and timely performance of Work connected with Contract.

2.03 MATERIAL REFERENCE STANDARDS

Where material is specified solely by reference to "standard specifications" and if requested by District, Contractor shall submit for review data on actual material proposed to be incorporated into Work of Contract listing name and address of vendor, manufacturer, or producer, and trade or brand names of those materials, and data substantiating compliance with standard specifications.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. Where not more specifically described in any other Contract Documents, workmanship shall conform to methods and operations of best standards and accepted practices of trade or trades involved and shall include items of fabrication, construction, or installation regularly furnished or required for completion (including finish and for successful operation, as intended).
- B. Work shall be executed by tradespersons skilled in their respective lines of Work. When completed, parts shall have been durably and substantially built and present a neat appearance.

3.02 COORDINATION

- A. Contractor shall coordinate installation of Work so as to not interfere with installation of others. Adjustment or rework because of Contractor's failure to coordinate will be at no additional cost to District.
- B. Contractor shall examine in-place work for readiness, completeness, fitness to be concealed or to receive other work, and in compliance with Contract Documents. Concealing or covering Work constitutes acceptance of additional cost which will result should in-place Work be found unsuitable for receiving other Work or otherwise deviating from the requirements of the Contract Documents.

3.03 COMPLETENESS

Contractor shall provide all portions of the Work, unless clearly stated otherwise, installed complete and operational with all elements, accessories, anchorages, utility connections, etc., in manner to assure well-balanced performance, in accordance with manufacturer's recommendations and by Contract Documents. For example, electric water coolers require water, electricity, and drain services; roof drains require drain system; sinks fit within countertop, etc. Terms such as "installed complete," "operable condition," "for use intended," "connected to all utilities," "terminate with proper cap," "adequately anchored," "patch and refinish," "to match similar," should be assumed to apply in all cases, except where completeness of functional or operable condition is specifically stated as not required.

3.04 APPROVED INSTALLER OR APPLICATOR

Installation by a manufacturer's approved installer or applicator is an understood part of Specifications and only approved installer or applicator is to provide on-site Work where specified manufacturer has on-going program of approving (i.e. certifying, bonding, re-warranting) installers or applicators. Newly established relationships between a manufacturer and an installer or applicator who does not have other approved applicator work in progress or completed is not approved for this Project.

3.05 MANUFACTURER'S RECOMMENDATIONS

All installations shall be in accordance with manufacturer's published recommendations and specific written directions of manufacturer's representative. Should Contract Documents differ from recommendations of manufacturer or directions of his representative, Contractor shall analyze differences, make recommendations to the District and the Architect in writing, and shall not proceed until interpretation or clarification has been issued by the District and/or the Architect.

END OF DOCUMENT

QUALITY CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Inspector, Inspections and Tests, Uncovering of Work and Non-conforming of Work and Correction of Work;
- B. Special Conditions.

1.02 RELATED CODES:

- A. The Work is governed by requirements of Title 24, California Code of Regulations ("CCR"), and the Contractor shall keep a copy of these available at the job Site for ready reference during construction.
- B. The Division of the State Architect ("DSA") shall be notified at or before the start of construction.

1.03 OBSERVATION AND SUPERVISION:

- A. The District and Architect or their appointed representatives will review the Work and the Contractor shall provide facilities and access to the Work at all times as required to facilitate this review. Administration by the Architect and any consulting Structural Engineer will be in accordance with applicable regulations, including, without limitation, CCR, Part 1, Title 24, Section 4-341.
- B. One or more Project Inspector(s) approved by DSA and employed by or in contract with the District, referred to hereinafter as the "Project Inspector", will observe the work in accordance with CCR, Part 1, Title 24, Sections 4-333(b) and 4-342:
 - (1) The Project Inspector and Special Inspector(s) shall have access to the Work wherever it is in preparation or progress for ascertaining that the Work is in accordance with the Contract Documents and all applicable code sections. The Contractor shall provide facilities and operation of equipment as needed, and access as required and shall provide assistance for sampling or measuring materials.
 - (2) The Project Inspector will notify the District and Architect and call the attention of the Contractor to any observed failure of Work or material to conform to Contract Documents.
 - (3) The Project Inspector shall observe and monitor all testing and inspection activities required.

The Contractor shall conform with all applicable laws as indicated in the Contract Documents, including, without limitation, to CCR, Part 1, Title 24, Section 4-343. The Contractor shall supervise and direct the Work and maintain a competent superintendent on the job who is authorized to act in all matters pertaining to the Work. The Contractor's superintendent shall also inspect all materials, as they arrive, for compliance with the Contract Documents. Contractor shall reject defective Work or materials immediately upon delivery or failure of the Work or material to comply with the Contract Documents. The Contractor shall submit verified reports as indicated in the Contract Documents, including, without limitation, the Specifications and as required by Part 1, Title 24, Section 4-336.

1.04 TESTING AGENCIES:

- A. Testing agencies and tests shall be in conformance with the General Documents and the requirements of Part 1, Title 24, Section 4- 335.
- B. Testing and inspection in connection with earthwork shall be under the direction of the District's consulting soils engineer, if any, referred to hereinafter as the "Soils Engineer."
- C. Testing and inspection of construction materials and workmanship shall be performed by a qualified laboratory, referred to hereinafter as the "Testing Laboratory." The Testing Laboratory shall be under direction of an engineer registered in the State of California, shall conform to requirements of ASTM E329, and shall be employed by or in contract with the District.

1.05 TESTS AND INSPECTIONS:

- A. The Contractor shall be responsible for notifying the District and Project Inspector of all required tests and inspections. Contractor shall notify the District and Project Inspector at least seventy-two hours (72) hours in advance of performing any Work requiring testing or inspection.
- B. The Contractor shall provide access to Work to be tested and furnish incidental labor, equipment, and facilities to facilitate all inspections and tests.
- C. The District will pay for first inspections and tests required by the "CCR", and other inspections or tests that the District and/or the Architect may direct to have made, including the following principal items:
 - (1) Tests and observations for earthwork and paving.
 - (2) Tests for concrete mix designs, including tests of trial batches.
 - (3) Tests and inspections for structural steel work.
 - (4) Field tests for framing lumber moisture content.
 - (5) Additional tests directed by the District that establish that materials and installation comply with the Contract Documents.
 - (6) Tests and observations of welding and expansion anchors.

- D. The District may at its discretion, pay and then back charge the Contractor for:
 - (1) Retests or reinspections, if required, and tests or inspections required due to Contractor error or lack of required identifications of material.
 - (2) Uncovering of work in accordance with Contract Documents.
 - (3) Testing done on weekends, holidays, and overtime will be chargeable to the Contractor for the overtime portion.
 - (4) Testing done off Site.
- E. Testing and inspection reports and certifications:
 - (1) If initially received by Contractor, Contractor shall provide to each of the following a copy of the agency or laboratory report of each test or inspection or certification.
 - (a) The District;
 - (b) The Construction Manager, if any;
 - (c) The Architect;
 - (d) The Consulting Engineer, if any;
 - (e) Other engineers on the Project, as appropriate;
 - (f) The Project Inspector; and
 - (g) The Contractor.
 - (2) When the test or inspection is one required by the CCR, a copy of the report shall also be provided to the DSA.

PART 2 - PRODUCTS

2.01 TYPE OF TESTS AND INSPECTIONS

- A. Testing and inspection shall be in accordance with DSA Form 103 (or current version)
 - B. Slump Test
ASTM C 143
 - C. Concrete Tests
- Testing agency shall test concrete used in the work per the following paragraphs:
- (1) Compressive Strength:

- (a) Minimum number of tests required: One (1) set of three (3) cylinders for each 50 cubic yards (CBC Section 1905A1.17 & ACI 318-19 Section 26.12.2) of concrete or major fraction thereof, placed in one (1) day. See Title 24, Section 26.12.2
- (b) Two cylinders of each set shall be tested at twenty-eight (28) days. One (1) cylinder shall be held in reserve and tested only when directed by the Architect or District.
- (c) Concrete shall test the minimum ultimate compressive strength in twenty-eight 28 days, as specified on the structural drawings.
- (d) In the event that the twenty-eight (28) day test falls below the minimum specified strength, the effective concrete in place shall be tested by taking cores in accordance with UBC Standard No. 26-13 and tested as required for cylinders.
- (e) In the event that the test on core specimens falls below the minimum specified strength, the concrete will be deemed defective and shall be removed and replaced upon such direction of the Architect, and in a manner acceptable to the Division of the State Architect.

D. Reinforcing, Steel

E. Structural Steel Per Title 24 and as noted:

- (1) Material: Steel per CBC Section 1705A.2.1 & CBC Table 1705A.2.1
- (2) Qualification of Welders (AISC 360 Section N3)
- (3) Shop fabrication (CBC Section 1705A.2.5 & CBC Table 1705A.2.1)
- (4) Shop and field welding (CBC Section 1705A.2.5 & CBC Table 1705A.2.1)

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions;
- C. Site Standards; and
- D. Construction Waste Management and Disposal.

1.02 TEMPORARY UTILITIES:

- A. Electric Power and Lighting:
 - (1) Contractor will pay for power during the course of the Work. To the extent power is available in the building(s) or on the Site, Contractor may use the District's existing utilities by making prearranged payments to the District for the utilities used by Contractor and all Subcontractors. Contractor shall be responsible for providing temporary facilities required to deliver that power service from its existing location in the building(s) or on the Site to point of intended use.
 - (2) Contractor shall verify characteristics of power available in building(s) or on the Site. Contractor shall take all actions required to make modifications where power of higher voltage or different phases of current are required. Contractor shall be fully responsible for providing that service and shall pay all costs required therefor.
 - (3) Contractor shall furnish, wire for, install, and maintain temporary electrical lights wherever it is necessary to provide illumination for the proper performance and/or observation of the Work: a minimum of 20 foot-candles for rough work and 50 foot-candles for finish work.
 - (4) Contractor shall be responsible for maintaining existing lighting levels in the project vicinity should temporary outages or service interruptions occur.
- B. Heat and Ventilation:
 - (1) Contractor shall provide temporary heat to maintain environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation and curing of materials, and to

protect materials and finishes from damage due to improper temperature and humidity conditions. Portable heaters shall be standard units complete with controls.

- (2) Contractor shall provide forced ventilation and dehumidification, as required, of enclosed areas for proper installation and curing of materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.
- (3) Contractor shall pay the costs of installation, maintenance, operation, and removal of temporary heat and ventilation, including costs for fuel consumed, required for the performance of the Work.

C. Water:

- (1) Contractor shall pay for water used during the course of the Work. Contractor shall coordinate and pay for installation or use of water meter in compliance with local water agency requirements. To the extent water is then available in the building(s) or on the Site, Contractor may use the District's existing utilities by making prearranged payments to the District for the utilities used by Contractor and all Subcontractors. Contractor shall be responsible for providing temporary facilities required to deliver such utility service from its existing location in the building(s), on the Site, or other location approved by the local water agency, to point of intended use.
- (2) Contractor shall use backflow preventers on water lines at point of connection to District's water supply. Backflow preventers shall comply with requirements of Uniform Plumbing Code.
- (3) Contractor shall make potable water available for human consumption.

D. Sanitary Facilities:

- (1) Contractor shall provide sanitary temporary facilities in no fewer numbers than required by law and such additional facilities as may be directed by the Inspector for the use of all workers. The facilities shall be maintained in a sanitary condition at all times and shall be left at the Site until removal is directed by the Inspector or Contractor completes all other work at the Site.
- (2) Use of toilet facilities in the Work under construction shall not be permitted except by consent of the Inspector and the District.

E. Telephone Service:

- (1) Contractor shall arrange with local telephone service company for telephone service as required for the performance of the Work. Contractor shall, at a minimum, provide in its field office one line for telephone and one line for fax machine.
- (2) Contractor shall pay the costs for telephone and fax lines installation, maintenance, service, and removal.

F. Fire Protection:

- (1) Contractor shall provide and maintain fire extinguishers and other equipment for fire protection. Such equipment shall be designated for use for fire protection only and shall comply with all requirements of the California Fire, State Fire Marshall and/or its designee.
- (2) Where on-site welding and burning of steel is unavoidable, Contractor shall provide protection for adjacent surfaces.

G. Trash Removal:

- (1) Contractor shall provide trash removal on a timely basis. Under no circumstance shall Contractor use District trash service.

H. Field Office:

- (1) If Contractor chooses to provide a field office, it shall be an acceptable construction trailer that is well-lit and ventilated. The construction trailer shall be equipped with shelves, desks, filing cabinet, chairs, and such other items of equipment needed. Trailer and equipment are the property of the Contractor and must be removed from the Site upon completion of the Work. Contractor may use the corridor adjacent to the construction area for an office area, if approved in writing by District.
- (2) Contractor shall provide any additional electric lighting and power required for the trailer. Contractor shall make adequate provisions for heating and cooling as required.

I. Temporary Facilities:

- (1)

1.03 CONSTRUCTION AIDS:

A. Plant and Equipment:

- (1) Contractor shall furnish, operate, and maintain a complete plant for fabricating, handling, conveying, installing, and erecting materials and equipment; and for conveyances for transporting workers. Include elevators, hoists, debris chutes, and other equipment, tools, and appliances necessary for performance of the Work.
- (2) Contractor shall maintain plant and equipment in safe and efficient operating condition. Damages due to defective plant and equipment, and uses made thereof, shall be repaired by Contractor at no expense to the District.

B. None of the District's tools and equipment shall be used by Contractor for the performance of the Work.

1.04 BARRIERS AND ENCLOSURES:

- A. Contractor shall obtain the District's written permission for locations and types of temporary barriers and enclosures, including fire-rated materials proposed for use, prior to their installation.
- B. Contractor shall provide and maintain temporary enclosures to prevent public entry and to protect persons using other buildings and portions of the Site and/or Premises, the public, and workers. Contractor shall also protect the Work and existing facilities from the elements, and adjacent construction and improvements, persons, and trees and plants from damage and injury from demolition and construction operations.
- C. Contractor shall provide site access to existing facilities for persons using other buildings and portions of the Site, the public, and for deliveries and other services and activities.
- D. Tree and Plant Protection:
 - (1) Contractor shall preserve and protect existing trees and plants on the Premises that are not designated or required to be removed, and those adjacent to the Premises.
 - (2) Contractor shall provide barriers to a minimum height of 4'-0" around drip line of each tree and plant, around each group of trees and plants, as applicable, in the proximity of demolition and construction operations, or as denoted on the Plans.
 - (3) Contractor shall not park trucks, store materials, perform Work or cross over landscaped areas. Contractor shall not dispose of paint thinners, water from cleaning, plastering or concrete operations, or other deleterious materials in landscaped areas, storm drain systems, or sewers. Plant materials damaged as a result of the performance of the Work shall, at the option of the District and at Contractor's expense, either be replaced with new plant materials equal in size to those damaged or by payment of an amount representing the value of the damaged materials as determined by the District.
 - (4) Contractor shall remove soil that has been contaminated during the performance of the Work by oil, solvents, and other materials which could be harmful to trees and plants, and replace with good soil, at Contractor's expense.
 - (5) Excavation around Trees:
 - (a) Excavation within drip lines of trees shall be done only where absolutely necessary and with written permission from the District.
 - (b) Where trenching for utilities is required within drip lines, tunneling under and around roots shall be by hand digging and shall be approved by the District. Main lateral roots and taproots shall not be cut. All roots 2 inches in diameter and

larger shall be tunneled under and heavily wrapped with wet burlap so as to prevent scarring or excessive drying. Smaller roots that interfere with installation of new work may be cut with prior approval by the District. Roots must first be cut with a Vermeer, or equivalent, root cutter prior to any trenching.

- (c) Where excavation for new construction is required within drip line of trees, hand excavation shall be employed to minimize damage to root system. Roots shall be relocated in backfill areas wherever possible. If encountered immediately adjacent to location of new construction, roots shall be cut approximately 6 inches back from new construction.
- (d) Approved excavations shall be carefully backfilled with the excavated materials approved for backfilling. Backfill shall conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities. Do not use mechanical equipment to compact backfill. Tamp carefully using hand tools, refilling and tamping until Final Acceptance as necessary to offset settlement.
- (e) Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be wrapped with four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill.
- (f) Accidentally broken roots should be sawed cleanly 3 inches behind ragged end.

1.05 SECURITY:

The Contractor shall be responsible for project security for materials, tools, equipment, supplies, and completed and partially completed Work.

1.06 TEMPORARY CONTROLS:

A. Noise Control:

- (1) Contractor acknowledges that adjacent facilities may remain in operation during all or a portion of the Work period, and it shall take all reasonable precautions to minimize noise as required by applicable laws and the Contract Documents.
- (2) Notice of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to the District a minimum of forty-eight (48) hours in advance of their performance.

B. Noise and Vibration:

- (1) Equipment and impact tools shall have intake and exhaust mufflers.

- (2) Contractor shall cooperate with District to minimize and/or cease the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity.

C. Dust and Dirt:

- (1) Contractor shall conduct demolition and construction operations to minimize the generation of dust and dirt, and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.
- (2) Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.
- (3) Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.
- (4) Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.

D. Water:

- (1) Contractor shall not permit surface and subsurface water, and other liquids, to accumulate in or about the vicinity of the Premises. Should accumulation develop, Contractor shall control the water or other liquid, and suitably dispose of it by means of temporary pumps, piping, drainage lines, troughs, ditches, dams, or other methods.

E. Pollution:

- (1) No burning of refuse, debris, or other materials shall be permitted on or in the vicinity of the Premises.
- (2) Contractor shall comply with applicable regulatory requirements and anti-pollution ordinances during the conduct of the Work including, without limitation, demolition, construction, and disposal operations.

F. Lighting:

- (1) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

1.07 JOB SIGN(S):

A. General:

- (1) Contractor shall provide and maintain a Project identification sign with the design, text, and colors designated by the District and/or the Design Professional; locate sign as approved by the District.

- (2) Signs other than the specified Project sign and or signs required by law, for safety, or for egress, shall not be permitted, unless otherwise approved in advance by the District.

B. Materials:

- (1) Structure and Framing: Structurally sound, new or used wood or metal; wood shall be nominal 3/4-inch exterior grade plywood.
- (2) Sign Surface: Minimum 3/4-inch exterior grade plywood.
- (3) Rough Hardware: Galvanized.
- (4) Paint: Exterior quality, of type and colors selected by the District and/or the Design Professional.

C. Fabrication:

- (1) Contractor shall fabricate to provide smooth, even surface for painting.
- (2) Size: 4'-0" x 8'-0", unless otherwise indicated.
- (3) Contractor shall paint exposed surfaces of supports, framing, and surface material with exterior grade paint: one coat of primer and one coat of finish paint.
- (4) Text and Graphics: As indicated.

1.08 PUBLICITY RELEASES:

- A. Contractor shall not release any information, story, photograph, plan, or drawing relating information about the Project to anyone, including press and other public communications medium, including, without limitation, on website(s) without the written permission of the District.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF DOCUMENT

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions; and
- C. Temporary Facilities and Controls.

1.02 SECTION INCLUDES:

- A. Administrative and procedural requirements for the following:
 - (1) Salvaging non-hazardous construction waste.
 - (2) Recycling non-hazardous construction waste.
 - (3) Disposing of non-hazardous construction waste.

1.03 DEFINITIONS:

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.04 PERFORMANCE REQUIREMENTS:

- A. General: Develop waste management plan that results in end-of Project rates for salvage/recycling of sixty-five percent (65%) by weight (or by volume, but not a combination) of total waste generated by the Work.

1.05 SUBMITTALS:

- A. Waste Management Plan: Submit waste management plan within 30 days of date established for commencement of the Work.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit copies of report. Include the following information:
 - (1) Material category.
 - (2) Generation point of waste.
 - (3) Total quantity of waste in tons or cubic yards.
 - (4) Quantity of waste salvaged, both estimated and actual in tons or cubic yards.
 - (5) Quantity of waste recycled, both estimated and actual in tons or cubic yards.
 - (6) Total quantity of waste recovered (salvaged plus recycled) in tons or cubic yards.
 - (7) Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for final payment, submit copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

- H. CHPS Submittal: CHPS letter template for Credit ME2.0 and ME2.1, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
- I. Qualification Data: For Waste Management Coordinator.
- J. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- K. Submittal procedures and quantities are specified in Document 01 33 00.

1.06 QUALITY ASSURANCE:

- A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements. Review methods and procedures related to waste management including, but not limited to, the following:
 - (1) Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
 - (2) Review requirements for documenting quantities of each type of waste and its disposition.
 - (3) Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - (4) Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - (5) Review waste management requirements for each trade.

1.07 WASTE MANAGEMENT PLAN:

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measurement throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
- (1) Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - (2) Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - (3) Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - (4) Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - (5) Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - (6) Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION

3.01 PLAN IMPLEMENTATION:

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- (1) Comply with Document 01 50 00 for operation, termination, and removal requirements.
- B. [Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.]
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

- (1) Distribute waste management plan to everyone concerned within 3 days of submittal return.
 - (2) Distribute waste management plan to entities when they first begin work on site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - (1) Designate and label specific areas of Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - (2) Comply with Document 01 50 00 for controlling dust and dirt, environmental protection, and noise control.

3.02 RECYCLING CONSTRUCTION WASTE:

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to the Contractor.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
 - (1) Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project Site. Include list of acceptable and unacceptable materials at each container and bin.
 - (a) Inspect containers and bins for contamination and remove contaminated materials if found.
 - (2) Stockpile processed materials on site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - (3) Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - (4) Store components off the ground and protect from the weather.
 - (5) Remove recyclable waste off District property and transport to recycling receiver or processor.

- D. Packaging:
 - (1) Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - (2) Polystyrene Packaging: Separate and bag material.
 - (3) Pallets: As much as possible, require deliveries using pallets to remove pallets from Project Site. For pallets that remain on Site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - (4) Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- E. Site-Clearing Wastes: Chip brush, branches, and trees on site.
- F. Wood Materials:
 - (1) Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - (2) Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
 - (1) Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.03 DISPOSAL OF WASTE:

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project Site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - (1) Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on site.
 - (2) Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off District property and legally dispose of them.

END OF DOCUMENT

FIELD OFFICES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions; and
- C. Temporary Facilities and Controls.

1.02 SECTION INCLUDES:

- A. Requirements for Field Offices and Field Office Trailers.

1.03 SUMMARY:

- A. General: Contractor shall provide District's Field Office Trailer and contents, for District's use exclusively, during the term of the Contract.
- B. Property: Trailer, furniture, furnishings, equipment, and the like, supplied by the Contractor with the Office Trailer shall remain the property of the Contractor; District property items installed, delivered, and the like by District within the Office Trailer will remain District's property.
- C. Modifications: District reserves the right to modify the trailer or contents, or both, as may be deemed proper by District.
- D. Condition: Trailer and contents shall be clean, neat, substantially finished, in good, proper, and safe condition for use, operation, and the like; the trailer and contents shall not be required to be new.
- E. Installation Timing: Provide safe, fully furnished, functional, proper, complete, and finished trailer properly ready for entire use, within fourteen (14) calendar days of District's notification of the issuance of Notice to Proceed.

1.04 SUBMITTALS:

- A. General: Submit submittals to District in quantity, format, type, and the like, as specified herein.
- B. Office Trailer Data: One (1) copy of manufacturer's descriptive data, technical descriptions, regulatory compliance, industry standards, installation, removal, and maintenance instructions.

- C. Equipment Data: Two (2) copies of manufacturer data for each type of equipment, if directed by District.
- D. Furniture and Furnishings Data: Two (2) copies of manufacturer data for each type of equipment, if directed by District.
- E. Plans: One (1) reproducible copy of appropriately scaled plans of trailer layout. Plans shall include, but not be limited to: lighting; furniture; equipment; telephone and electrical outlets; and the like.
- F. Product Samples: One (1) complete and entire unit of each type, if directed by District.

1.05 QUALITY ASSURANCE

- A. Standards: In the event that provisions of codes, regulations, safety orders, Contract Documents, referenced manufacturer's specifications, manufacturer's instructions, industry standards, and the like, are in conflict, the more restrictive and higher quality shall govern.
- B. Installer: Installer or Installers engaged by Contractor must have a minimum of five (5) years of documented and properly authenticated successful experience of specialization in the installation of the items or systems, or both, specified herein.
- C. Manufacturer: Contractor shall obtain products from nationally and industry recognized Manufacturer with five (5) years minimum, of immediately recent, continuous, documented and properly authenticated successful experience of specialization in the manufacture of the product specified herein.
- D. State Personnel Training: Provide proper training for maintenance and operations, including emergency procedures, and the like, as directed by District.
- E. Units: Shall be sound and free of defects, and shall not include any damage or defect that will impair the safety, installation, performance, or the durability of the entire Office Trailer and appurtenant systems.

1.06 REGULATORY REQUIREMENTS

- A. General: Work shall be executed in accordance with applicable Codes, Regulations, Statutes, Enactments, Rulings, Laws, each authority having jurisdiction, and including, but not limited to, Regulatory Requirements specified herein.
- B. California Building Standards Code ("CBSC").
- C. California Code of Regulations, Title 25, Chapter 3, Sub Chapter 2, Article 3 ("CCR").
- D. Coach Insignia: Trailer shall display California Commercial Coach Insignia; such insignia shall be deemed to show that the trailer is in accordance with the Construction and Fire Safety requirements of CCR.

PART 2 – PRODUCTS

2.01 FIELD OFFICE TRAILER

- A. General: Provide entire Field Office Trailer of type, function, operation, capacity, size, complete with controls, safety devices, accessories, and the like, for proper and durable installation. Partitions, walls, ceiling, and other interior and exterior surfaces shall be appropriately finished, including, but not limited to, trim, painting, wall base, floor covering, suspended or similar ceiling, and the like; provide systems, components, units, nuts, bolts, screws, anchoring devices, fastening devices, washers, accessories, adhesives, sealants, and other items of type, grade, and class required for the particular use, not identified but required for a complete, weather-tight, appropriately operating, and finished installation.
- B. Manufacturers: General Electric Capital Modular Space; The Space Place, Inc.; or equal.
- C. Program: Provide a wheel-mounted trailer with stairs, landings, platforms, ramps, and the like, in good, proper, safe, clean, and properly finished condition; with proper heavy duty locks, and other proper and effective security at all doors, windows, and the like. Trailer shall be maintained in good, proper, safe, clean, and properly finished condition during the Contract.
 - (1) Nominal Trailer Size: Four hundred eighty (480) square feet, minimum.
 - (2) Stairs, Platform: Properly finished stairs, platforms, and ramps.
 - (3) Doors: Two (2), three (3) foot wide exterior doors with locksets; finished ramp, steps, and entry platform at each exterior door.
 - (4) Keys: Submit five (5) keys for each door, window, furniture unit, and the like. There shall be no other key copies or originals available; each key shall be identified for District; and shall be labeled, or tagged or both, as directed by District.
 - (5) HVAC:
 - (6) Lighting: Sixty-five (65) foot-candles illumination minimum at any point, at thirty (30) inches above finished floor throughout from fluorescent light source, exclusively, or as directed by District.
 - (7) Electrical Outlets: One (1) duplex outlet evenly spaced every twelve (12) linear horizontal feet of wall face, and electrical service ready for use.
 - (8) Telephones and Telephone Outlets: Two (2) telephone lines wired, connected to telephone utility service, and ready for use, and two (2) telephone instruments, each with two (2)-line capability, speed dial and hands-free feature. Locate each outlet as directed by District.

- (9) Voicemail Messaging System or Answering Machine: One (1) unit, two (2)-line; digital.

2.02 FIELD OFFICE TRAILER ITEMS

- A. General: Provide the Field Office Trailer with the following arranged into two (2) workstations:
- (1) Desks: Two (2) desks: thirty-six (36) inches by sixty (60) inches; steel, laminated plastic top; locking, one (1) or two (2) file drawers single pedestal; steel; provide five (5) keys to District.
 - (2) Tables: Two (2) tables; thirty-six (36) inches by sixty (60) inches; twenty-nine (29) inches high; steel, laminated plastic top tables; one (1) at each desk.
 - (3) Chairs: Two (2) chairs: swivel; steel; with seat cushion and arms; one (1) at each desk.
 - (4) Waste Baskets: Two (2) waste baskets, one at each desk.
- B. Furniture and Equipment: Provide in the space located to effect efficient and logical use.
- (1) File cabinet: One (1); four (4) drawer; lateral; steel locking.
 - (2) Plan Table: One (1) plan table: thirty-six (36) inches deep by seventy-two (72) inches wide by forty-two (42) inches high; adjustable; wood or steel; with lockable plan and pencil drawers.
 - (3) Drafting Stool: One (1) drafting stool; swiveling; steel; padded; adjustable; with footrest and casters.
 - (4) Bookshelf: One (1) bookshelf: thirty-six (36) inches deep by seventy-two (72) inches wide by forty-two (42) inches high; adjustable; wood or steel; with lockable plan and pencil drawer.
 - (5) Plan Rack: One (1) wheel mounted plan rack.
 - (6) Waste Baskets: One (1) large waste basket.
 - (7) Coat/Hat Hanger: Wall mounted with minimum capacity for four (4) garments and ten (10) hats.
 - (8) Document Management System: Shall include an integrated high-volume printer, copier, and facsimile machine, including stand, base, and storage cabinet; and shall include the following features:
 - (a) Type: Laser, dry electrostatic transfer, plain paper, digital, multi-function imaging system.
 - (b) Network: Ethernet or Token Ring network ready, Plug-and-Play.

- (c) Print, send/receive facsimile from any connected workstation.
- (d) Resolution: Six hundred (600) dots per inch by six hundred (600) dots per inch, minimum.
- (e) Print Speed: Twenty (20) pages per minute, minimum.
- (f) Copies: Twenty (20) copies per minute, minimum.
- (g) Document Handler: Forty (40) sheet, minimum
- (h) Collator: Forty (40) bin, minimum, with stapling.
- (i) Duplexing: Capable.
- (j) Paper Size: Capable of handling paper sizes to eleven (11) inches by seventeen (17) inches.
- (k) Paper Cassettes: One (1) each for eight and one half (8.5) inches by eleven (11) inches, eight and one half (8.5) inches by fourteen (14) inches, and eleven (11) inches by seventeen (17) inches paper sizes; minimum two hundred fifty (250) sheets per cassette.
- (l) Reduction/Enlargement: Capable of reduction to twenty-five percent (25%) and enlargement to two hundred percent (200%).
- (m) Facsimile Electronic Storage: Capable of storing minimum of fifty (50) speed dial numbers, group faxing and broadcast faxing.
- (n) Facsimile Scanning: Capable of scanning into memory a minimum of one hundred (100) pages with maximum scan time of three (3) seconds per page.
- (o) Halftone: Sixty-four (64) levels.
- (p) Redial: Automatic and Manual.
- (9) Maintenance: Contractor shall purchase service agreements for each unit of equipment for the duration of the project plus two (2) months, and shall maintain all equipment in proper working condition. Service agreements shall include provision for replacement of toner cartridges and other items required to effect proper unit use. Service agreements shall also provide for:
 - (a) Unlimited Service Calls.
 - (b) Same Day Response.
 - (c) All parts, labor, preventative maintenance and mileage.

- (d) All chemicals, such as toner, fixing agent, and the like.
 - (e) System training and setup.
- (10) Portable Toilets: Two (2); each shall include a urinal; each unit shall be a properly enclosed chemical unit conforming to ANSI Z4.3.
 - (a) Location: As directed by District.
 - (b) Maintenance: Maintain each unit and surrounding areas in a clean, hygienic and orderly manner, at all time. Empty, clean, and sanitize each unit each day at a location and time as directed by District.
 - (c) Removal: Relocate, or remove from the site, each Portable Toilet. Upon such directive by District, the Contractor shall forthwith relocate or remove each Portable Toilet and submit the affected areas to a condition which existed prior to the installation of each Portable Toilet, within three (3) calendar days, or as directed by District in writing, at no cost to District.

2.03 UTILITY AND SERVICES

- A. Telephone Service: Contractor shall provide and interface the entire telephone service, and shall properly and timely pay for telephone service for District's non-long-distance use.
- B. Electrical Service: Provide all proper connections and continuously pay for service for the duration of the Work.

2.04 FINISHES

- A. General: Manufacturer standard finish system over surfaces properly cleaned, pretreated, and prepared to obtain proper bond; all visible surfaces shall be coated.
- B. Finish: Color as selected by District from manufacturer standard palette.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. General: Properly prepare area and affected items to receive the Work. Set Work accurately in location, alignment, and elevation; rigidly, securely, and firmly anchor to appropriate structure; install plumb, straight, square, level, true, without racking, rigidly anchored to proper solid blocking, substrate, and the like; provide appropriate type and quantity of reinforcements, fasteners, adhesives, self-adhesive and other tapes; lubricants, coatings, accessories, and the like, as required for a complete, structurally rigid, stable, sound, and appropriately finished installation, in accordance with manufacturer's published instructions, and as indicated. The more restrictive and higher quality requirement shall govern. Moving parts shall be properly secured, without binding, looseness, noise, and the like.

- B. Installation: Install in accordance with 25 CCR 3.2.3 and as directed by District; jack up trailer and level both ways; mount on proper concrete piers with all load off wheels; provide required tie down and accessories per Section 4368 of referenced CCR, and as directed by District.
- C. Rejected Work: Work, materials, unit, items, systems, and the like, not accepted by District shall be deemed rejected, and shall forthwith be removed and replaced with proper and new Work, materials, unit, items, systems, and the like at no cost to District.
- D. Standard: Comply with manufacturer's published instructions, or with instructions as shown or indicated; the more restrictive and higher quality requirement shall govern.
- E. Location: As directed by District.
- F. Fire Resistance: Construct and install in accordance with UL requirements.
- G. Maintenance: Contractor shall maintain trailer and adjacent areas in a safe, clean and hygienic condition throughout the duration of the Work, and as directed by District. Properly repair or replace furniture or other items, as directed by District. Properly remove unsafe, damaged, or broken furniture, or similar items, and replace with safe and proper items. Contractor shall pay cost of all services, repair, and maintenance, or replacement of each item.
- H. Janitorial Service: Provide professional janitorial services, including, but not limited to, trash, waste paper baskets, fill paper dispensers; clean and dust all furniture, files, and the like; sweep and mop resilient and similar flooring; and vacuum carpeting and similar flooring.
 - (1) Frequency: Two (2) times per week, minimum.
- I. Removal: Properly remove the Office Trailer and contents from the Site upon completion of the Contract, or as directed by District in writing. Forthwith properly patch and repair affected areas; replace damaged items with new items. Carefully and properly inventory, clean, pack, store, and protect District property; submit District property to District at a date, time and location as directed by District.

END OF DOCUMENT

OWNER-FURNISHED PRODUCTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions; and
- C. Materials and Equipment.

1.02 SECTION INCLUDES

- A. Requirements for the following:
 - (1) Installing Owner-furnished materials and equipment.
 - (2) Providing necessary utilities, connections and rough-ins.

1.03 DEFINITIONS

- A. Owner: District, who is providing/furnishing materials and equipment.
- B. Installing Contactor: Contractor, who is installing the materials and equipment furnished by the Owner.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Receive, store and handle products in accordance with the manufacturer's instructions.
- B. Protect equipment items as required to prevent damage during storage and construction.

PART 2 – PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

- A. Installing Contractor's Responsibilities:
 - (1) Verify mounting and utility requirements for Owner-furnished materials and equipment items.
 - (2) Provide mounting and utility rough in for all items where required.

- (a) Rough in locations, sizes, capacities, and similar type items shall be as indicated and required by product manufacturer.

B. Owner and Installing Contractor(s) Responsibilities:

- (1) Owner-Furnished/Contractor Installed ("OFCI"): Furnished by the Owner; installed by the Installing Contractor.
 - (a) General: Owner and Installing Contractor(s) will coordinate deliveries of materials and equipment to coincide with the construction schedule.
 - (b) Owner will furnish specified materials and equipment delivered to the site. Owner/vendor's representative shall be present on Site at the time of delivery to comply with the contract requirements and Specifications Section 01 43 00, Materials and Equipment, Article 1.04.
 - (c) The Owner furnishing specified materials and equipment is responsible to provide manufacturer guarantees as required by the Contract to the Installing Contractor.
 - (d) The Installing Contractor shall:
 - 1) Review, verify and accept the approved manufacturer's submittal/Shop Drawings for all materials and equipment required to be installed by the Installer Contractor and furnished by the Owner. Any discrepancies, including but not limited to possible space conflicts, should be brought to the attention of the Project Manager and/or Program Manager, if applicable.
 - 2) Coordinate timely delivery. Installing Contractor shall receive materials and equipment at Site when delivered and give written receipt at time of delivery, noting visible defects or omissions; if such declaration is not given, the Installing Contractor shall assume responsibility for such defects and omissions.
 - 3) Store materials and equipment until ready for installation and protect from loss and damage. Installing Contractor is responsible for providing adequate storage space.
 - 4) Coordinate with other bid package contractors and field measurement to ensure complete installation.
 - 5) Uncrate, assemble, and set in place.
 - 6) Provide adequate supports.
 - 7) Install materials and equipment in accordance with manufacturer's recommendations, instructions, and

Shop Drawings, supply labor and material required, and make mechanical, plumbing, and electrical connections required to operate equipment.

- 8) Be certified by equipment manufacturer for installation of the specific equipment supplied by the Owner.
- 9) Provide anchorage and/or bracing as required for seismic restraint per Title 24, UBC Standard 27-11 and all other applicable codes.
- 10) Provide the contract-required warranty and guarantee for all work, materials and equipment, and installation upon its completion and acceptance by the District. Guarantee includes all costs associated with the removal, shipping to and from the Site, and re-installation of any equipment found to be defective.

C. Compatibility with Space and Service Requirements:

- (1) Equipment items shall be compatible with space limitations indicated and as shown on the Contract Documents and specified in other sections of the Specifications.
- (2) Modifications to equipment items required to conform to space limitations specified for rough in shall not cause additional cost to the District.

D. Manufacturer's printed descriptions, specifications, and instructions shall govern the Work unless specifically indicated or specified otherwise.

2.02 FURNISHED MATERIALS AND EQUIPMENT

- A. All furnished materials and equipment are indicated or scheduled on the Contract Documents.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install equipment items in accordance with the manufacturer's instructions.
- B. Set equipment items securely in place, rigidly or flexibly mounted in accordance with manufacturers' directions.
- C. Make electrical and mechanical connections as indicated and required.
- D. Touch-up and restore damaged or defaced finishes to the Owner's satisfaction.

3.02 CLEANING AND PROTECTION

- A. Repair or replace items not acceptable to the Architect or Owner.

- B. Upon completion of installation, clean equipment items in accordance with manufacturer's recommendations, and protect from damage until final acceptance of the Work by the Owner.

END OF DOCUMENT

PRODUCT DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Access, Conditions and Requirements;
- B. Special Conditions.

1.02 PRODUCTS

- A. Products are as defined in the General Conditions.
- B. Contractor shall not use and/or reuse materials and/or equipment removed from existing Premises, except as specifically permitted by the Contract Documents.
- C. Contractor shall provide interchangeable components of the same manufacturer, for similar components.

1.03 TRANSPORTATION AND HANDLING

- A. Contractor shall transport and handle Products in accordance with manufacturer's instructions.
- B. Contractor shall promptly inspect shipments to confirm that Products comply with requirements, quantities are correct, and products are undamaged.
- C. Contractor shall provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE AND PROTECTION

- A. Contractor shall store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Contractor shall store sensitive products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated Products, Contractor shall place on sloped supports, above ground.
- C. Contractor shall provide off-site storage and protection when Site does not permit on-site storage or protection.

- D. Contractor shall cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.
- E. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.
- F. Contractor shall provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- G. Contractor shall arrange storage of Products to permit access for inspection and periodically inspect to assure Products are undamaged and are maintained under specified conditions.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

FIELD ENGINEERING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Investigation, and Soils Investigation Report;
- B. Special Conditions;
- C. Site-Visit Certification.

1.02 REQUIREMENTS INCLUDED:

- A. Contractor shall provide and pay for field engineering services by a California-registered engineer, required for the project, including, without limitations:
 - (1) Survey work required in execution of the Project.
 - (2) Civil or other professional engineering services specified, or required to execute Contractor's construction methods.

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEERS:

Contractor shall only use a qualified licensed engineer or registered land surveyor, to whom District makes no objection.

1.04 SURVEY REFERENCE POINTS:

- A. Existing basic horizontal and vertical control points for the Project are those designated on the Drawings.
- B. Contractor shall locate and protect control points prior to starting Site Work and preserve all permanent reference points during construction. In addition Contractor shall:
 - (1) Make no changes or relocation without prior written notice to District and Architect.
 - (2) Report to District and Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 - (3) Require surveyor to replace Project control points based on original survey control that may be lost or destroyed.

1.05 RECORDS:

Contractor shall maintain a complete, accurate log of all control and survey work as it progresses.

1.06 SUBMITTALS:

- A. Contractor shall submit name and address of Surveyor and Professional Engineer to District and Architect prior to its/their work on the Project.
- B. On request of District and Architect, Contractor shall submit documentation to verify accuracy of field engineering work, at no additional cost to the District.
- C. Contractor shall submit a certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance or nonconformance with Contract Documents.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION

3.01 COMPLIANCE WITH LAWS:

Contractor is responsible for meeting all applicable codes, OSHA, safety and shoring requirements.

3.02 NONCONFORMING WORK:

Contractor is responsible for any re-surveying required by correction of nonconforming work.

END OF DOCUMENT

CUTTING AND PATCHING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Inspector, Inspections, and Tests, Integration of Work, Nonconforming Work, and Correction of Work, and Uncovering Work;
- B. Special Conditions;
- C. Hazardous Materials Procedures and Requirements;
- D. Hazardous Materials Certification;
- E. Lead-Based Paint Certification;
- F. Imported Materials Certification.

1.02 CUTTING AND PATCHING:

- A. Contractor shall be responsible for all cutting, fitting, and patching, including associated excavation and backfill, required to complete the Work or to:
 - (1) Make several parts fit together properly.
 - (2) Uncover portions of Work to provide for installation of ill-timed Work.
 - (3) Remove and replace defective Work.
 - (4) Remove and replace Work not conforming to requirements of Contract Documents.
 - (5) Remove Samples of installed Work as specified for testing.
 - (6) Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.
 - (7) Attaching new materials to existing remodeling areas – including painting (or other finishes) to match existing conditions.
- B. In addition to Contract requirements, upon written instructions from the District, Contractor shall uncover Work to provide for observations of covered Work in accordance with the Contract Documents; remove samples of installed materials for testing as directed by District; and remove Work to provide for alteration of existing Work.

- C. Contractor shall not cut or alter Work, or any part of it, in such a way that endangers or compromises the integrity of the Work, the Project, or work of others.

1.03 SUBMITTALS:

- A. Prior to any cutting or alterations that may affect the structural safety of Project, or work of others, and well in advance of executing such cutting or alterations, Contractor shall submit written notice to District pursuant to the applicable notice provisions of the Contract Documents, requesting consent to proceed with the cutting or alteration, including the following:
 - (1) The work of the District or other trades.
 - (2) Structural value or integrity of any element of Project.
 - (3) Integrity or effectiveness of weather-exposed or weather-resistant elements or systems.
 - (4) Efficiency, operational life, maintenance or safety of operational elements.
 - (5) Visual qualities of sight-exposed elements.
- B. Contractor's Request shall also include:
 - (1) Identification of Project.
 - (2) Description of affected Work.
 - (3) Necessity for cutting, alteration, or excavations.
 - (4) Effects of Work on District, other trades, or structural or weatherproof integrity of Project.
 - (5) Description of proposed Work:
 - (a) Scope of cutting, patching, alteration, or excavation.
 - (b) Trades that will execute Work.
 - (c) Products proposed to be used.
 - (d) Extent of refinishing to be done.
 - (6) Alternates to cutting and patching.
 - (7) Cost proposal, when applicable.
 - (8) The scheduled date the Contractor intends to perform the Work and the duration of time to complete the Work.

- (9) Written permission of District or other District contractor(s) whose work will be affected.

1.04 QUALITY ASSURANCE:

- A. Contractor shall ensure that cutting, fitting, and patching shall achieve security, strength, weather protection, appearance for aesthetic match, efficiency, operational life, maintenance, safety of operational elements, and the continuity of existing fire ratings.
- B. Contractor shall ensure that cutting, fitting, and patching shall successfully duplicate undisturbed adjacent profiles, materials, textures, finishes, colors, and that materials shall match existing construction. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the District's decision shall be final.

1.05 PAYMENT FOR COSTS:

- A. Cost caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of the District, its consultants, including but not limited to the Construction Manager, the Architect, the Project Inspector(s), Engineers, and Agents, will be paid by Contractor and/or deducted from the Contract by the District.
- B. District shall only pay for cost of Work if it is part of the original Contract Price or if a change has been made to the contract in compliance with the provisions of the General Conditions. Cost of Work performed upon instructions from the District, other than defective or nonconforming Work, will be paid by District on approval of written Change Order. Contractor shall provide written cost proposals prior to proceeding with cutting and patching.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Contractor shall provide for replacement and restoration of Work removed. Contractor shall comply with the Contract Documents and with the Industry Standard(s), for the type of Work, and the Specification requirements for each specific product involved. If not specified, Contractor shall first recommend a product of a manufacturer or appropriate trade association for approval by the District.
- B. Materials to be cut and patched include those damaged by the performance of the Work.

PART 3 – EXECUTION

3.01 INSPECTION:

- A. Contractor shall inspect existing conditions of the Site and the Work, including elements subject to movement or damage during cutting and patching, excavating and backfilling. After uncovering Work, Contractor shall inspect conditions affecting installation of new products.

- B. Contractor shall report unsatisfactory or questionable conditions in writing to District as indicated in the General Conditions and shall proceed with Work as indicated in the General Conditions by District.

3.02 PREPARATION:

- A. Contractor shall provide shoring, bracing and supports as required to maintain structural integrity for all portions of the Project, including all requirements of the Project.
- B. Contractor shall provide devices and methods to protect other portions of Project from damage.
- C. Contractor shall, provide all necessary protection from weather and extremes of temperature and humidity for the Project, including without limitation, any work that may be exposed by cutting and patching Work. Contractor shall keep excavations free from water.

3.03 ERECTION, INSTALLATION AND APPLICATION:

- A. With respect to performance, Contractor shall:
 - (1) Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.
 - (2) Execute cutting and demolition by methods that will prevent damage to other Work, and provide proper surfaces to receive installation of repairs and new Work.
 - (3) Execute cutting, demolition excavating, and backfilling by methods that will prevent damage to other Work and damage from settlement.
- B. Contractor shall employ original installer or fabricator to perform cutting and patching for:
 - (1) Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants, waterproofing, and other trades.
 - (2) Sight-exposed finished surfaces.
- C. Contractor shall execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes as shown or specified in the Contract Documents including, without limitation, the Drawings and Specifications.
- D. Contractor shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Contractor shall conform to all Code requirements for penetrations or the Drawings and Specifications, whichever calls for a higher quality or more thorough requirement. Contractor shall maintain integrity of both rated and non-rated fire walls, ceilings, floors, etc.
- E. Contractor shall restore Work which has been cut or removed. Contractor shall install new products to provide completed Work in accordance with

requirements of the Contract Documents and as required to match surrounding areas and surfaces.

- F. Contractor shall refinish all continuous surfaces to nearest intersection as necessary to match the existing finish to any new finish.

END OF DOCUMENT

ALTERATION PROJECT PROCEDURES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Integration of Work, Purchase of Materials and Equipment, Uncovering of Work and Non-conforming Work and Correction of Work and Trenches;
- B. Special Conditions.

PART 2 - PRODUCTS

2.01 PRODUCTS FOR PATCHING AND EXTENDING WORK:

- A. New Materials: As specified in the Contract Documents including, without limitation, in the Specifications, Contractor shall match existing products, conditions, and work for patching and extending work.
- B. Type and Quality of Existing Products: Contractor shall determine by inspection, by testing products where necessary, by referring to existing conditions and to the Work as a standard.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Contractor shall verify that demolition is complete and that areas are ready for installation of new Work.
- B. By beginning restoration Work, Contractor acknowledges and accepts the existing conditions.

3.02 PREPARATION:

- A. Contractor shall cut, move, or remove items as necessary for access to alterations and renovation Work. Contractor shall replace and restore these at completion.
- B. Contractor shall remove unsuitable material not as salvage unless otherwise indicated in the Contract Documents. Unsuitable material may include, without limitation, rotted wood, corroded metals, and deteriorated masonry and concrete. Contractor shall replace materials as specified for finished Work.

- C. Contractor shall remove debris and abandoned items from all areas of the Site and from concealed spaces.
- D. Contractor shall prepare surface and remove surface finishes to provide for proper installation of new Work and finishes.
- E. Contractor shall close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity. Contractor shall insulate ductwork and piping to prevent condensation in exposed areas. Contractor shall insulate building cavities for thermal and/or acoustical protection, as detailed.

3.03 INSTALLATION:

- A. Contractor shall coordinate Work of all alternations and renovations to expedite completion and to accommodate District occupancy.
- B. Designated Areas and Finishes: Contractor shall complete all installations in all respects, including operational, mechanical work and electrical work.
- C. Contractor shall remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to original or specified condition.
- D. Contractor shall refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat and square or straight transition to adjacent finishes.
- E. Contractor shall install products as specified in the Contract Documents, including without limitation, the Specifications.

3.04 TRANSITIONS:

- A. Where new Work abuts or aligns with existing, Contractor shall perform a smooth and even transition. Patched Work must match existing adjacent work in texture and appearance.
- B. When finished surfaces are cut so that a smooth transition with new Work is not possible, Contractor shall terminate existing surface along a straight line at a natural line of division and make a recommendation for resolution to the District and the Architect for review and approval.

3.05 ADJUSTMENTS:

- A. Where removal of partitions or walls results in adjacent spaces becoming one, Contractor shall rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
- B. Where a change of plane of 1/4 inch or more occurs, Contractor shall submit a recommendation for providing a smooth transition to the District and the Architect for review and approval.

- C. Contractor shall trim and seal existing wood doors and shall trim and paint metal doors as necessary to clear new floor finish and refinish trim as required.
- D. Contractor shall fit Work at penetrations of surfaces.

3.06 REPAIR OF DAMAGED SURFACES:

- A. Contractor shall patch or replace portions of existing surfaces, which are damaged, lifted, discolored, or showing other imperfections, in the area where the Work is performed.
- B. Contractor shall repair substrate prior to patching finish.

3.07 CULTIVATED AREAS AND OTHER SURFACE IMPROVEMENTS:

- A. Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored by Contractor to their original condition or better, where indicated.
- B. Contractor shall protect and replace, if damaged, all existing guard posts, barricades, and fences.
- C. Contractor shall give special attention to avoid damaging or killing trees, bushes and/or shrubs on the Premises and/or identified in the Contract Documents, including without limitation, the Drawings.

3.08 FINISHES:

- A. Contractor shall finish surfaces as specified in the Contract Documents, including without limitations, the provisions of all Divisions of the Specifications.
- B. Contractor shall finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, Contractor shall refinish entire surface to nearest intersections.

3.09 CLEANING:

- A. Contractor shall continually clean the Site and the Premises as indicated in the Contract Documents, including without limitation, the provisions in the General Conditions and the Specifications regarding cleaning.

END OF DOCUMENT

CONTRACT CLOSEOUT AND FINAL CLEANING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Completion of Work;
- B. Special Conditions;
- C. Temporary Facilities and Controls.

1.02 CLOSEOUT PROCEDURES

Contractor shall comply with all closeout provisions as indicated in the General Conditions.

1.03 FINAL CLEANING

- A. Contractor shall execute final cleaning prior to final inspection.
- B. Contractor shall clean interior and exterior glass and all surfaces exposed to view; remove temporary labels, tape, stains, and foreign substances, polish transparent and glossy surfaces, wax and polish new vinyl floor surfaces, vacuum carpeted and soft surfaces.
- C. Contractor shall clean equipment and fixtures to a sanitary condition.
- D. Contractor shall replace filters of operating equipment.
- E. Contractor shall clean debris from roofs, gutters, down spouts, and drainage systems.
- F. Contractor shall clean Site, sweep paved areas, and rake clean landscaped surfaces.
- G. Contractor shall remove waste and surplus materials, rubbish, and construction facilities from the Site and surrounding areas.

1.04 ADJUSTING

Contractor shall adjust operating products and equipment to ensure smooth and unhindered operation.

1.05 RECORD DOCUMENTS AND SHOP DRAWINGS

- A. Contractor shall legibly mark each item to record actual construction, including:
 - (1) Measured depths of foundation in relation to finish floor datum.
 - (2) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permit surface improvements.
 - (3) Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - (4) Field changes of dimension and detail.
 - (5) Details not on original Contract Drawings
 - (6) Changes made by modification(s).
 - (7) References to related Shop Drawings and modifications.
- B. Contractor will provide one set of Record Drawings to District.
- C. Contractor shall submit all required documents to District and/or Architect prior to or with its final Application for Payment.

1.06 INSTRUCTION OF DISTRICT PERSONNEL

- A. Before final inspection, at agreed upon times, Contractor shall instruct District's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. For equipment requiring seasonal operation, Contractor shall perform instructions for other seasons within six months or by the change of season.
- C. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- D. Contractor shall prepare and insert additional data in Operation and Maintenance Manual when the need for such data becomes apparent during instruction.
- E. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Contractor shall provide products, spare parts, maintenance, and extra materials in quantities specified in the Specifications and in Manufacturer's recommendations.

- B. Contractor shall provide District with all required Operation and Maintenance Data at one time. Partial or piecemeal submissions of Operation and Maintenance Data will not be accepted.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Completion of the Work;
- B. Special Conditions.

1.02 QUALITY ASSURANCE:

Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.03 FORMAT:

- A. Contractor shall prepare data in the form of an instructional manual entitled "OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS" ("Manual").
- B. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.
- C. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.
- D. Contractor shall arrange content by systems process flow under section numbers and sequence of Table of Contents of the Contract Documents.
- E. Contractor shall provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.
- G. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

1.04 CONTENTS, EACH VOLUME:

- A. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, subconsultants, Subcontractor(s), and Contractor with name of responsible parties; and schedule of products and systems, indexed to content of the volume.

- B. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.
- C. Product Data: Contractor shall mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Contractor shall supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.
- E. Text: Contractor shall include any and all information as required to supplement product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- F. Warranties and Bonds: Contractor shall bind in one copy of each.

1.05 MANUAL FOR MATERIALS AND FINISHES:

- A. Building Products, Applied Materials, and Finishes: Contractor shall include product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture Protection and Weather Exposed Products: Contractor shall include product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.
- E. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS:

- A. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.
- B. Panelboard Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.

- C. Contractor shall include color coded wiring diagrams as installed.
- D. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.
- G. Contractor shall include manufacturer's printed operation and maintenance instructions.
- H. Contractor shall include sequence of operation by controls manufacturer.
- I. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Contractor shall provide control diagrams by controls manufacturer as installed.
- K. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- L. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- N. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).
- O. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.07 SUBMITTAL:

- A. Contractor shall submit to the District for review two (2) copies of preliminary draft or proposed formats and outlines of the contents of the Manual within thirty (30) days of Contractor's start of Work.
- B. For equipment, or component parts of equipment put into service during construction and to be operated by District, Contractor shall submit draft content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.

- C. Contractor shall submit two (2) copies of a complete Manual in final form prior to final Application for Payment. Copy will be returned with Architect/Engineer comments. Contractor must revise the content of the Manual as required by District prior to District's approval of Contractor's final Application for Payment.
- D. Contractor must submit two (2) copies of revised Manual in final form within ten (10) days after final inspection.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

WARRANTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Warranty/Guarantee Information;
- B. Special Conditions.

1.02 FORMAT

- A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.
- B. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list title of Project.
- C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier; and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the product or work item is specified.
- D. Contractor shall separate each warranty with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible Subcontractor(s), supplier(s), and/or manufacturer(s), with name, address, and telephone number of each responsible principal(s).

1.03 PREPARATION:

- A. Contractor shall obtain warranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within ten (10) days after completion of the applicable item or work. Except for items put into use with District's permission, Contractor shall leave date of beginning of time of warranty blank until the date of completion is determined.
- B. Contractor shall verify that documents are in proper form, contain full information, and are notarized, when required.
- C. Contractor shall co-execute submittals when required.
- D. Contractor shall retain warranties until time specified for submittal.

1.04 TIME OF SUBMITTALS:

- A. For equipment or component parts of equipment put into service during construction with District's permission, Contractor shall submit a draft warranty for that equipment or component within ten (10) days after acceptance of that equipment or component.
- B. Contractor shall submit for District approval all warranties and related documents within ten (10) days after date of completion. Contractor must revise the warranties as required by the District prior to District's approval of Contractor's final Application for Payment.
- C. For items of work delayed beyond date of completion, Contractor shall provide an updated submittal within ten (10) days after acceptance, listing the date of acceptance as start of warranty period.

PART 2 - PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Documents on Work;
- B. Special Conditions.

PART 2 - RECORD DRAWINGS

2.01 GENERAL:

- A. As indicated in the Contract Documents, the District will provide Contractor with one set of reproducible, full size original Contract Drawings (mylars).
- B. Contractor shall maintain at each Project Site one set of marked-up plans and shall transfer all changes and information to those marked-up plans, as often as required in the Contract Documents, but in no case less than once each month. Contractor shall submit to the Project Inspector one set of reproducible vellums of the Project Record Drawings ("As-Built") showing all changes incorporated into the Work since the preceding monthly submittal. The As-Built shall be available at the Project Site. The Contractor shall submit reproducible vellums at the conclusion of the Project following review of the blue line prints.
- C. Label and date each Record Drawing "RECORD DOCUMENT" in legibly printed letters.
- D. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused by without limitation Change Orders, Construction Claim Directives, RFI's, and Addenda, shall be accurately and legibly recorded by Contractor.
- E. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

2.02 RECORD DRAWING INFORMATION:

- A. Contractor shall record the following information:
 - (1) Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.

- (2) Actual numbering of each electrical circuit to match panel schedule.
- (3) Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Contract Drawings.
- (4) Locations of all items, not necessarily concealed, which vary from the Contract Documents.
- (5) Installed location of all cathodic protection anodes.
- (6) Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.
- (7) Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, etc.
- (8) Sufficient information to locate Work concealed in each building with reasonable ease and accuracy.

In some instances, this information may be recorded by dimension. In other instances, it may be recorded in relation to the spaces in the building near which it was installed.

- B. Contractor shall provide additional drawings as necessary for clarification.
- C. Contractor shall provide reproducible record drawings, made from final Shop Drawings marked "No Exceptions Taken" or "Approved as Noted."
- D. After review and approval of the marked-up specifications by the Project Inspector, Contractor shall provide electronic copies of the drawings (in PDF format) with one file with all of the sheets and one set of individual sheet files at the conclusion of the Project.

PART 3 - RECORD SPECIFICATIONS

3.01 GENERAL:

- A. Contractor shall mark each section legibly to record manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.
- B. After review and approval of the marked-up specifications by the Project Inspector, Contractor shall provide one electronic copy of the specifications (in PDF format) at the conclusion of the Project.

PART 4 - MAINTENANCE OF RECORD DOCUMENTS

4.01 GENERAL

- A. Contractor shall store Record Documents apart from documents used for construction as follows:

- (1) Provide files and racks for storage of Record Documents.
- (2) Maintain Record Documents in a clean, dry, legible condition and in good order.

B. Contractor shall not use Record Documents for construction purposes.

PART 5 – PRODUCTS Not Used.

END OF DOCUMENT

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SECTION 01 81 13.71 - SUSTAINABLE DESIGN REQUIREMENTS - CALGREEN
NON-RESIDENTIAL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: General requirements and procedures for compliance with 24 CCR 11, California Green Building Standards Code (CALGreen).
 - 1. Some CALGreen requirements depend on product selections and may not be specifically identified as CALGreen requirements. Compliance with CALGreen requirements may be used as one criterion to evaluate substitution requests and comparable product requests.
 - 2. Some CALGreen requirements depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
 - 3. Additional CALGreen requirements not included in this specification apply to the Project.

1.02 DEFINITIONS

- A. CALGreen: California Green Building Standards Code, including supplements in effect as of date of the Contract Documents unless otherwise indicated.
 - 1. Definitions that are part of CALGreen apply to this Section.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Respond to questions and requests from Architect about CALGreen requirements that depend on product selection or product qualities. Document responses as informational submittals.
- B. When requested by enforcing agency submit substantiating documentation confirming compliance with CALGreen requirements.
- C. Sustainable design submittals shall be identified and submitted separately from other submittals.

1.04 INFORMATIONAL SUBMITTALS

- A. Sustainable Design Submittals:
 - 1. Documentation for Construction and Demolition Waste Management: Submit documentation complying with CALGreen for one of the following:
 - a. Construction Waste Management Plan.
 - b. Waste Management Company.

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- c. Waste Stream Reduction Alternative.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Construction and Demolition Waste Management: Achieve end-of-Project rates for salvage/recycling of not less than 65 percent of total nonhazardous solid waste generated by the Work. Comply with local construction and demolition waste management ordinance when it is more stringent.
- B. Universal Waste: Universal Waste items such as fluorescent lamps and ballast, and mercury containing thermostats, as well as other California prohibited Universal Waste materials shall be disposed of properly and diverted from landfills.
- C. Site-Clearing Waste: 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled. If contamination by disease or pest infestation is suspected, contact the Country Agricultural Commissioner and follow its direction for recycling or disposal of the material.

2.02 MATERIALS

- A. Provide products and procedures necessary to comply with CALGreen requirements in this Section. Although other Sections may specify some requirements that contribute to referenced CALGreen requirements, determine additional materials and procedures necessary to comply with CALGreen requirements indicated.

2.03 LOW-EMITTING MATERIALS

- A. Adhesives and Sealants:
 - 1. For field applications, adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, and caulks shall comply with VOC content limits of authorities having jurisdiction, or the following VOC content limits:
 - a. Indoor Carpet Adhesives: 50 g/L.
 - b. Carpet Pad Adhesives: 50 g/L.
 - c. Outdoor Carpet Adhesives: 150 g/L.
 - d. Wood Flooring Adhesive: 100 g/L.
 - e. Rubber Floor Adhesives: 60 g/L.
 - f. Subfloor Adhesives: 50 g/L.
 - g. Ceramic Tile Adhesives: 65 g/L.
 - h. VCT and Asphalt Tile Adhesives: 50 g/L.
 - i. Gypsum Board and Panel Adhesives: 50 g/L.
 - j. Cove Base Adhesives: 50 g/L.

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- k. Multipurpose Construction Adhesives: 70 g/L.
 - l. Structural Glazing Adhesives: 100 g/L.
 - m. Single-Ply Roof Membrane Adhesive: 250 g/L.
 - n. Other Adhesive Not Specifically Listed: 50 g/L.
 - o. PVC Welding Compounds: 510 g/L.
 - p. CPVC Welding Compounds: 490 g/L.
 - q. ABS Welding Compounds: 325 g/L.
 - r. Plastic Cement Welding Compounds: 250 g/L.
 - s. Adhesive Primer for Plastic: 550 g/L.
 - t. Contact Adhesive: 80 g/L.
 - u. Special-Purpose Contact Adhesive (Contact Adhesive That Is Used to Bond Melamine Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch or Less in Thickness to Any Surface): 250 g/L.
 - v. Structural Wood Member Adhesives: 140 g/L.
 - w. Top and Trim Adhesive: 250 g/L.
 - x. Metal-to-Metal Adhesives: 30 g/L.
 - y. Plastic Foam Adhesives: 50 g/L.
 - z. Adhesives for Porous Materials (except Wood): 50 g/L.
 - aa. Wood Glues: 30 g/L.
 - bb. Fiberglass Adhesives: 80 g/L.
 - cc. Architectural Sealants: 250 g/L.
 - dd. Nonmembrane Roof Sealants: 300 g/L.
 - ee. Roadway Sealants: 250 g/L.
 - ff. Single-Ply Roof Membrane Sealants: 450 g/L.
 - gg. Other Sealants: 420 g/L.
 - hh. Sealant Primers for Nonporous Substrates: 250 g/L.
 - ii. Sealant Primers for Porous Substrates: 775 g/L.
 - jj. Modified Bituminous Sealant Primers: 500 g/L.
 - kk. Other Sealant Primers: 750 g/L.
2. Prohibited Ingredients: Adhesives and sealants must not contain the following:
- a. Chloroform.
 - b. Ethylene dichloride.
 - c. Methylene chloride.
 - d. Perchloroethylene.
 - e. Trichloroethylene.
3. Additional Requirements: Comply with additional requirements in CALGreen for aerosol adhesives, and small unit sizes of adhesives, and sealant or caulking compounds.

B. Paints and Coatings:

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1. For field applications, paints and coatings shall comply with VOC limits of California Air Resources Board (CARB) Architectural Coatings Suggested Control Measure (SCM) below, unless more stringent local limits apply. The VOC content limit for coatings that do not meet the definitions for the specialty coatings categories listed shall be determined by classifying the coating as flat, nonflat, or nonflat-high gloss coating, based on its gloss.
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Nonflat - High Gloss Coatings: 150 g/L.
 - d. Specialty Coatings:
 - 1) Aluminum Roof Coatings: 400 g/L.
 - 2) Basement Special Coatings: 400 g/L.
 - 3) Bituminous Roof Coatings: 50 g/L.
 - 4) Bituminous Roof Primers: 350 g/L.
 - 5) Bond Breakers: 350 g/L.
 - 6) Concrete Curing Compounds: 350 g/L.
 - 7) Concrete/Masonry Sealers: 100 g/L.
 - 8) Driveway Sealers: 50 g/L.
 - 9) Dry-Fog Coatings: 150 g/L.
 - 10) Faux Finishing Coatings: 350 g/L.
 - 11) Fire-Resistive Coatings: 350 g/L.
 - 12) Floor Coatings: 100 g/L.
 - 13) Form-Release Compounds: 250 g/L.
 - 14) Graphic Arts Coatings (Sign Paints): 500 g/L.
 - 15) High-Temperature Coatings: 420 g/L.
 - 16) Industrial Maintenance Coatings: 250 g/L.
 - 17) Low Solids Coatings: 120 g/L.
 - 18) Magnesite Cement Coatings: 450 g/L.
 - 19) Mastic Texture Coatings: 100 g/L.
 - 20) Metallic Pigmented Coatings: 500 g/L.
 - 21) Multi-Color Coatings: 250 g/L.
 - 22) Pretreatment Wash Primers: 420 g/L.
 - 23) Primers, Sealers, and Undercoaters: 100 g/L.
 - 24) Reactive Penetrating Sealers: 350 g/L.
 - 25) Recycled Coatings: 250 g/L.
 - 26) Roof Coatings: 50 g/L.
 - 27) Rust-Preventive Coatings: 250 g/L.
 - 28) Shellacs, Clear: 730 g/L.
 - 29) Shellacs, Opaque: 550 g/L.
 - 30) Specialty Primers, Sealers and Undercoaters: 100 g/L.
 - 31) Stains: 250 g/L.
 - 32) Stone Consolidants: 450 g/L.
 - 33) Swimming Pool Coatings: 340 g/L.

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- 34) Traffic Marking Coatings: 100 g/L.
 - 35) Tub and Tile Refinish Coatings: 420 g/L.
 - 36) Waterproof Membranes: 250 g/L.
 - 37) Wood Coatings: 275 g/L.
 - 38) Wood Preservatives: 350 g/L.
 - 39) Zinc-Rich Primers: 340 g/L.
2. Additional Requirements: Comply with additional requirements in CALGreen for aerosol paints and coatings.

PART 3 - EXECUTION

3.01 CONSTRUCTION WASTE MANAGEMENT

- A. Construction and Demolition Waste Management: Achieve specified rates for waste management by one of the following:
- 1. Construction Waste Management Plan: Where a local jurisdiction does not have a construction and demolition waste management ordinance that is more stringent, submit a construction waste management plan that includes the following:
 - a. Identification of construction and demolition waste materials to be diverted from disposal by efficient usage, recycling, reuse on the Project or salvage for future use or sale.
 - b. Determination of construction and demolition waste materials will be sorted on-site (source separated) or bulk mixed (single stream).
 - c. Identification of diversion facilities where construction and demolition waste material collected will be taken.
 - d. Specification of the amount of construction and demolition waste materials diverted shall be taken by weight or volume, but not by both.
 - 2. Waste Management Company: Utilize a waste management company that can provide verifiable documentation that the percentage of construction and demolition waste material diverted from the landfill complies with CALGreen.
 - 3. Waste Stream Reduction Alternative: The combined weight of new construction disposal that does not exceed two pounds per square foot of building area shall be deemed to meet the 65 percent minimum requirement as approved by the enforcing agency.

3.02 CONSTRUCTION IAQ MANAGEMENT

- A. Cover or close openings in ducts and other related air-distribution component openings with tape, plastic, sheet metal, or other approved method before beginning dust-producing operations and maintain until dust-producing operations are complete.

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- B. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period, install MERV 8 filter media according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
1. Replace all air filters immediately prior to occupancy.

END OF SECTION

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GENERAL COMMISSIONING

SECTION 01 91 00 GENERAL COMMISSIONING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.
- B. This section includes general and specific requirements that apply to the Commissioning Process (Cx) without regard to specific systems, assemblies, or components.
- C. Related Sections. Specific commissioning-related sections that may contain additional requirements specifying the relationship of general work provisions in conjunction with commissioning are:
 - 1. Division 23 Heating, Ventilating, and Air Conditioning (HVAC)
 - 2. Division 26 Electrical
- D. Additional documentation may be included by reference for information only.

1.2 SYSTEMS TO BE COMMISSIONED

- A. The following is an overview list of the major building systems that will be commissioned in this project:
 - 1. Mechanical Systems
 - a. Split System Air Conditioning Units
 - b. Exhaust Fans
 - c. HVAC distribution (Ductwork)
 - d. Building Automation Control System (BAS)
 - e. Associated operational components installed within the above systems
 - 2. Electrical Systems
 - a. Lighting Control System
 - b. Associated operational components installed within the above systems

1.3 ABBREVIATIONS / DEFINITIONS

- A. Abbreviations
 - 1. A/E: Architect / Engineer
 - 2. BoD: Basis of Design Documentation
 - 3. CC: Controls Contractor (Subcontractor)
 - 4. CM: Construction Manager
 - 5. Cx: Commissioning
 - 6. Cx Plan: Commissioning Plan
 - 7. CxM: CM/GC's Commissioning Manager

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8. CxP: Commissioning Provider or Commissioning Authority (Commissioning Authority often referred to as CxA; for purpose of this document, referred to as CxP)
9. CxS: Commissioning Specialist
10. EC: Electrical Contractor (Subcontractor)
11. EE: Electrical Engineer
12. EOR: Engineer of Record
13. FAT: Functional Acceptance Test
14. FWT: Factory Witness Test
15. GC: General Contractor (Prime)
16. MC: Mechanical Contractor (Subcontractor)
17. ME: Mechanical Engineer
18. OPR: Owner's Project Requirements
19. OR: Owner's Representative
20. PC: Plumbing Contractor (Subcontractor)
21. PFC: Pre-Functional Checklist
22. PM: Project Manager
23. PMS: Project Management Software
24. RE: Resident Engineer
25. Subs: Subcontractors to the General Contractor (Subcontractors)
26. TAB: Testing, Adjusting, and Balancing Contractor (Subcontractor)

B. Definitions

1. Acceptance Phase: The phase of construction after startup and initial checkout when functional acceptance tests, O&M documentation review and training occurs.
2. BoD: Basis of Design. A document produced by the design team that records concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements (OPR) and to satisfy applicable regulatory requirements, standards, and guidelines. The basis of design describes space use, redundancy, diversity, space zoning, occupancy, operations and space requirements. The document includes both narrative descriptions and lists of individual items that support the design process.
3. CxP: Commissioning Provider. An entity who leads, plans, schedules and coordinates the Cx team to implement the Cx process.
4. Commissioning: The basic purpose of building Cx is to provide documented confirmation that building systems function in compliance with criteria set forth in the project documents to satisfy the Owner's operational needs. The CM/GC shall be responsible for participation in the commissioning process as outlined below, and in references and attachments throughout the contract documents. Commissioning procedures will be written and coordinated by the Commissioning Provider (CxP).
5. Cx Plan: A living document that outlines the organization, schedule, allocation of resources, and documentation requirements (guidelines) of the Cx process.
6. CxS: An individual who works on a project to conduct commissioning on a specific technical area or system. Specialists shall be designated to commission systems for which specialized technical certification or licenses are required.

GENERAL COMMISSIONING

7. Final Commissioning Report: Includes the overall final Cx documents, prepared by the CxP, which details the actual Cx procedures performed, inspection and testing results, and the final version of the issues list indicating that all issues discovered through the Cx process have been verified as resolved or accepted. The report also includes key items for the maintenance staff such as fan and pump curves for the equipment furnished, marked with design and actual duty points.
8. Functional Acceptance Test (FAT): Functional Acceptance Testing is the process of verifying that a material, product, assembly, or system is properly installed and operates in accordance with design and manufacturer's specifications. Test includes operational and performance tests.
9. Integrated Testing: The goal of integrated testing is to verify that fire protection and life safety systems operate as designed and as required by codes and standards. Mechanical and electrical systems with interconnections to fire protection and/or fire alarm systems will be included in the testing.
10. Observation Issues Log (Deficiencies List): Includes a list of noted issues discovered as a result of the Cx process. This list also includes the current disposition of issues, and the date of final resolution as confirmed by the CxP. Issues are defined as those issues where products, execution or performance do not satisfy the specifications and/or the design intent.
11. Operational Test: Operational Testing is the process of verifying that a material, product, assembly, or system meets defined sequence of operation criteria. The methods and conditions under which operation is verified are described in one or more test protocols.
12. Owner Contracted Tests: Tests paid for by the Owner outside the GC's contract and for which the CxP does not oversee. These tests will not be repeated during functional tests if properly documented. E.G. Fire Marshall Demonstration tests etc.
13. Owner's Project Requirements (OPR): A written document that details the requirements of a project and the expectations of how it will be used and operated. This includes project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. (The term Project Intent or Design Intent is used by some Owners for their Commissioning Process Owner's Project Requirements.)
14. Performance Test: Performance Testing is the process of verifying that a material, product, assembly, or system meets defined performance criteria. The methods and conditions under which performance is verified are described in one or more test protocols.
15. Pre-Functional Checklists (PFC): Checklists are prepared by the CxP and completed by the installing Subcontractors. Checklist shall be by system and/or equipment for verification of system set points, operating strategies, required component testing, correct rotation, and damper positions prior to functional test. They include system specific tests such as pipe system pressure tests, chemical cleaning and flushing, duct leakage tests, mechanical system test and balance, and electrical equipment testing. These checklists shall verify that all systems and equipment are ready for continuous operation and final testing. This document shall incorporate manufacturers' start-up plan and system operational

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checkout. Requires final sign-off by the CM/GC prior to continuing with the Cx process. They must be completed before FATs commence.

16. Project Management Software: Computer Software to manage documents associated with the construction of the building. Access to the software is generally through the internet. Construction plans and specifications, submittals, information requests, clarifications, change orders, commissioning documents, O&M manuals, and closeout documents should be located here for access by all personnel associated with the project. Management of the PMS can be by the Owner, Architect, or CM/GC.
17. CFR/O&M: A living document assembled by the CxP with support from the commissioning team to document current facilities requirements and operations & maintenance plans that contain the information necessary to operate the building efficiently. This document included setpoints and schedules, maintenance requirements, continuous commissioning requirements, and systems narrative describing the commissioned systems with any seasonal or change adjustments needed for unusual situations.
18. Training Plan: A CxP written document that details the expectations, schedule, duration and deliverables of Commissioning Process activities related to training of project operating and maintenance personnel, users, and occupants.

1.4 THE COMMISSIONING TEAM

- A. Overview: The Cx Team will consist of all members needed to execute the approved Cx program. This includes at a minimum the CxP, the Owner's staff, the CM/GC and its Subcontractors, the architect, the mechanical engineer, and the electrical engineer.
- B. Members Appointed by CM/GC: Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the Cx process through coordinated action. These shall consist of, but not be limited to, representatives of CM/GC, including project superintendent and Subcontractors, installers, suppliers, and specialists deemed appropriate by the CxP. E.G TAB and DDC controls specialist.

1.5 SUBMITTALS

- A. Submittals to CxP
 1. All Contract Documents and associated documentation including changes to the drawings Architectural Supplemental Instructions, Request for Information, Change Requests, and Change Orders.
 2. Copies or access to all submittals made to A/E required by Contract Documents for Cx Divisions. Includes all transmittals, product data, shop drawings, coordination drawings, test reports, field reports, factory reports, installation instructions, training documentation, warranty forms, manufacturer start-up reports, certificates from manufacturer, close out documentation, information for Material Completion, as-built information, and operating and maintenance manuals.
 3. All submittals to and from the CxP will be electronic.

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4. Organize submittals into logical groupings, by specification Sections and Divisions.
5. Product Data: If submittals to A/E do not include the following, submit copies of information as soon as possible.
 - a. Manufacturer's product data, cut sheets, and shop drawings.
 - b. Manufacturer's installation instructions.
 - c. Startup, operating, and troubleshooting procedures.
 - d. Fan and pump curves (marked with design and actual duty points).
 - e. Factory test reports.
 - f. Warranty information.
6. Startup Plans, Procedures, and Reports.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform Subcontractor's pre-commissioning checklists, startup, and functional acceptance tests (FAT), shall be provided by the division Subcontractor for the equipment being tested.
- B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, to be provided according to these contract documents, shall be included in the base bid price to the CM/GC.
- C. All testing equipment shall be of sufficient quality and calibrated accuracy to test and/or measure system performance with the tolerances indicated in the specifications.

PART 3 EXECUTION

3.1 OVERVIEW OF THE DESIGN PHASE COMMISSIONING PROCESS

- A. Work with the Design Team to finalize system and equipment basis of design, per space use.
- B. Work with the Design Team to define system and equipment operating and performance characteristics.
- C. Work with the Design Team to define system and equipment acceptance criteria including agreed tolerances for pass fail criteria.
- D. Conduct a focused review of the design prior to construction documents completion, including system schematic single-line diagrams, mechanical schedules, systems sequence of operations, and equipment integration & interdependency plan.
- E. Conduct a focused review of the construction documents.

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3.2 OVERVIEW OF THE CONSTRUCTION PHASE COMMISSIONING PROCESS

- A. As soon as mobilization has occurred to the project site, the CxP will conduct a pre-installation Cx "kick-off" meeting with the CM/GC and Subcontractors. The CxP will explain the Cx process in detail and identify specific Cx-related responsibilities of the CM/GC and Subcontractors.
- B. Ongoing Cx status meetings will be scheduled to occur during the construction phase to monitor progress and to help facilitate the Cx process. CM/GC and Subcontractor representatives will be required to attend these meetings (normally tagged onto general progress site meetings).
- C. Once the CM/GC has provided the CxP with written verification indicating Subcontractor's pre-functional checklists have been completed, the CxP will conduct an on-site installation inspection of the specific systems and equipment.
- D. Verify the execution of Cx process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxP will report the failure in the issues and resolutions log.
- E. CxP will review preliminary TAB reports. Spot-check and witness the final TAB process. Approximately 10-15% of the TAB report will be randomly selected and verified by the CxP.
- F. Review DDC Point to Point Reports. Spot-check and/or witness the DDC Point by Point checks. Approximately 20-30% of the DDC points of the terminal units will be randomly selected and verified by the CxP.
- G. Upon confirmation of system readiness, the CxP will schedule with the CM/GC and Subcontractors to perform operational and performance tests to verify functional compliance with the specifications and design intent documents. The CxP will oversee the process and will provide the format and documentation for these tests.
- H. Issues noted during these tests will be documented on the issues and resolutions log. When easily corrected, issues will be resolved at the time of discovery. All other issues will be resolved by the responsible CM/GC and Subcontractor at a later time. All issues will be noted by the CxP as either resolved or pending resolution. When resolved, CM/GC and Subcontractor shall return communications to the CxP for "re-check".
- I. The construction phase Cx process will be complete when all noted issues have been corrected, proven to comply with the contract specifications or otherwise resolved to the satisfaction of the Owner.

3.3 COMMISSIONING PLAN

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- A. The Cx process is intended to enhance the quality of system start-up and aid in the orderly transfer of systems to the Owner's staff prior to beneficial occupancy. This process includes design review, submittal review, installation inspections, functional and operational testing, training evaluation, O&M manual review, and final documentation. The Commissioning Plan is intended to describe the details of the Cx process.
- B. The Commissioning Plan, prepared by the CxP, will:
 - 1. Include site specific descriptions and information.
 - 2. Identify Cx team roles, responsibilities, and deliverables.
 - 3. Define systems to be commissioned.
 - 4. List Cx-related specification sections for reference.
- C. CM/GC is responsible for compliance with the Commissioning Plan.
- D. Commissioning Scope. The scope of Cx is to verify building systems' performance and operation per the contract documents. Cx of this project is intended to:
 - 1. Verify through inspections that equipment and systems have been installed in accordance with the contract documents and manufacturer's written installation instructions.
 - 2. Inspect and verify that equipment has been installed and placed into operation with manufacturer's oversight and approval.
 - 3. Evaluate the results of operational and performance tests for each system and piece of equipment per acceptance criteria as defined in the contract documents.
 - 4. Review Subcontractor as-built/as-installed shop drawings, schematics, one-line diagrams, etc.
 - 5. Review O&M manuals.
 - 6. Inspect and verify the performance of each piece of equipment and its system, as described in the project documents.
 - 7. Test the interrelationship of systems and equipment to verify integrated performance and sequence of operation.
 - 8. Review Subcontractor training of the Owner personnel in the proper operation of equipment and systems. Evaluate training program and make recommendations to the Owner for approval or retraining requirements.
 - 9. Identify, document, and report, for tracking and correction, all issues of the work versus contract documents and performance requirements as it pertains to specific system commissioning.
 - 10. Make a recommendation to the Owner as to whether the systems should be accepted based on the results of the tests compared with the contract documents.

3.4 OWNER'S RESPONSIBILITIES

- A. Ensure the participation of Owner's chosen representatives as required to complete the Cx process.
- B. Provide the OPR documentation to the CxP, A/E, and GM/GC for information and use.

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- C. Assign O&M personnel and schedule them with the CxP to participate in Cx team activities.
- D. Ensure an on-line Project Management Software with a folder for commissioning documentation is specified and access is granted to all commissioning team members. Encourage reduced use of paper-based documentation.
- E. Will review, direct, and approve commissioning related tasks in relation to the requirements of the contract documents.
- F. Will provide direction to the Project Team for Cx issue resolution.
- G. Will review and comment on the submitted Commissioning Plan.
- H. Will review technical submittals and issue comments to the Architect / Engineer and/or approve.
- I. Will be invited for startup of equipment / systems to be commissioned, as appropriate.
- J. Ensure O&M personnel are available for scheduled training sessions.
- K. Will review and approve the Operation and Maintenance Documents.
- L. Attend Cx meetings as required to facilitate the Cx process.

3.5 ARCHITECT / ENGINEER'S RESPONSIBILITIES

- A. Review the Cx documentation and provide comments as necessary to the CxP and the Owner.
- B. Provide the Basis of Design documentation to the Owner.
- C. The architect shall ensure the participation of necessary representatives from the design team as required to complete the Cx process. Design team members will be expected to provide prompt replies to Cx review reports.
- D. Copies of all submittals, RFI's and ASI's pertaining to equipment to be commissioned shall be transmitted in parallel to the CxP for review and comment. Comments will be coordinated with the Design team prior to return to the GM/GC.
- E. Will review and approve the technical submittals, reviewing and incorporating all received review comments from the commissioning team as required. Will issue the Electrical Coordination sturdy report for field verification by specialists.
- F. Will perform equipment and system design verification walks prior to Construction Complete and report issues to the Architect for distribution to the Commissioning Team.

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- G. Will develop the design and specification sequence of operations and Fire Life Safety cause and effect matrix.
- H. Participate in determination of final controls system input/output points list and sequences of operation as required to complete functional test procedures with the Owner's representative, CxP, and controls Subcontractor.
- I. Attend Cx meetings as required to facilitate the Cx process.
- J. Will assist in resolution of commissioning related issues.
- K. Will review and approve the preliminary & final TAB reports and Functional Acceptance Test records.
- L. Will review and approve the Operation & Maintenance Documents.

3.6 COMMISSIONING PROVIDER'S RESPONSIBILITIES

- A. Organize and lead the Cx team.
- B. Coordinate Cx meetings as necessary to facilitate the Cx process, assist the CM/GC in maintaining the project Cx schedule, and resolve identified issues. Provide meeting notes to Cx team for review and comment.
- C. Review OPR and BoD as related to the equipment and systems being commissioned.
- D. Provide and implement Cx Plan with list of commissioned equipment and systems.
- E. Review Cx-related specifications, submittals, and construction documents related to equipment and systems to be commissioned. Communicate noted issues and concerns to the A/E, Owner and/or Owner's representative.
- F. Review and approve training curriculum as developed by the Subcontractor(s). Will observe and report regarding the adequacy of training.
- G. Develop detailed and specific operational and performance procedures for the functional acceptance test plans for equipment and systems to be commissioned.
- H. Review TAB specifications, TAB plan and balancing reports. Provide comments to A/E and Owner.
- I. Review and comment on the mechanical flushing and chemical cleaning procedures and methods.
- J. Review DDC specifications, DDC points list, plan and reports. All written sequences will be functionally tested and demonstrated to the CxP by the controls Subcontractor.
- K. Perform regular and key site inspections and verify Subcontractor readiness for the operational and functional testing process. Document issues for future resolution.

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- L. Verify the execution of Cx process activities using random sampling, where appropriate. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, FAT and Integrated tests, and test reports to verify compliance with the OPR.
- M. Prepare and maintain the Cx observation issues log.
- N. Prepare and maintain completed construction equipment list matrix.
- O. Will assist the CM/GC with scheduling and tracking statuses of commissioning activities. Will review master schedule to identify that sufficient commissioning activities are incorporated, and durations are adequate to fully commissioning the project. Will monitor and coordinate with CM/GC regularly on TAB and DDC progress leading up to Cx FATs, in an effort to assist in maintaining schedule for final testing activities.
- P. Will witness hydronic and non-hydronic pipe system flushing and cleaning activities, when possible.
- Q. Will witness Subcontractor-performed systems, assemblies, equipment, and component startup, when possible.
- R. Will provide Pre-Functional Checklists (PFCs) for completion, submission, and execution by the CM/GC and their Subcontractors.
- S. Verify all documentation from the Subcontractor's pre-functional test forms: building flush-out verification, pressure tests, pipework flushing and chemical cleaning, testing and balancing data, pre-functional checklist, installation checklist, operational checklist, functional acceptance testing, Cx issues list, and any other forms used to document the commissioning process has been uploaded into the Project Management Software's commissioning module.
- T. Will lead and execute the Functional Acceptance Tests and Integrated Systems Testing per the CxP provided FAT procedures for the equipment and systems to be commissioned with Subcontractor/vendor support where needed. Functional Acceptance Testing will not commence until the systems are construction complete, the system documentation has been submitted, the control program has been loaded and de-bugged, and the TAB report has been submitted to the Engineer of Record for approval.
- U. Will coordinate with Owner's O&M staff to witness FATs, as appropriate.
- V. Review the closeout documentation with the mechanical and electrical engineers and prepare the agenda of items to be clarified or tested to complete the commissioning process for the Owner's acceptance of the systems.
- W. When all items of commissioning have been successfully completed, recommend acceptance to the Owner.

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- X. Provide the Owner with a final Cx report to document the Cx process and to verify that the Cx process has been completed. Report shall be provided in the Owner's required format for the Owner's project record.
- Y. Compile test data, inspection reports, and certificates; include them in the current facilities requirements and operations & maintenance plan (CFR/O&M) when manual is required.

3.7 CM/GC AND CONSTRUCTORS' RESPONSIBILITIES

- A. CM/GC, all Subcontractors, and all specialist contractors shall assign representatives with expertise and authority to act on its behalf and shall ensure that they are familiar with all requirements noted in this section. All parties shall execute all Cx responsibilities assigned to them in the contract documents. CM/GC, all Subcontractors, and all specialist contractors must schedule time for, participate in, and perform Cx process activities including, but not limited to, the following:
 - 1. In each purchase order or subcontract written, include requirements for submittal data, Cx documentation, O&M data and training.
 - 2. Attend Cx meetings, to include a Cx scoping kick off meeting and other meetings, as required to facilitate the Cx process.
 - 3. Review the Cx Plan, Cx milestone schedule, and functional test procedures. Provide the input required to develop final test plans and procedures.
 - 4. Integrate and coordinate Cx process, Cx milestones and testing activities with construction schedule with assistance from the CxP. The schedule is to identify, among other milestones, the completion of all Subcontractor pre-commissioning checklists, preliminary TAB report, DDC points verification, system startup, operational and functional acceptance testing, initiation and completion of the performance period indicated in the specification, and training for the systems specified. The performance period is to be coordinated with any required building purge or occupancy move-in schedules required by the Owner. The initial schedule shall identify the pertinent Cx milestones as outlined above.
 - 5. Notify CxP of all activities defined in Contract Documents that require CxP attendance.
 - 6. CM/GC, all Subcontractors, and all specialist contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures. A Controls Sequence meeting will be organized early in the project prior to rough-in completion of MEP equipment.
 - 7. Upload to the Project Management Software normal cut sheets, shop drawings, RFIs, ASIs, and approved change orders and equipment submittals of commissioned equipment. Notify by email their availability to the commissioning team.
 - 8. Coordinate installation of mechanical and electrical systems and equipment with equipment suppliers, mechanical, controls, and electrical Subcontractors. Verify that coordination, installation, quality control, and final specialist testing have been completed such that installed systems and equipment comply with construction documents.

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9. Will confirm availability and provision of qualified personnel, tools, equipment, ladders and lifts to support the commissioning process.
10. Will provide the Owner, A/E, and CxP written email notification that individual onsite commissioning activities are planned to take place. The Owner, A/E, and CxP require seven (7) days' notice of all commissioning related witnessing activities.
11. Provide assistance to the CxP, as necessary, in preparing the specific functional acceptance test procedures as specified herein. The CM/GC, all Subcontractors, and all specialist contractors shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
12. Review and accept construction pre-functional checklists provided by the CxP or Subcontractors.
13. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and complete the construction pre-functional checklists for all commissioned equipment.
14. Provide skilled technicians to execute starting of equipment, and to execute the functional acceptance tests, as required by the CxP, typically following the manufacturers' approved procedures. The CxP shall develop the test procedures and orchestrate the execution of the functional testing procedures with assistance from the Subcontractors and vendors. These procedures shall be reviewed and approved by the design team, the CM/GC, and the Owner prior to execution. Ensure that skilled technicians are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving. The Cx procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the CxP or Owner.
15. Follow proper LOTO (Lock Out Tag Out) procedures and confirm all Safety Trips are operational prior to initial energization.
16. Schedule and execute installation, pre-commissioning, testing, and commissioning of the control system such that systems are operable and checked out prior to commencement of the test and balance activities.
17. Participate in fine-tuning or troubleshooting of system performance if either of these measures becomes necessary.
18. Participate in an integrated whole building test under emergency power. This test is initiated by disconnecting the utility power to the building (or by simulation), and it will involve multiple disciplines. All Subcontractors shall participate in the FATs as required for operation of the inter-related systems on emergency power.
19. Retain all documentation from the Subcontractors and upload into the Project Management Software's commissioning module, including manufacturers' information and cut sheets, installation checklists, test sheets, pre-functional checklists, system readiness checklists, manufacturers' startup forms, flush-out verification, pressure tests, electrical tests, coordination study and safety trip settings, testing and balancing data (TAB), Functional Acceptance Tests (FAT), recorded performance data, record of equipment operational settings and any other reports (in electronic format) used to document the commissioning process.

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20. Evaluate performance issues identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend any corrective action.
 21. Notify the CxP and CxM as soon as possible of any issues identified during construction that may affect the construction schedule, Cx process, or final system performance.
 22. Correct issues (differences between specified and observed performance) as interpreted by the CxP, CM/GC and A/E and retest the equipment.
 23. Address current A/E punch list and CxP observation issues log items, prior to start of the functional testing. DDC Points list and sufficient programming to allow Air and Water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
 24. Cooperate with the CxP for resolution of issues recorded in the Cx observation issues log.
 25. Provide complete O&M manuals according to the contract documents, including clarifying and updating the original sequences of operation to as-built conditions. Upload electronic copies of O&M manuals into the Project Management Software. O&M's will be issued in sufficient time for them to be reviewed, approved, and used during owner staff training.
 26. Will coordinate with CxP to collate final commissioning documentation, in electronic format (pdf files) for issue to the Owner's O&M staff and A/E design team for approval and inclusion in the Final Commissioning Report.
 27. Complete and/or verify that the Subcontractors complete the Cx process test procedures.
 28. CM/GC and Subcontractors shall comply with all training requirements as noted in the specifications and shall coordinate training with the CxP.
 - a. CxP Training plan and Subcontractor agendas must be submitted to the Owner for approval at least two weeks in advance of the scheduled trainings. Training shall not be performed until the Cx functional acceptance test process is 100% complete and the training plan and agenda have been approved by the Owner and CxP.
 - b. Provide training using expert qualified personnel.
 29. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
 30. Obtain agreements from manufacturers and vendors for the equipment warranties to start when equipment is accepted by the Owner.
 31. Execute seasonal or deferred functional acceptance testing, witnessed by the CxP, according to the specifications.
 32. Make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.
 33. Specific detailed responsibilities associated with Subcontractors, specialist contractors; i.e. mechanical, electrical, controls, flushing and TAB Subcontractors, are detailed in Part 3, "Execution" of this section.
- B. CxM; The CM/GC will have a person designated as their commissioning manager who will be responsible for day-to-day oversight of the CM/GC and Subcontractors commissioning requirements.

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1. The CxM will hold regular meetings with CM/GC and Subcontractors to continuously refine the project schedule for commissioning activities and publish metrics showing current progress towards final completion.
 2. The CxM or CM/GC field superintendent witnesses all tests for building systems, mechanical and electrical and verifies they are performing within design parameters.
 3. It is required that the CxM sign off all Pre-Functional Checklist commissioning forms on behalf of the CM/GC as required for all equipment.
 4. The CxM must meet on a regular basis with Subcontractors as required to verify that identified deficiencies are repaired.
 5. The CxM must meet on a regular basis with CxP and Design consultants to update as to actual site conditions.
- C. HVAC Mechanical Subcontractor. The Cx responsibilities of the HVAC Mechanical Subcontractor(s) in addition to those listed in 3.8.A are:
1. Test Plans:
 - a. Where duct leakage testing is required, submit a Duct Leakage Test Plan to the A/E and CxP two weeks in advance of conducting any duct leakage tests.
 - 1) Floor plan drawings showing the duct section to be tested.
 - 2) The total duct square footage for the duct section to be tested. Provide supporting calculation showing how the square footage was calculated.
 - 3) The duct pressure class and the SMACNA duct "leakage" class per the SMACNA Duct Leakage Test Manual.
 - 4) The intended test static pressure and the corresponding allowable leakage rate (cfm) per the SMACNA Duct Leakage Test Manual.
 - 5) Test fan orifice certificate of calibration sheet and chart showing the orifice pressure drop and airflow (cfm).
 - b. Submit a Hydronic Pipe Hydrostatic Pressure Test Plan to the A/E and CxP for all applicable systems two weeks in advance of conducting any required tests.
 - c. Submit a Hydronic, Flush, clean and Treat Plan to the A/E and CxP for all applicable systems two weeks in advance of filling, flushing, and cleaning any hydronic systems.
 - 1) The intended minimum durations for all pipe flushing and cleaning, and the associated cleaning agents and corrosion inhibitors to be used.
 - 2) An outline of the chemical treatment and water analysis testing to be performed after flushing and cleaning, including any additional chemicals and biocides to be added as part of the final water treatment, the water chemistry analysis and corrosion testing to be conducted, and the intended final water chemistry limits / ranges (including steel, iron and copper levels) to be achieved in order to meet the specifications and any specific manufacturer requirements.
 - 3) The Plan shall indicate the timing for submitting the Water Treatment Analysis Reports for review by the Engineer of Record, Owner and CxP.

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- d. Submit a Flush and clean Plan to the A/E and CxP for all applicable non-hydronic systems two weeks in advance of flushing and cleaning.
 - 1) The intended minimum durations for all pipe flushing and cleaning, and methodology.
2. Pre-Acceptance Checklists
 - a. Division 23 contractor(s) will document installation, pressure testing, inspection, and startup of their systems, equipment, and components.
 - b. The following documents will be uploaded by the Subcontractor to the commissioning folder in the Project's document management website for inclusion into the CFR/O&M:
 - 1) As-built plans and Final Test Records
 - 2) Pressure Test Documentation. If not a whole system test, then include marked up plan views of the section(s) tested.
 - 3) Manufacturer installation and startup checklists
 - 4) Variable Frequency Drive startup/programming reports
 - 5) Flushing and Chemical Treatment reports
 - 6) Combustion efficiency reports
 - 7) As-built valve charts
 - 8) DDC final SOO and point to point checklists
 - 9) Test and Balance reports. Fan and pump curves shall be marked with design and actual duty points, balance sheet shall include actual flows, volumes, and pressures expressed as a percentage (%) against design values.
 - 10) Chiller and fan operational noise level reports.
 - 11) AHJ progress and final inspections
3. Functional Acceptance of HVAC
 - a. Functional Acceptance of HVAC will be based upon the operational and performance tests of the systems, equipment, and components by the CxP and final AHJ inspection approval of systems.
 - b. HVAC Subcontractor(s) to have a qualified person on call during FAT to help troubleshoot issues as needed.
 - c. HVAC Subcontractor(s) to have qualified person(s) on call during Integrated Systems Testing for demonstration of emergency power systems.
 - d. Operate equipment and systems as required for operational and functional acceptance testing. Dry Mechanical Subcontractor to uncover all fire and/or smoke dampers for CxP testing and AHJ acceptance inspection. The Mechanical Subcontractor shall have ladder and any necessary tools for opening access doors to fire and/or smoke dampers for visual inspection.
4. Perform start-up and testing of mechanical equipment and systems and document as required with start-up reports and completion of Subcontractor's pre-commissioning checklists submitted to the CxP.
5. Perform and record manufacturers' recommended equipment maintenance as a minimum during the period between delivery, installation, start-up, and Owner Acceptance.
6. Provide complete operation and maintenance information, single line schematics and as-built drawings to the CM/GC for verification, organization, and distribution.

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- D. Controls Subcontractor. The Cx responsibilities of the controls Subcontractor(s) in addition to those listed in 3.8.A are:
1. Complete Subcontractor pre-functional checklist and other supporting documentation as required demonstrating completion of control system installation, point-to-point verification (including sensor calibration), controller communication, start-up and testing, and to the Commissioning folder in the Project Management Software.
 2. Participate in pre-functional testing of mechanical equipment. Place specific systems as directed by Cx Team into test modes for pre-commissioning and startup.
 3. Assist and cooperate with the TAB Subcontractor in the following manner:
 - a. Meet with the TAB Subcontractor minimum 4 weeks prior to beginning TAB and review the TAB plan to determine the capabilities of the control system operational modes toward completing TAB.
 - b. Provide a qualified technician to operate the controls to assist the TAB Subcontractor in performing TAB or provide sufficient training for the TAB Technician to operate the mechanical systems without assistance.
 - c. Provide (loan) any necessary control interface tool to the TAB Technician to allow them to make temporary equipment adjustments.
 4. Assist and cooperate with the CxP in the following manner:
 - a. Provide a skilled technician to execute and assist in performance of the functional acceptance testing procedures of the controls system. This will require dedicated support during testing. Assist in the functional testing of all equipment specified and written sequence of operations in this section.
 - b. Provide and set up control system trend logs and metering for the points as directed by the CxP. Trended points include those required for M&V.
 - c. Final graphics to be complete, reviewed, and ready for loading prior to functional testing.
 5. Participate in fine-tuning or troubleshooting P&ID control loops of system sequence of operation performance if either of these measures becomes necessary.
 6. Provide the CxP and CM/GC with final documentation for all installed conditions, including as-built drawings and final detailed narrative sequences of operation and a final as-built control programming record as determined during the Cx process.
- E. TAB Subcontractor. The Cx responsibilities of the TAB Subcontractor(s) in addition to those listed in 3.8.A are:
1. Test Plan:
 - a. Provide a TAB Plan that outlines the TAB procedures and approach for each system type that satisfies the requirements of NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems Section 7.3 (Preliminary TAB Procedures) and/or AABC National Standards Section 20.4 (Procedures).
 - 1) TAB Plan shall also include the associated forms and drawings to be used in the TAB work, and the forms shall be pre-filled with all available project, site, and design parameters.

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- 2) The TAB Plan shall include any TAB qualification certificates and TAB instrument calibration certificates.
 - 3) The TAB Subcontractor shall submit the TAB Plan and certificates to the A/E and CxP for review two (2) weeks minimum prior to the start of balancing, in addition to any other submittal requirements per the specifications. Electronic files are acceptable.
 2. Coordinate balancing activities with those of the mechanical and controls Subcontractors. Document through pre-balancing checklists; that coordination, installation, flushing process, quality control, and final Subcontractor testing have been completed to allow proper balancing work to be performed. Upload completed checklists to the commissioning folder in the Project Management Software.
 3. Notify the CM/GC, CxP, and A/E within 24 hours of any system installation or performance issues that may compromise the ability of the system to be balanced or operate at design capacities.
 4. Participate in start-up and testing as required by the CM/GC and Subcontractors.
 5. Return all control points to automatic or as found values at the end of each day unless specific permission is obtained in writing from the CM/GC, Mechanical and Control Subcontractors.
 6. Provide preliminary TAB report, indicating all actual field values recorded and a percentage (%) against design values, to the CM/GC, CxP, and Engineer, prior to initiation of operational and functional testing, and highlighting any variations in actual volumes and static pressures -5% or +10% from design parameters. A preliminary TAB report shall be submitted within seven (7) working days after completion of the balancing work. If job conditions require the TAB work be divided by logical systems, the preliminary TAB report will be submitted in logical sections within seven (7) working days after completion of the balancing work on each system. Mark and permanently record all field regulating devices in the final balanced position (or minimum outside air for AHU dampers), for readily identifiable resetting mode if needed. Include marked-up plans showing openings with corresponding numbering from the report.
 7. Record design and actual duty points of all fans and pump on manufacturers performance curves for CxP & ME review and approval. Include in preliminary TAB report.
 8. Provide a separate submittal record of DDC values and setpoints determined during the TAB of the systems for use by the DDC Subcontractor to "lock in" the numbers and update their as-built drawings.
 9. Coordinate with CxP and demonstrate a 10 – 15% verification of selected systems balance sheet readings, to be identified by the CxP.
 10. Assist during the operational and functional testing as required.
 11. Participate in fine-tuning or troubleshooting of system performance if either of these measures becomes necessary.
- F. Electrical Subcontractor. The Cx responsibilities of the electrical Subcontractor(s) in addition to those listed in 3.8.A are (all references apply to commissioned equipment only):
1. Pre-Acceptance Checklists

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- a. Division 26 contractor(s) will document installation, component testing, inspection, and startup of their systems, equipment, and components.
- b. The following documents will be uploaded by the Subcontractor to the commissioning folder in the Project's document management website for inclusion into the CFR/O&M:
 - 1) As-built plans
 - 2) Circuit Breaker test reports
 - 3) Manufacturer installation and startup checklists
 - 4) Variable Frequency Drive startup/programming reports
 - 5) Breaker Coordination Study
 - 6) Complete and document the discrimination trip settings in conjunction with the Electrical Engineer of all breakers, fuses and safety trips prior to the commissioning functional acceptance testing
 - 7) Cabling test reports
 - 8) Programmed sequences of operation
 - 9) Lighting and emergency light level test records
 - 10) Generator noise transmission decibel levels
 - 11) Fire Alarm decibel levels and cause and effect matrix
 - 12) AHJ progress and final inspections
2. Functional Acceptance of Electrical Systems
 - a. Functional Acceptance of Electrical Systems will be based upon the operational and performance tests of the systems, equipment, and components by the CxP and final AHJ inspection approval of systems.
 - b. Electrical Subcontractor to have sufficient fuel levels and a qualified person(s) available during integrated systems testing for demonstration of emergency power systems.
 - c. Operate equipment and systems as required for functional acceptance testing. Provide and set up electrical system trend logs for the points as directed by the CxP (power monitoring and lighting controls).
3. Perform start-up and testing of electrical equipment and systems and document as required with start-up reports and completion of Subcontractor's pre-commissioning checklists submitted to the CxP.
4. Provide complete operation and maintenance information, as-built distribution board charts and as-built drawings to the CM/GC for verification, organization and distribution.

3.8 NOTIFICATION OF SYSTEM COMPLETION AND REQUEST FOR FINAL SYSTEM AND EQUIPMENT START-UP AND CX VERIFICATION

- A. Two weeks prior to the beginning of start-up or test activities, the CM/GC shall provide a detailed look-ahead schedule. This schedule shall be reviewed and updated weekly for the Cx Team progress meetings and shall provide information to include date, time, beginning location, and anticipated duration of each start-up or test activity. CM/GC shall notify the CxP in writing at least 72 hours of any changes to this schedule. The CxP will witness the equipment start-up by the manufacturer's representative per the specifications.

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- B. When systems are ready for operational and performance verification testing, Subcontractor will verify all pre-functional testing documents have been uploaded and then shall notify the CxP, in writing, at least 72 hours in advance.
- C. Should the verification test for systems and equipment reveal that the equipment is not performing as specified or control operation is not acceptable; the Subcontractor may be entitled to one re-inspection of any failed item at no additional cost.
- D. The Subcontractor shall be liable for costs incurred by the engineers of record, CxP, the Owner staff and others if the second system or equipment verification test does not meet specification or design intent.

3.9 PRE-FUNCTIONAL CHECKLISTS

- A. Pre-functional checking includes verification of proper installation and start-up for each piece of equipment and system. Pre-functional checking is required to establish that the equipment and systems are installed and operational so the functional acceptance testing can proceed without unnecessary delays. Pre-functional checklists and start-up testing must be completed prior to functional testing of equipment and systems.
- B. Pre-functional checklists are provided by the CxP and performed/completed by the Subcontractors. If a Subcontractor prefers to utilize their own pre-functional checklists (for internal QA/QC or compulsory reasons), the CxP can assist by reviewing the forms. The forms at a minimum must include the following:
 - 1. Design and submittal data verification.
 - 2. Installation verification.
 - 3. Operational verification.
 - 4. Functional verification.
 - 5. Signoff by CxM and Subcontractor.
- C. The CxP will verify that the Subcontractor has completed the PFCs and will sample the installation to check readiness for Functional Acceptance Testing. Each PFC must be signed by Subcontractor attesting to the equipment or system's readiness for Functional Acceptance Testing.
- D. PFCs will be completed for all commissioned equipment and systems. Sampling is not acceptable.
- E. Manufacturer's start-up documentation will be included as part of the pre-functional checking.
- F. The Subcontractor individuals that sign the PFCs and checklists must have direct knowledge and have witnessed that the line-item task on the pre-functional checklist was actually performed. It is not acceptable for supervisors to fill out these forms unless they have actually observed the installation and witnessed the tests.
- G. Subcontractor PFCs, that match the rigor, clarity and intent of all the commissioning specifications, may be substituted for CxP forms if approved by CxP.

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3.10 VERIFICATION OF OPERATION and PERFORMANCE

- A. Functional Acceptance Testing is the dynamic testing of material, equipment and systems to demonstrate performance and operation in accordance with commissioning objectives.
- B. Verification of operation and performance will take place after formal notice from the Subcontractor that the pre-commissioning checklists have been signed-off.
- C. Each functional acceptance test will be performed under conditions that simulate actual conditions as close as practically possible. The CM/GC and Subcontractor will provide all necessary materials and system modifications to produce the necessary flows, pressures, temperatures necessary to execute the test according to the specified conditions. At completion of the test, the CM/GC and Subcontractor will return all affected building equipment and systems to their normal pre-test condition.
- D. The CxP will direct, witness and document the functional testing. Performance demonstration will be done by the systems and equipment trade representatives and shall be witnessed by the CxP.
- E. Verification will include demonstration of performance listed in the functional test plan test script data sheets. This may involve trend logging and analysis.
- F. The specified, submitted and other data will be entered on the equipment test script data sheets prior to the verification.
- G. The witnessed performance data will be added to the test script data sheet at the time of verification.
- H. Notify the CxP and CM/GC as soon as possible of any issues identified during construction that may affect the Cx process or final system performance.
- I. Process the CxP's observation issues list to the appropriate parties for timely resolution and notify the CxP for recheck.

3.11 TRAINING OF THE OWNER'S STAFF

A. General

- 1. The Owner's personnel shall be given comprehensive training in the understanding of the systems and the operation, maintenance, and repair of each major piece of equipment and system per the CxP and Owner's FM team approved agenda and curriculum.
- 2. Training session agendas will be provided to the CxP one week prior to the scheduled date of training.
- 3. The CM/GC, in cooperation with the CxP, will be responsible for scheduling the training. Classroom training session(s) may be provided as part of the training requirements.
- 4. The CM/GC or their Subcontractor representative shall conduct all sessions and shall add to each session any special information relating to the details of

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- installation of the equipment as it might impact the operation, maintenance, and repair.
5. Training shall occur after functional acceptance testing is complete, unless approved otherwise by the Owner's representative.
 6. Training shall include:
 - a. Subcontractor overview of systems' normal and emergency operations. The CxP will assist as needed.
 - b. Reference to installation, O&M instruction material included in the O&M manuals.
 - c. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions.
 - d. Discussion of relevant health and safety issues and concerns.
 - e. Discussion of warranties and guarantees.
 - f. Common troubleshooting problems and solutions.
 - g. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
 - h. Discussion of any peculiarities of equipment installation or operation.
 - i. Hands-on training shall include start-up, operation in all modes possible, including manual, shutdown and any emergency procedures and preventative maintenance for all pieces of equipment.
 - j. The Subcontractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system. The CxP will assist as needed.

3.12 COMMISSIONING ACCEPTANCE CRITERIA

- A. The project acceptance criteria will be developed from the plans, specifications, and equipment manufacturer's operating criteria. The CM/GC and Subcontractors are responsible for meeting contractual requirements found in the plans and specifications. The GM/GC is reminded of their responsibility for furnishing a working system. All items in the issues and resolutions log need to be corrected per the plans and specifications.

3.13 REPORT REQUIREMENTS

- A. The CxP will submit a final report to the Owner which includes a statement that the project meets the Owner's design intent and includes a narrative of the results of the completed inspections, operational and functional testing. The final report will also include an outline of the issues and resolutions log and dates identifying items were found and dates those items were corrected. All open items will be identified in the report. The CFR/O&M will include the final report along with technical data from the equipment as well as all test results and completed FAT test scripts, manufacturer's start-up sheets, and testing, adjusting, & balancing (TAB) reports when possible. The CxP will upload the report into the Project Management Software.

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- B. At the conclusion of the commissioning process and after the final summary has been completed, the CxP will formally recommend system and equipment performance acceptance to the design engineer and the Owner's Representative.
- C. The Final Commissioning Report will include:
 - 1. Executive Summary
 - 2. Commissioning Plan
 - 3. Design Reviews
 - 4. Submittal Reviews
 - 5. Commissioning Meeting Minutes
 - 6. Site Observation Reports
 - 7. Observation Log
 - 8. Training Records
 - 9. O&M and As-built Reviews
- D. The Current Facilities Requirements and Operations & Maintenance (CFR/O&M) report will include:
 - 1. Executive Summary
 - 2. Owner's Project Requirements
 - 3. Basis of Design
 - 4. Pre-Functional Checklists
 - 5. Start-up Forms, Pressure Tests
 - 6. Test, Adjust, and Balance (TAB) Report
 - 7. Functional Acceptance Tests
 - 8. Re-Commissioning Forms (blank, for future use by operations staff)
 - 9. Trend Reviews
 - 10. As-built Control Drawings and Sequences of Operation, including set points and schedules (as-built programming)

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SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.

1.02 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.03 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for dust control and , for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

1.04 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.

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- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.05 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.06 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

3.03 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

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2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 sustainable design requirements Section(s).

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3.05 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction. and recycle or dispose of them according to Division 01 sustainable design requirements Section(s).
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

3.06 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

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SECTION 03 30 53 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.

1.03 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Comply with ACI 301.
- C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 - PRODUCTS

2.01 FORMWORK

- A. Furnish formwork and formwork accessories according to ACI 301.
- B. Acceptable Materials:
 - 1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. APA HDO (high-density overlay).
 - b. APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
 - c. APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
 - d. APA Plyform Class I, B-B or better; mill oiled and edge sealed.

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

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- B. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.03 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I .
- B. Normal-Weight Aggregate: ASTM C 33, graded, 1-1/2-inch nominal maximum aggregate size.
- C. Water: ASTM C 94/C 94M.

2.04 ADMIXTURES

- A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.05 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

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- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.06 MISCELLANEOUS MATERIALS

- A. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - 2. Form release agent for form liners shall be acceptable to form liner manufacturer.

2.07 CONCRETE MIXTURES

- A. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:
 - 1. Minimum Compressive Strength: 3500 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.50.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.

2.08 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - 1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.02 STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

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3.03 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Contraction Joints in Slabs-on-Grade: Form weakened-plane grooved or sawed contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness.
- C. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

3.04 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment.

3.05 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
 - 1. Do not further disturb surfaces before starting finishing operations.
- C. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish.
- D. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces.

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3.06 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.07 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301.
 - 1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - 2. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

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3.08 REPAIRS

- A. Remove and replace concrete that does not comply with requirements in this Section.

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SECTION 06 10 00 ROUGH CARPENTRY

PART I – GENERAL

1.1 Description Of Work

A. Work Included:

1. Wood framing and sheathing systems.
2. Wood furring, blocking and nailers.
3. Backing for wall mounted equipment, railings, toilet partitions, toilet accessories, etc.
4. Rough hardware, including tie-downs, post caps, etc.
5. Acoustical sealant, where indicated, at wood plates and plywood.
6. Prefabricated wood products

1.2 Applicable Standards (latest editions apply)

A. AITC- American Institute of Timber Construction Standards

1. 110 – Standard Appearance Grades for Structural Glued Laminated Timber.
2. 111 – Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection.
3. 113 – Standard for Dimensions of Glued Laminated Structural Members.
4. 115 – Standard for Fabricated Structural Timber
5. 103 – Standard for Structural Glued Laminated Timber

B. ANSI- American National Standards Institute

1. ANSI/AITC A190.1 Structural Glued Laminated Timber
2. ANSI/ASME B18.2.1 Square and Hex Bolts and Screws (Inch Series)
3. ANSI/ASME B18.6.1 Wood Screws (Inch Series)

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- C. APA- American Plywood Association Product Standard PS 1.
- D. ASTM- American Society for Testing and Materials: D05055-90, Establishing and monitoring Structural Capacities of Prefabricated Wood I Joists.
- E. AWWPA- American Wood Preservers Association Standard, U1
- F. ICC- International Code Council, Inc.
 - 1. CBC- California Building Code, 2022 Edition
- H. FS- Federal Specifications
- I. TPI- Truss Plate Institute: Design Specification for Metal Plate Connected Wood Trusses.
- J. WCLIB- West Coast Lumber Inspection Bureau, Grading Rule No. 17

1.3 Submittals

- A. Shop drawings of glued laminated beams plus AITC or equal certificate of conformance with product standard ANSI/AITC 190.1
- B. Shop drawings of prefabricated wood I joists including:
 - 1. Plan layout of members and bridging, design loads and installation instructions.
 - 2. Details of member connections, stiffeners, blocking and web openings.
 - 3. Structural calculations stamped and signed by California Registered Civil Engineer.
- C. Product information for rough hardware.

1.4 Store lumber and plywood off ground in manner to ensure proper ventilation and protection from weather; and to prevent damage by either decay or insects. Store plywood under cover and cover lumber as required to avoid twisting and warping.

1.5 Coordinate work of this Section with work by others. Check lines and levels indicated on such other work as has been completed, before commencing work of this Section. Report discrepancies in writing to the Owner for correction and adjustment, or in the event of failure to do so, correct errors without additional cost to the Owner.

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- 1.6 Install temporary bracing as required. Make proper provision to take care of stresses resulting from construction loads, whenever piles of materials, erection equipment or other loads are carried by frame during its erection.

PART II – PRODUCTS

- 2.1 Wood: Materials shall conform to grades and grading rules as hereinafter specified. Each piece of lumber and plywood shall be grade-stamped or certified by a competent agency approved by the Owner.

A. Plywood:

1. Roof Sheathing: Structural 1, 15/32" APA Rated, 24/0, Exposure I; 5 ply, min.
2. Wall Sheathing: Structural 1, 15/32" APA C-C, Interior with exterior glue; 5 ply, min.
3. Floor Sheathing: Structural 1, 3/4" APA Rated 48/24 Exposure 1; 5 ply, min.

B. Framing Lumber: Douglas Fir – Larch conforming to "WCLIB Standard Grading and Dressing Rules No. 17" as follows:

1. Structural Light Framing: 2" to 4" thick 2" to 6" wide D.F. No. 1
2. Structural Joists & Planks: 2" to 4" thick, 6" and wider D.F. No. 1 or better
3. Beams & Stringers: 5" and thicker, Rectangular width more than 2" greater than thickness D.F. No. 1, free of heart centers
4. Posts & Timbers: 5" x 5" and larger, width not more than 2" greater than thickness D.F. No. 1 free of heart centers
5. Sills: Pressure treated D.F. No. 1, Stamped in compliance with CBC 2303.1.9, Ammoniacal Copper Quat (ACQ), Copper Boron Azole (CBA) or Borate Treated AWPA Standard C2, minimum 4/10" penetration, incised

C. Glued Laminated Timber

1. Lumber; Douglas Fir (Laminating Grades), Grade Combination No. A ($F_B = 2,400$ psi) graded in accordance with the Standard Grading and Dressing Rules of WCLIB.
2. Glues: Exterior type adhesive conforming to ASTM D2559, resin adhesive of phenol, or melamine base applied in accordance with the manufacturer's recommendation.

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3. Fabrication shall comply with the Standards established by the American Institute of Timber Construction, (AITC 103, 110, 113, 115 and ANSI / A190.1)
 4. Provide extra length of at least six (6) inches at each end for field trim of all members, or verify field dimensions prior to fabrication of members to ensure proper fit.
 5. Glu-lam beam fabrication shall be continuously inspected by a DSA certified inspector per 1705A.5.4 of the CBC, where required.
- D. Prefabricated Wood I-joists: Red-I Joist by RedBuilt or an approved equal manufacturer. Fabrication of I-joists to take place under the supervision of an independent inspection agency.
1. Flanges: Continuous Laminated Veneer Lumber (LVL) proof loaded per ANSI A-190.1, moisture content not to exceed 15 percent; $F_t = 2000$ psi, $E = 2.0 \times 10^6$ psi.
 2. Webs: CD Structural I plywood with exterior glue, grade marked by APA, in accordance with Product Standard PS1-09 or other recognized equal which complies with APA standards as substantiated by performance verification data and verified by an independent testing agency.
 3. Adhesive: adhesives shall comply with ASTM D2559
 4. Metal Bridging: Metal bridging shall be 20 gauge "TB-tension bridging" (nail type) as manufactured by Simpson Strong-Tie, or approved equal.
- E. Laminated Veneer Lumber (LVL): "Microlam" as manufactured by Weyerhaeuser Co. or approved equal.
- F. Parallel Strand Lumber (PSL): "Parallam" as manufactures by Weyerhaeuser Co. or approved equal.
- G. Additional Grading Requirements
1. In order to qualify as "structural lumber", each piece including plywood, shall be marked with the grade of the lumber by some competent and reliable organization whose regular business is to establish lumber grades and whose trade-mark shall also appear on each piece; except that, a certificate from such an organization may be accepted in lieu of such grade and trade-marks. All plywood must be grade stamped on each piece with the APA trade-mark.
 2. There shall be no boxed heart in any framing lumber 4" and larger in the least dimension.

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2.2 Preservative Treatment

- A. Use waterborne preservatives complying with AWWPA Standard U-1, Use Category 2.
- B. All preservative treated lumber shall be retreated where cut on site.

2.3 Rough Hardware

Nails, bolts, nuts, washers, lag bolts, screws, anchor and other fastenings as shown or as required for complete installation. Galvanized or cadmium-plate for exterior work. Comply with the following specifications:

- A. Wire Nails: Common. Plywood nails are acceptable at diaphragms and walls. Provide minimum penetration as required for common nails.
- B. Bolts, Nuts, ASTM A307, (upset threads are prohibited)
- C. Lag Screws and Lag Bolts: ANSI/ASME B18.2.1.
- D. Wood Screws: ANSI/ASME B18.6.1.
- E. Framing Clips, Boots, Hangers, hold-downs etc.: by Simpson Strong Tie or approved equal.

- 2.4 Glue:** AFG – 01 approved. PL Premium" polyurethane construction adhesive by Chem Pex, Inc., or equal.

PART III – EXECUTION

3.1 General Framing

- A. Joists, rafters and beams shall be cut as required to provide a full even and horizontal seating on the support, unless otherwise shown. Do not overcut.
- B. Notches and bored holes in joists and beams shall be limited as shown on the drawings.

3.2 Framing For Pipes

- A. Frame members for passage of pipes and ducts to avoid cutting structural members. Do not cut, notch or bore framing members for passage of pipes or conduits without architect's authorization.

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- B. Pipes 1" diameter or less may pass through a neatly bored hole in the center of the plates. Hole location is subject to the Architect's acceptance.
- 3.3 Fire stops: Provide 2" nominal fire stops in conformance with Section 708.2 of the CBC.
- 3.4 Blocking: Provide solid blocking in all walls for wall mounted items.
- 3.5 Furring: Provide furring, stripping, blocking, backing and grounds where indicated or where necessary to support, or to furnish suitable spacings for finish materials and accessories.
- 3.6 Nailing:
 - A. All nailing shall conform to CBC Table 2304.10.2, except where more stringent requirements are shown on drawings.
 - B. Penetration of nails or spikes into piece receiving point shall be not less than 1/2 length of nail or spike, except, that 16 penny nails may be used to connect pieces of 2" thickness.
 - C. Drive nails and spikes no closer together than 2/3 their length nor closer to edge of member than 1/2 their length, except when detailed otherwise.
 - D. Place nails without splitting wood. Pre-drill holes whenever nailing tends to split wood or plywood. Replace split members.
 - E. Use of machine nailing is subject to a satisfactory job site demonstration. Authorization is subject to continued satisfactory performance. If nail heads penetrate the outer ply of plywood more than would be normal for a hand hammer or if the minimum allowable edge distances are not maintained the performance will be deemed unsatisfactory.
- 3.7 Bolts and Lag Screws:
 - A. Provide bolts and lag screws, bearing on wood, with malleable iron or steel plate washers of sizes indicated under heads and nuts. All nuts and screws shall be tightened when placed and re-tightened at completion of the job or immediately prior to closing with finish construction. Nuts shall be secured against loosening.
 - B. Except where otherwise indicated on the details, bore holes for bolts with a bit 1/32" to 1/16" larger than nominal diameter as the bolt.
 - C. Bore lag screw holes the same diameter and depth as shank, continue hole to depth equal to length of lag screw and with a diameter equal to 40% to 70% of the diameter of the shank.

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- D. Screw all lag screws; do not drive into place. Embed threaded portion of lag screws in each timber a minimum of seven (7) times their shank diameter.
- 3.8 Preservative Treatment: Treat all framing in direct contact with concrete or masonry construction with wood preservative, as follows:
- A. Wood bucks and nailing blocks: Dip in preservative 15 minutes prior to incorporation in concrete.
 - B. All treated lumber shall be marked or branded.
- 3.9 Glue Plywood Floor Sheathing to supporting members
- 3.10 Prefabricated Wood: Install prefabricated wood products in accordance with the recommendations of the manufacturer. All trusses and I-joists must be securely braced during erection and after permanent installation. Erection bracing shall hold trusses and I-joists straight and plumb and in safe condition until decking and permanent bracing has been fastened forming a structurally sound framing system. All erection and permanent bracing shall be installed and all trusses permanently fastened before application of any loads. Do not impose construction loads which cause stresses beyond design limits. Materials used in bracing are to be furnished by the erection contractor.
- 3.11 Removal Of Debris: Remove all wood, including form lumber, chips, shavings and sawdust in or on the ground from the area under the floor. No wood shall be buried in any fill.

END OF SECTION

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SECTION 07 56 00 - FLUID-APPLIED ROOFING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. PMMA-based, fluid-applied roofing membrane system.
- B. Related Sections:
 - 1. Division 01 sustainable design requirements Section(s) for supplementary sustainable design criteria.

1.02 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review substrate requirements for conditions and finishes, including flatness.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.

1.03 ACTION SUBMITTALS

- A. Product Data: For each membrane system component.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1.04 INFORMATIONAL SUBMITTALS

- A. Sustainable Design Submittals:

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1. Documentation for roof coatings, indicating VOC content.
- B. Field quality-control reports and manufacturer's final roof inspection report.
- 1.05 CLOSEOUT SUBMITTALS
 - A. Maintenance Data: For roofing system to include in maintenance manuals.
- 1.06 QUALITY ASSURANCE
 - A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's roofing system and that is eligible to receive manufacturer's special warranty.
- 1.07 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
 - B. Handle and store roofing materials, and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.
- 1.08 PROJECT CONDITIONS
 - A. Environmental Limitations: Apply roofing within the range of ambient and substrate temperatures recommended by roofing system manufacturer. Do not apply roofing to a damp or wet substrate or when temperature is below 0 deg F.
 1. Do not apply roofing in snow, rain, fog, or mist.

PART 2 - PRODUCTS

- 2.01 SUSTAINABLE DESIGN CRITERIA
 - A. Sustainable Design Criteria: Comply with indicated criteria for the following product categories:
 1. Roof Coatings:
 - a. VOC content limits for field applications.
- 2.02 PERFORMANCE REQUIREMENTS
 - A. General Performance: Installed roofing and base flashings are to withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings are to remain watertight.

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- B. Material Compatibility: Roofing materials are to be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.03 ROOFING MEMBRANE

- A. Fluid-Applied Roofing Membrane: Flexible, PMMA-based resin combined with a thixotropic agent for use in combination with non-woven, needle-punched polyester fabric reinforcement to form a monolithic, reinforced roofing membrane.
 - 1. Roofing Systems: Subject to compliance with requirements, roofing systems that may be incorporated into the Work include, but are not limited to the following:
 - a. Kemper System; 2K FR.

2.04 ACCESSORY MATERIALS

- A. Accessory materials recommended by roofing manufacturer for intended use and compatible with roofing membrane.
 - 1. Liquid-type accessory materials are to comply with VOC limits of authorities having jurisdiction.
- B. Reinforcing Fabric: Manufacturer's recommended, spun-bonded polyester fabric.
- C. Anti-Skid Granule Walkway Surfacing: Manufacturer's standard ceramic granules suitable for broadcast into a PMMA-based resin wear layer.
- D. Color Topcoat: A pigmented, PMMA-based resin for used to provide a color finish for both field and flashing membranes.
 - 1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof drain bodies are securely clamped in place.
 - 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.02 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions.
- B. Mask off adjoining surfaces not receiving roofing to prevent spillage from affecting other construction.

3.03 INSTALLATION OF ROOFING MEMBRANE

- A. Apply primer, at manufacturer's recommended rate, over prepared substrates and allow to dry.
- B. Apply fluid-applied roofing membrane according to manufacturer's written instructions.
- C. Start application with manufacturer's authorized representative present.
- D. Reinforced Membrane: Apply roofing membrane to area to receive roofing. Spread a layer of fluid-applied PMMA; embed reinforcing fabric, overlapping sheets 2 inches; spread another layer of fluid-applied PMMA to form a uniform, reinforced, seamless membrane, 90 mils thick minimum.

3.04 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

3.05 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

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SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Penetration firestopping systems for the following applications:
 - a. Penetrations in fire-resistance-rated walls.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.03 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.

1.05 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

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- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.06 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. A/D Fire Protection Systems Inc.
 - 2. Grace Construction Products.
 - 3. Hilti, Inc.
 - 4. Johns Manville.
 - 5. Nelson Firestop Products.
 - 6. NUCO Inc.
 - 7. Passive Fire Protection Partners.
 - 8. RectorSeal Corporation.
 - 9. Specified Technologies Inc.
 - 10. 3M Fire Protection Products.
 - 11. Tremco, Inc.; Tremco Fire Protection Systems Group.
 - 12. USG Corporation.

2.02 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Approval in its "Approval Guide."

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2.03 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

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3.03 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION

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SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Sealant and backing materials.
 - 2. Acoustical sealants.
- B. Related Sections:
 - 1. Division 01 sustainable design requirements Section(s) for supplementary sustainable design criteria.

1.02 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

1.03 INFORMATIONAL SUBMITTALS

- A. Sustainable Design Submittals:
 - 1. Documentation for sealants, indicating VOC content.
- B. Product Test Reports: For each kind of joint sealant.
- C. Sample Warranties: For special warranties.

1.04 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

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1.05 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period:
 - a. Silicone Sealants: 20 years from date of Substantial Completion.
 - b. All Other Sealants: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SUSTAINABLE DESIGN CRITERIA

- A. Sustainable Design Criteria: Comply with indicated criteria for the following product categories:
 - 1. Sealants:
 - a. VOC content limits for field applications.

2.02 SOURCE LIMITATIONS

- A. Obtain joint sealants from single manufacturer for each sealant type.

2.03 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- C. Nonstaining Joint Sealants: Where sealants are indicated to be nonstaining, provide products that exhibit no staining of substrates when tested according to ASTM C1248.
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with the following public health and safety requirements:

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1. Sealant is certified for compliance with NSF standards for end-use application indicated.
 2. Washed and cured sealant complies with the FDA's regulations for use in areas that come in contact with food.
- E. Mildew-Resistant Joint Sealants: Where sealants are indicated to be mildew-resistant, provide products formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.04 JOINT SEALANTS

- A. Silicone: Mildew-resistant, single-component, nonsag, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
1. Joint Locations: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces, and as follows:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Other joints as indicated on Drawings.
 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
 - b. The Dow Chemical Company; DowSil 786.
- B. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
1. Joint Locations: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement, and as follows:
 - a. Perimeter joints between interior wall surfaces and frames of interior doors.
 - b. Other joints as indicated on Drawings.
 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. BASF Corporation; MasterSeal NP 520.
 - b. Bostik, Inc.; Bosti-Flex Plus.
 - c. Pecora Corporation; AC-20.
 - d. Tremco Incorporated; Tremflex 834.

2.05 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834. Sealant effectively reduces airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E90.
1. Joint Location:

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- a. Acoustical joints where indicated.
 - b. Other joints as indicated.
 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. Accumetric LLC; BOSS 826 Acoustical Sound Sealant.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; RCS20 Acoustical.
 - c. Grabber Construction Products; Acoustical Sealant GSC.
 - d. Hilti, Inc.; CP 506 Smoke and Acoustical Sealant.
 - e. Pecora Corporation; AC-20 FTR or AIS-919.
 - f. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - g. Tremco Incorporated; Tremflex 834.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant. Sealant effectively reduces airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E90
1. Joint Location:
 - a. Concealed acoustical joints where indicated.
 - b. Other joints as indicated.
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; BA-98.
 - b. Tremco Incorporated; Acoustical/Curtainwall Sealant.

2.06 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), unless otherwise recommended by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.07 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

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- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.
- D. Mineral Wool Forming Material: Unfaced mineral wool board insulation preformed or cut to fit metal deck flutes.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove laitance and form-release agents from concrete.
 - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.02 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.

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3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
 - D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
 - E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
 - F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.
 - G. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters including heads of walls, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
- 3.03 CLEANING
- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION

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SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Standard hollow-metal doors and frames.

1.02 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.03 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of moldings, removable stops, and glazing.

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1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Amweld International, LLC.
 - 2. Ceco Door Products; an Assa Abloy Group company.
 - 3. Curries Company; an Assa Abloy Group company.
 - 4. Deansteel.
 - 5. Fleming-Baron Door Products.
 - 6. Mesker Door Inc.
 - 7. Pioneer Industries, Inc.
 - 8. Security Metal Products Corp.
 - 9. Steelcraft; an Ingersoll-Rand company.

2.02 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At locations indicated in the Door and Frame Schedule.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch.
 - d. Edge Construction: Model 2, Seamless.
 - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.

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- f. Core: Manufacturer's standard .
- 2. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
 - b. Construction: Face welded.
- 3. Exposed Finish: Prime.

2.03 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.04 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

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- E. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

2.05 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

2.06 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

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PART 3 - EXECUTION

3.01 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.02 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - 2. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Solidly pack mineral-fiber insulation inside frames.
 - 4. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.

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3.03 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

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SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Access doors and frames for walls and ceilings.

1.02 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 tested according to the following test method:
 - 1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
 - 2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.02 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Access Panel Solutions.
 - 2. Acudor Products, Inc.
 - 3. Alfab, Inc.
 - 4. Babcock-Davis.
 - 5. Cendrex Inc.
 - 6. Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
 - 7. Jensen Industries; Div. of Broan-Nutone, LLC.
 - 8. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
 - 9. Karp Associates, Inc.
 - 10. Larsen's Manufacturing Company.
 - 11. Maxam Metal Products Limited.
 - 12. Metropolitan Door Industries Corp.
 - 13. MIFAB, Inc.
 - 14. Milcor Inc.
 - 15. Nystrom, Inc.

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16. Williams Bros. Corporation of America (The).

- B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- C. Recessed Access Doors:
1. Assembly Description: Fabricate door in the form of a pan recessed 5/8 inch for gypsum board infill. Provide frame with gypsum board bead for concealed flange installation.
 2. Locations: As indicated on Drawings.
 3. Door Size: As indicated on Drawings.
 4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage.
 - a. Finish: Factory prime.
 5. Frame Material: Same material and thickness as door.
 6. Hinges: Manufacturer's standard.
- D. Fire-Rated, Recessed Access Doors with Concealed Flanges:
1. Assembly Description: Fabricate door in the form of a pan recessed 5/8 inch for gypsum board infill. Provide frame with gypsum board bead for concealed flange installation.
 2. Locations: As indicated on Drawings.
 3. Fire-Resistance Rating: Not less than that of adjacent construction.
 4. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage.
 - a. Finish: Factory prime.
 5. Frame Material: Same material, thickness, and finish as door.
 6. Hinges: Manufacturer's standard.

2.03 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

2.04 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

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- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

2.05 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
 - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.02 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

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END OF SECTION

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SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
 - 1. Division 08: Section - Hollow Metal Doors and Frames.

1.03 REFERENCES

- A. 2022 California Building Code, CCR Title 24, Part 2
- B. BHMA - Builders' Hardware Manufacturers Association
- C. DHI - Door and Hardware Institute
- D. NFPA - National Fire Protection Association.
 - 1. NFPA 80 - Fire Doors and Other Opening Protectives
 - 2. NFPA 105 - Smoke and Draft Control Door Assemblies
- E. UL - Underwriters Laboratories.
 - 1. UL 10C - Fire Tests of Door Assemblies
 - 2. UL 305 - Panic Hardware
- F. WHI - Warnock Hersey Incorporated
- G. SDI - Steel Door Institute

1.04 SUBMITTALS & SUBSTITUTIONS

- A. General: Submit in accordance with Conditions of the Contract and Division 01 Specification sections.
- B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of

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operating parts and finish, and other information necessary to show compliance with requirements.

- C. Submit electronic PDF copies of schedule organized vertically into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Include a Cover Sheet with:
 - a. Job Name, location, telephone number.
 - b. Architects name, location and telephone number.
 - c. Contractors name, location, telephone number and job number.
 - d. Suppliers name, location, telephone number and job number.
 - e. Hardware consultant's name, location and telephone number.
2. Job Index information included:
 - a. Numerical door number index including; door number, hardware heading number and page number.
 - b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
 - c. Manufacturers' names and abbreviations for all materials.
 - d. Explanation of abbreviations, symbols, and codes used in the schedule.
 - e. Mounting locations for hardware.
 - f. Clarification statements or questions.
 - g. Catalog cuts and manufacturer's technical data and instructions.
3. Vertical schedule format sample:

| Heading Number 1 (Hardware group or set number - HW Group #1) | | | | |
|---|----------|--------------|------------------------------------|-------------|
| | | | | |
| (a) 1 Single - Door #101 - Corridor 101 to Exterior | | | (b) 90° | (c) RH |
| | | | | |
| (d) 3'-0" x 7'-0" x 1-3/4" - Wood Door x Hollow Metal Frame - 20 Minute | | | | |
| | | | | |
| (e) 1. | (f) 3 ea | (g) Hinges - | (h) 5BB1 4.5 x 4.5 NRP | (i) 1/2 TMS |
| 2. | 1 ea | Lockset - | ND80P6D x RHO x RH x 10-025 x JTMS | (j) 630 |
| 3. | 1 ea | Closer - | 4040XP x EDA x TBSRT | (k) IVE |
| | | | | 626 |
| | | | | 689 |
| | | | | SCH |
| | | | | LCN |

- (a) Single or pair of doors with opening number and location.
- (b) Degree of opening.
- (c) Hand of door(s).
- (d) Door/frame dimensions and material; Label requirements, if any.
- (e) Hardware item line # (Optional).
- (f) Quantity.
- (g) Product description.
- (h) Product part number.
- (i) Fastenings and other pertinent information.
- (j) Hardware finish codes per ANSI/BHMA A156.18.
- (k) Manufacturer abbreviation.

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- D. Make substitution requests in accordance with Division 01. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.
- E. Keying Schedule: Submit separate detailed schedule indicating clearly how the District's final instructions on keying of locks has been fulfilled.
- F. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- G. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.
- H. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the District to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.05 QUALITY ASSURANCE

- A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to District, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
 - 1. Responsible for detailing, scheduling and ordering of finish hardware.
 - 2. Meet with District to finalize keying requirements and to obtain final instructions in writing.
 - 3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.
- C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.
 - 1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped

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with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

- E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.
- F. Product packaging to be labelled in compliance with CA Prop 65, Safe Drinking Water and Toxic Enforcement Act of 1986.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.
- B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.
- C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.
- D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.07 WARRANTY

- A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
 - 1. Locksets: Ten (10) years.
 - 2. Exit devices: Ten (10) years.
 - 3. Closers: Thirty (30) years.
 - 4. All other hardware: Two (2) years.

1.08 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for continued adjustment, maintenance, and removal and replacement of door hardware.

1.09 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference at least one week prior to beginning work of this section.
- B. Attendance: Architect, Construction Manager, General Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.

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- C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

| <u>Item</u> | <u>Manufacturer</u> | <u>Acceptable Substitutes</u> |
|---------------------------------|---------------------|-------------------------------|
| Hinges | Ives | Hager, Stanley, McKinney |
| Locks, Latches & Cylinders | Schlage | None – District Standard |
| Exit Devices | Von Duprin | None – District Standard |
| Closers | LCN | None – District Standard |
| Push, Pulls & Protection Plates | Ives | Trimco, BBW, DCI |
| Flush Bolts | Ives | Trimco, BBW, DCI |
| Door Stops | Ives | Trimco, BBW, DCI |
| Overhead Stops | Glynn-Johnson | Or Approved Equal |
| Seals, Bottoms & Thresholds | Zero | Pemko, National Guard |

2.02 MATERIALS

- A. Hinges:
1. Provide hinges conforming to ANSI/BHMA A156.1.
 2. Hinges shall be sized in accordance with the following:
 - a. Height:
 - 1) Doors up to 42" wide: 4-1/2 inches.
 - 2) Doors 43" to 48" wide: 5 inches.
 - b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
 - c. Number of Hinges: Provide 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
 3. Exterior out-swinging hinges shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
 4. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
- B. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" lever design.
1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3 hour fire doors.
 2. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
 - a. Abusive locked lever torque – minimum 3,100 inch-pounds without gaining access.
 - b. Offset lever pull – minimum 1,600 foot pounds without gaining access.
 - c. Vertical lever impact – minimum 100 impacts without gaining access.

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- d. Cycle Test – tested to minimum 16 million cycles with no visible lever sag; without the use of performance aids such as set screws or spacers.
 - 3. Cylinders: Refer to “KEYING” article, herein.
 - 4. Provide locks with standard 2-3/4” backset, unless noted otherwise, with 1/2” latch throw. Provide proper latch throw for UL listing at pairs.
 - 5. Provide locksets with separate solid steel anti-rotation thru-bolts, and no exposed screws.
 - 6. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
 - 7. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
 - 8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
 - 9. Provide levers with vandal resistant technology as scheduled for use at abusive applications.
- C. Door Stops:
- 1. Unless otherwise noted in hardware sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
 - 2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
 - 3. Provide backing plate at wall framing behind wall type.
 - 4. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions. Stop-only function shall be provided at fire-rated openings.
- D. Protection Plates:
- 1. Provide kick, mop, and/or armor plates minimum of 0.050” thick, with four beveled edges. Furnish with sheet metal or wood screws, finished to match plates.
 - 2. Kick plates shall be sized 10" high and 2" less door width (LDW) at single doors and 10" high and 1" LDW at pairs or doors.
 - 3. Provide mop and armor plates with sizes as scheduled in hardware sets.
- E. Thresholds: As scheduled and per details.
- 1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope. Thresholds shall comply with CBC Section 11B-404.2.5.
 - 2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 07 “Thermal and Moisture Protection”.
 - 3. Use 1/4” fasteners, red-head flat-head sleeve anchors (SS/FHSL).
- F. Seals: Provide silicone gasketing at all rated and exterior doors.
- 1. Smoke & Draft Control Doors: Provide UL10C Classified gasketing that complies with NFPA 80 & NFPA 252 for use on “S” labeled Positive Pressure door assemblies.

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- G. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

- A. Furnish a Proprietary Schlage Primus masterkey system as directed by the District. Key system to be designated and combined by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer.
- B. A detailed keying schedule is to be prepared by the District and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.
- C. Furnish all cylinders in the Schlage Full Size Interchangeable Core (FSIC) style. Pack change keys independently (PKI). Verify Schlage Primus keyway with District locksmith.
- D. Furnish construction keying for doors requiring locking during construction.
- E. Furnish all keys with visual key control.
 - 1. Stamp key "Do Not Duplicate".
 - 2. Stamp (BHMA) key symbol on key.
 - 3. Stamp unique owner identifier from the key bow.
- F. Furnish mechanical keys as follows:
 - 1. Furnish 2 cut change keys for each different change key code.
 - 2. Furnish 1 uncut key blank for each change key code.
 - 3. Furnish 6 cut masterkeys for each different masterkey set.
 - 4. Furnish 3 uncut key blanks for each masterkey set.
 - 5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
 - 6. Furnish 1 cut control key cut to each SKD combination.
- G. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.
 - 1. Furnish KS43F3200 padlock for use with FSIC Schlage cylinders.

2.04 FINISHES

- A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.
- B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.

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- C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.
- D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

- A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
- B. Screws for butt hinges shall be flathead, countersunk, full-thread type.
- C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
- D. Provide expansion anchors for attaching hardware items to concrete or masonry.
- E. All exposed fasteners shall have a phillips head.
- F. Finish of exposed screws to match surface finish of hardware or other adjacent work.
- G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
- B. Use the templates provided by hardware item manufacturer.
- C. Mounting heights for hardware shall be as recommended by DHI. Operating hardware shall be located between 34" and 44" above finish floor to comply with CBC Section 11B-404.2.7.
- D. Door Closers:
 - 1. Place door closers inside building, stairs, rooms, etc. Closers shall be installed to permit doors to swing 180 degrees or maximum allowable by conditions.

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2. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors.
 3. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal.
 4. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
 5. Compensating devices or automatic door operators may be utilized to meet the above standards.
 6. Per CBC Section 11B-404.2.8.1, doors shall take minimum of 5 seconds to move from an open position of 90 degrees to 12 degrees to the latch jamb.
- E. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- G. Set thresholds for exterior doors in full bed of butyl-rubber sealant.
- H. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.
- 3.03 ADJUST AND CLEAN
- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surface soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units.

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Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.04 HARDWARE LOCATIONS

- A. Conform to CCR, Title 24, Part 2; and ADA Standards; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

- A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.06 HARDWARE SCHEDULE

- A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.
- B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.
- C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

MANUFACTURERS ABBREVIATIONS

| | | | |
|-----|---|---------------|--------------------------------|
| GLY | = | Glynn-Johnson | Overhead Stops |
| IVE | = | Ives | Hinges & Silencers |
| SCH | = | Schlage Lock | Locksets, Padlocks & Cylinders |

HW GROUP NO. 1

| <u>QTY</u> | | <u>DESCRIPTION</u> | <u>CATALOG NUMBER</u> | <u>FINISH</u> | <u>MFR</u> |
|------------|----|---------------------|-----------------------|---------------|------------|
| 3 | EA | HINGE | BY GATE FABRICATOR | | |
| 1 | EA | LOCKABLE FORK LATCH | BY GATE FABRICATOR | | |
| 1 | EA | FSIC PADLOCK | KS43F3200 | 606 | SCH |
| 1 | EA | PRIMUS CORE | 20-740 | 606 | SCH |

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HW GROUP NO. 2

| <u>QTY</u> | | <u>DESCRIPTION</u> | <u>CATALOG NUMBER</u> | <u>FINISH</u> | <u>MFR</u> |
|------------|----|----------------------|-----------------------|---------------|------------|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | VANDL STOREROOM LOCK | ND96JD RHO | 626 | SCH |
| 1 | EA | PRIMUS CORE | 20-740 | 626 | SCH |
| 1 | EA | OVERHEAD STOP | 450S | 689 | GLY |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

END OF SECTION

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SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.04 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corp.
 - 3. Georgia-Pacific Gypsum LLC.
 - 4. Continental Building Products.

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5. National Gypsum Company.
6. PABCO Gypsum.
7. USG Corporation.

2.02 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.03 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C1396/C1396M.
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.

2.04 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.

2.05 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper or self-adhering glass mesh.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose compound.

2.06 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

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- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.

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3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.03 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Single-Layer Application:
 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) or horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.04 INSTALLATION OF TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

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- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.

3.05 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 4: Surfaces scheduled for light-textured finishes, wallcoverings, paints and panel surfaces that will be exposed to view, unless otherwise indicated .
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.06 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or blotchy surface contamination and discoloration.

END OF SECTION

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SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Surface preparation and the application of paint systems on interior substrates.
- B. Related Sections:
 - 1. Division 01 sustainable design requirements Section(s) for supplementary sustainable design criteria.

1.02 DEFINITIONS

- A. Sheen Levels:
 - 1. Flat: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
 - 2. Eggshell: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
 - 3. Satin: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
 - 4. Semi-Gloss: 35 to 70 units at 60 degrees, according to ASTM D523.
 - 5. Gloss: 70 units and greater at 60 degrees, according to ASTM D523.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include preparation requirements and application instructions.
 - 2. Indicate VOC content.

1.04 INFORMATIONAL SUBMITTALS

- A. Sustainable Design Submittals:
 - 1. Documentation for paints and coatings, indicating VOC content.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 3 articles for the paint category indicated.

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- B. Source Limitations: Obtain products for each coating system from single source from single manufacturer.

2.02 SUSTAINABLE DESIGN CRITERIA

- A. Sustainable Design Criteria: Comply with indicated criteria for the following product categories:
 - 1. Paints and Coatings:
 - a. VOC content limits for field applications.

2.03 PAINT PRODUCTS, GENERAL

- A. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. Colors: As indicated in a color schedule on drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

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3.02 PREPARATION

- A. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.03 INSTALLATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.04 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

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- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.05 INTERIOR PAINTING SCHEDULE

- A. Gypsum Board; Acrylic Latex: Provide one of the following systems:
1. Benjamin Moore:
 - a. Primer: Ultra Spec 500 Interior Latex Primer.
 - b. Intermediate Coat: Same as top coat.
 - c. Top Coat: Ultra Spec 500 Interior.
 - d. Sheen:
 - 1) Walls: Eggshell, unless indicated otherwise.
 - 2) Ceilings: Flat, unless indicated otherwise.
 2. Sherwin Williams:
 - a. Primer: ProMar 200 Zero VOC Interior Latex Primer B28 Series.
 - b. Intermediate Coat: Same as top coat.
 - c. Top Coat: ProMar 200 Zero VOC Interior Latex.
 - d. Sheen:
 - 1) Walls: Eggshell, unless indicated otherwise.
 - 2) Ceilings: Flat, unless indicated otherwise.
 3. PPG:
 - a. Primer: Speedhide ZERO VOC Interior Latex Primer.
 - b. Intermediate Coat: Same as top coat.
 - c. Top Coat: Speedhide ZERO VOC Interior Latex.
 - d. Sheen:
 - 1) Walls: Eggshell, unless indicated otherwise.
 - 2) Ceilings: Flat, unless indicated otherwise.

END OF SECTION

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SECTION 22 05 10 - PLUMBING GENERAL PROVISIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. References.
- B. Description of Work.
- C. Drawings and Specifications.
- D. Industry Standards and Codes.
- E. Site Examination.
- F. Permits, Fees and Utility Connections.
- G. Coordination of Work.
- H. Progress of Work.
- I. Submittals
- J. Operation and Maintenance Manuals.
- K. Project Record Documents.
- L. Warranty.
- M. Quality and Care
- N. Access Doors.
- O. Starting Equipment and Systems.

1.02 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

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1.03 REFERENCES

- A. ANSI - American National Standards Institute.
- B. ASTM - American Society for Testing Materials.
- C. CEC - California Electric Code.
- D. NEMA - National Electric Manufacturers' Association.
- E. NFPA - National Fire Protection Association.
- F. OSHA - Occupational Safety and Health Act.
- G. UL - Underwriters' Laboratories.
- H. See detailed References that are listed in individual sections.

1.04 DESCRIPTION OF WORK

- A. The work included in this division of the specifications consists of furnishing labor, tools, equipment, supplies and materials, unless otherwise specified, and in performing operations necessary for the installation of the complete Plumbing System as required by these specifications or shown on the Drawings, subject to the terms and conditions of the Contract Agreement.
- B. The work shall also include the completion of details of plumbing work not mentioned or shown which are necessary for the successful operation of mechanical systems described on the drawings or required by these specifications. Furnish and install any incidental work not shown or specified which is required to provide a complete and operational system.

1.05 DRAWINGS AND SPECIFICATIONS

- A. Drawings are schematic and diagrammatic. Drawings indicate the general arrangement of equipment, piping, and other plumbing work. Use judgement and care to install mechanical work to fit the job conditions within the building construction and finishes, and to function properly.
- B. The Contractor shall investigate the building conditions affecting the Work and shall arrange his work accordingly providing offsets, fittings, valves and accessories to fit the actual job conditions. The Contractor shall be responsible to field measure and confirm new and existing mechanical systems locations with respect to other architectural, structural, and electrical work, existing and new. Do not scale distances off of the mechanical drawings. Use actual building dimensions.

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- C. The drawings and specifications are complimentary each to the other. What is required by one shall be as binding as if called for by both.
- D. Examine all drawings and specifications prior to bidding the Work. Report any discrepancies to the Engineer.

1.06 INDUSTRY STANDARDS AND CODES

- A. The Mechanical Contractor shall comply with the latest provisions of all codes, regulations, laws and ordinances applicable to the work involved. This does not relieve the Contractor from furnishing and installing work shown or specified which may exceed the requirements of such codes, regulations laws and ordinances.
- B. All materials, products, devices, fixtures forms or types of construction included in this project shall meet or exceed the published requirements of the publications listed below. These publications form a part of this specification.
 - 1. California Building Code, 2022.
 - 2. California Mechanical Code, 2022.
 - 3. California Plumbing Code, 2022.
 - 4. California Electrical Code, 2022.
 - 5. National Fire Protection Association.
 - 6. California Fire Code, 2022.
 - 7. California State Fire Marshal.
 - 8. Occupational Safety and Health Administration, including CAL-OSHA.
 - 9. California Energy Code, 2022.
 - 10. California Green Building Standards Code, 2022.
 - 11. State of California Code of Regulations, Title 24.
 - 12. Other applicable state laws.
- C. Nothing in the Drawings or Specifications shall be construed to permit work that does not conform these codes. When Contract Documents differ from governing codes, furnish and install to the higher standard required at no extra charge. The Contract Documents are not intended to repeat the code requirements except where necessary for clarity.

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- D. No material or product installed as a part of the Work shall contain asbestos in any form.
- E. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.

1.07 SITE EXAMINATION

- A. Contractor shall examine the site, verify dimensions and locations with Drawings, check utility connection locations, and familiarize himself with the existing conditions and limitations. No extras will be allowed because of the Contractor's misunderstanding of the amount of work involved or his lack of knowledge of any site condition which may affect his work. Any apparent variance of the drawings or specifications from the existing conditions at the site shall be called to the attention of the Engineer immediately.

1.08 PERMITS, FEES AND UTILITY SERVICES

- A. Contractor shall pay for and obtain all permits and service required in the installation of this work.
- B. Contractor shall arrange for all required inspections and will secure approvals from authorities having jurisdiction.

1.09 COORDINATION OF WORK

- A. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the mechanical work, and in its interface with other work and that such establishment is the exclusive responsibility of the contractor.
- B. The Contractor shall give careful consideration to the work of the General, Electrical and other contractors on the job and shall organize his work so that it will not interfere with the work of other trades. He shall consult the drawings and specifications for work of other trades for correcting information, and the pertinent drawings for details and dimensions.
- C. Arrange plumbing work in a neat, well-organized manner with the piping and similar services running parallel and/or perpendicular to primary lines of the building construction. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.

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- D. Verify the location of all equipment, plumbing devices, etc. and if interference develops, the Owner/Engineer's decision will be final and no additional compensation will be allowed for the moving of misplaced air devices or equipment.

1.10 PROGRESS OF WORK

- A. This Contractor shall organize his work so that the progress of the mechanical work will conform to the progress of the other trades, and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from defective or ill timed work performed under this section shall be borne by this Contractor.

1.11 STRUCTURAL DESIGN REQUIREMENTS AND SEISMIC RESTRAINTS

- A. Plumbing systems and equipment shall be anchored and seismically braced in accordance with all applicable codes and industry standards.
- B. Plumbing systems and equipment shall include, but are not limited to, all piping, water heaters, expansion tanks, air compressors, vacuum pumps, electrical and control panels, conduits and other components.
- C. For all non-standard installations not detailed in one of the approved systems, the Contractor shall provide details of supports, anchorages and restraints, including attachments to building structure, with supporting calculations all stamped and signed by a licensed professional structural engineer registered in the state in which the Work is performed.

1.12 SUBMITTALS

- A. See Section 013300 - Submittals, for additional submittal procedures.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project.
- D. Organize submittals in sequence according to Specification Section. Submit in bound document with tabs identifying each Specification Section. Provide a Table of Contents identifying the Specifications Sections being submitted and the contents within each tabbed section. Prepare Submittals in multiple volumes if required. Provide a complete Submittal package at one time. Do not submit individual Sections piecemeal.

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- E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- F. Furnish, upon request, installation instructions for all equipment and materials to Inspector of Record prior to installation.
- G. Maintain a copy of the fire penetration installation instructions on site for use by the Inspector of Record.

1.13 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. LP Consulting Engineers, Inc. will consider requests for substitutions only within 7 days after date of Agreement.
- C. Substitutions may be considered when a product becomes unavailable through no fault of the .
- D. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.
- E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- F. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner and LP Consulting Engineers, Inc. for review or redesign services associated with reapproval by authorities including obtaining reapproval by authorities.

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- G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- H. If excessive review, as judged by the Engineer, is required caused by complicated, numerous or repetitive requests, Contractor shall reimburse Engineer and its Consultants for such review at their standard billing rates.
- I. Substitution Submittal Procedure:
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 - 3. The LP Consulting Engineers, Inc. will notify in writing of decision to accept or reject request.
 - 4. Present each substitution individually. If a proposed substitute is not found to be acceptable, then the specified item shall be supplied.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01700 Closeout Submittals for Operation and Maintenance Manual requirements.
- B. Provide operating and maintenance instructions, diagrams and parts lists for all components of all mechanical systems and each piece of equipment furnished under these specifications.
- C. Operating and maintenance instructions shall be furnished for the following equipment and systems:
 - 1. Plumbing Systems.
 - 2. Medical Gas Equipment, Piping and Alarm Systems.
 - 3. Piping Systems.
 - 4. Temperature Controls Systems.
 - 5. Testing, Adjusting, and Balancing Reports.
- D. Provide manufacturer's model number, design data, capacities, etc. for each piece of plumbing equipment furnished as a part of the Work.

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- E. The operating instructions shall include procedures for starting, stopping and emergency manual operation for all equipment and systems.
- F. Provide maintenance instructions of each item of individual equipment including applicable maintenance data as recommended by the manufacturer, including frequency of lubrication, lubricants, inspections required, adjustment procedures, belt and pulley sizes, etc.
- G. Provide manufacturer's parts bulletins with part numbers for each item of equipment included in the Work. Parts bulletins shall be specific to the equipment provided. Extraneous information that does not apply to the equipment provided shall be eliminated from the literature.
- H. Include copies of test reports (startup, check, etc.) and inspections performed for each piece of equipment provided in the Work.
- I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- J. Provide supplier and manufacturer contacts, telephone numbers and addresses in the front portion of the operation and maintenance manual.

1.15 PROJECT RECORD DOCUMENTS

- A. See Section 017700 - Closeout Procedures.
- B. Provide red-lined drawings accurately showing location of equipment and devices and size and routing of piping. Include notes explaining installed condition for complete understanding.

1.16 QUALITY ASSURANCE

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from LP Consulting Engineers, Inc. before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.

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- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

1.17 PROJECT CONDITIONS

- A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.18 WARRANTY

- A. See Section 01700 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 QUALITY AND CARE

- A. All materials shall be new and in perfect condition when installed unless specifically indicated otherwise. Materials shall be tested within the Continental United States by an independent, nationally recognized testing agency and shall be listed in accordance with testing agency requirements. When not otherwise specified, all material shall conform to applicable National Standards (ANSI).
- B. All capacities, sizes and efficiency ratings shown on the drawing are minimum. Gas meter and gas pressure reducing valve capacities are maximum allowable.
- C. Each category of material or equipment shall be of the same brand or manufacturer throughout the Work wherever possible.
- D. The quality of materials and equipment to be provided is defined by the brand names, manufacturers, model and catalog numbers listed on the Drawings and in the Specifications. Contractor shall provide each item listed, of the quality specified, or equal.
- E. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.

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- F. Inspect and report concealed damage to carrier within their required time period.
- G. Store materials in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect from dirt, water, construction debris, and traffic.
- H. Equipment which has been damaged, exposed to weather or is, in the opinion of the Engineer or Owner, otherwise unsuitable because of improper fabrication, storage or installation shall be removed and replaced by this Contractor at his expense.

2.02 ACCESS DOORS

- A. Coordinate access door requirements with Section 08305. The more stringent requirements shall govern.
- B. Provide access doors where access through floors, walls or ceilings is required to access plumbing equipment and plumbing devices or other systems requiring access for maintenance, test or observation.
 - 1. Access doors requiring hand access or access for observation only shall be 14"x14" minimum usable opening.
 - 2. Access doors where entrance of a service person may be required shall be 24"x30" minimum usable opening.
- C. Established standard: Milcor of types listed below. Other acceptable manufacturers: CESCO, J.L. Industries, Karp, Larsen's, or equal. Comply with the following:
 - 1. Form doors and frames of welded, ground smooth steel construction, 14 gauge for doors, 16 gauge for frames. Provide prime coat finish except for stainless steel type.
 - 2. Concealed hinges to allow 175 degree opening.
 - 3. Locks: flush, screw driver operated cam lock(s).
 - 4. Provide anchoring devices suitable for the construction into which the doors are framed.
- D. Application (as applicable):
 - 1. In gypsum drywall walls and ceilings: Type DW.

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2. In ceramic tile walls: Type MS (stainless steel).
3. In fire rated walls: Type Fire Rated (rating as required for wall or ceiling), self closing, 250 F in 30 min. temperature rating.

PART 3 EXECUTION

3.01 INSTALLATION

A. Access Doors

1. Coordinate the exact location of access doors to provide proper access to the item concealed. Obtain written approval for access door locations from Architect.
2. Coordinate installation of access doors with the trades performing the construction assemblies into which the access doors are placed.
3. Install all access doors neatly and securely, to open and close completely, and to operate freely and without binding. Install rated doors in accordance with their listing requirements.
4. Test operate all doors and make all adjustments required for satisfactory operation. Replace all damaged materials.
5. Install in accordance with manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with the requirements within this section.
- B. Test all piping with no leak or loss in pressure in accordance with the requirements within this section.

3.03 GENERAL TESTING REQUIREMENTS FOR MECHANICAL AND PLUMBING SYSTEMS

- A. Contractor shall assign a responsible person to be an independent representative to witness testing and to sign as witness of times, pressure and losses of testing media for all hydronic, duct and gas piping testing.
 1. Test all piping as noted below with no leak or loss of pressure. Repair or replace defective piping until tests are accomplished successfully.

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2. Submit to the Engineer for review a log of all tests made which shall include time, temperature, pressure, water makeup and other applicable readings, necessary to indicate the systems have been operated and tested in the manner outlined in the construction documents.
 3. After producing the specified test pressure, disconnect the pressurizing source; do not introduce further pressure for the duration of the test period, repair leaky piping and retest. Repeat the procedure until the entire system is proven tight.
- B. Test the following systems with the medium listed to the pressure indicated for the time period listed:
1. Sanitary Sewer, Drain, Vent Piping: Pressure=10 Ft.Hd. / Medium= Water / Duration=4 Hours.
 2. Domestic Water Piping: Pressure=125 Psig / Medium= Water / Duration=4 Hours.
 3. Condensate drains: Pressure=10 Ft.Hd. / Medium=Water / Duration=4 Hours.
 4. Gas Piping: Pressure=60 Psig / Medium=Air and soap / Duration=8 Hours.

3.04 CUTTING AND PATCHING

- A. Submit written request in advance of cutting or alteration which affects:
1. Structural integrity of any element of Project.
 2. Integrity of weather exposed or moisture resistant element.
 3. Efficiency, maintenance, or safety of any operational element.
 4. Visual qualities of sight exposed elements.
 5. Work of Owner or separate Contractor.
- B. Execute cutting and patching to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.

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- C. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Code requirements , to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.05 PRIMING AND PAINTING

- A. Apply primer to all exposed ferrous metals that are not factory primed, factory finished, galvanized, stainless steel or anodized. Exposed black steel piping shall be primed and finish painted, including gas piping outdoors.
 - 1. Primer shall be as recommended by the paint manufacturer for each specific application.
 - 2. Acceptable Products include: Fuller O'Brien Blox-Rust Metal All Purpose Primer, equivalent Rust-Oleum product, or equal. See Section 09900 for other acceptable products.
- B. Apply two coats of primer to metal surfaces of items to be insulated or jacketed, except piping, or factory primed or finished.
- C. Preparation:
 - 1. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.
 - 2. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; seal stains and marks which cannot be completely removed using Devco KILSTAIN primers,

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shellac, or other coating acceptable to paint manufacturer any marks or defects that might bleed through paint finishes.

3. Remove mildew from impervious surfaces by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow substrate to thoroughly dry.
4. Galvanized Surfaces:
 - a. Remove surface contamination and oils by solvent cleaning in accordance with SSPC-SP 1 and allow to dry.
 - b. Apply Devoe MIRROLAC Galvanized Metal Primer in accordance with manufacturer instructions.
5. Uncoated Steel And Iron Surfaces:
 - a. Remove grease, rust, scale, and dust from steel and iron surfaces using solvent in accordance with SSPC-SP 1.
 - b. Where heavy coatings of scale or contaminants are evident, hand tool clean in accordance with SSPC-SP 2 or use other approved SSPC SP method as needed.
6. Shop Primed Steel Surfaces: Remove loose primer and dust. Sand and feather edges to smooth surface. Clean areas with solvent and spot prime bare metal surfaces with appropriate Devoe MIRROLAC metal primer or primer recommended by manufacturer.

D. Application:

1. Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.
2. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.
3. Remove dust and other foreign materials from substrate immediately prior to applying each coat.

E. Finish Painting: See Section 09900.

3.06 STARTING EQUIPMENT AND SYSTEMS/COMMISSIONING

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- A. Start equipment and systems in accordance with manufacturer's written instructions..
- B. Adjust for proper operation within manufacturer's published tolerances.
- C. Demonstrate proper operation of equipment to Owner's designated representative.
- D. Description:
 - 1. Comply with all start up of mechanical and electrical equipment systems as required in the various sections and herein.
 - 2. Coordinate all testing and startup procedures with all other trades so that all non-plumbing and non-electrical work is completed and operational so that the specified testing can be performed.
- E. Preliminary Work:
 - 1. Prior to the startup, the Contractor shall ensure that the systems are ready to operate, and the following items have been completed and checked including but not limited to:
 - a. Proper motor and fan/pump rotation.
 - b. Flushing and cleaning of the system.
 - c. Wiring
 - d. Auxiliary connections
 - e. Lubrication.
 - f. Venting.
 - g. Controls.
 - h. Installation of filters and strainers.
 - i. Setting of relief and safety valves .
 - 2. All electrical testing must be completed and test results submitted before equipment startup to avoid power interruptions during mechanical equipment startup and testing.
 - 3. The Contractor shall submit at least 30 days in advance a schedule listing the date of completion of his work as it will be ready for equipment startup

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of Electrical/Plumbing equipment. This schedule shall include work on a system by system, floor by floor basis.

4. Two weeks prior to the startup of any major equipment, the Contractor shall certify in writing that the systems will be complete and ready for startup. Completeness shall not only include physical installation of individual pieces of equipment, but all related elements of other crafts to make all equipment operate as a system.
 - a. The startup checklist will cover all related crafts, e.g., controls, electrical, plumbing, and a clean environment for equipment startup.
5. The Contractor shall schedule a tour with the Owner's representative and the Engineer to review startup conditions prior to equipment startup. This tour shall take place during the associated Engineer's regularly scheduled visit. This tour does not relieve the Contractor of any responsibilities to properly start equipment. The Engineer will issue a notice of deficiencies that will be required to be corrected prior to equipment startup. The Contractor will be required to reschedule a back check with the Engineer prior to attempting an equipment startup.
6. Equipment of systems should not be started until systems and associated subsystems are completed. Verify that other continuing work could not possibly damage completed systems if they are in operation. Furnish signed off prestartup check sheet.

F. Startup and Commissioning:

1. System Startup and Operation:
 - a. The Contractor shall provide all labor, materials and services necessary for the initial startup and operation of all systems and equipment furnished and installed under this section.
 - b. The Contractor and the factory representative shall check all equipment during initial startup to insure correct rotation, proper lubrication, adequate fluids or air flows, nonoverloading electrical characteristics, proper alignment and vibration isolation. Systems shall be checked for water flows throughout without blockages. Plumbing systems shall be checked for proper connections and positions, nonexcessive electrical characteristics and minimal vibration. Other miscellaneous equipment shall be started and operated as described above as applicable. Manufacturer's representative shall submit a

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preliminary written copy of equipment startup check sheet prior to leaving job site.

- c. After initial startup and operation of systems, the Contractor shall submit a report, showing proper operation before commencement of the final "Operation Test".
- d. During initial operation of the system and until substantial completion, qualified personnel shall be provided and designated for maintaining the equipment and systems in good running order. Items such as strainers, cleanouts, packing replacement, and other consumables shall be provided without cost to the Owner. Failure of equipment during this period due to lack of proper supervision is the responsibility of the Contractor and continued failures shall be grounds for the Owner to provide such services with back charges to the Contractor. Submit written schedule of completed maintenance to the Engineer.

G. System Acceptance:

- 1. General: The system installation shall be complete and tested for proper operation prior to acceptance testing "Operation Test" for the Owners authorized representative. A letter shall be submitted to the Engineer requesting system acceptance. This letter shall certify that all controls are installed and the software programs have been completely exercised for proper equipment operation. Acceptance testing shall commence at a mutually agreeable time within ten (10) calendar days of request. When the field test procedures have been demonstrated to the Owner's representative and pass, the system will be accepted. The warranty period may begin at this time.

H. Operation Test:

- 1. Provide all labor, equipment, and materials required to perform test.
- 2. The test shall occur after all major equipment startup and balance services have been performed as specified. The purpose is to demonstrate that individual pieces of equipment and all related elements operate as one complete system and not to identify incomplete or defective work.
- 3. All equipment is to be run in an automatic operating position and exercised for 72 hours to verify that they perform in accordance with the specified sequence of operation and designed operation logic.

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4. The Engineer's representative shall be notified and may be present for the initiation of the test.
5. A log shall be prepared by the Contractor, to be submitted to the Engineer, of all tests including, but not limited to: time, temperatures, pressures, and other readings to prove all equipment is operating as specified.
6. All temperatures, pressures, status indication, etc., shall be verified by at least one other means of measurement or visual verification of condition.
7. Change set points and simulate conditions as directed to demonstrate:
 - a. Ability to control to new set point.
 - b. Interface between systems, fire alarm/fire sprinkler systems.
 - c. Proper sequence and operation.
 - d. Equipment safety systems and all automatic changeover/backup systems and alarms are functioning or will function.
8. If unsatisfactory performance or a system failure is experienced for any reason, the test shall be repeated until 72 hour consecutive hours are achieved. The Engineer's representative shall make all final decisions of a satisfactory test.

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SECTION 22 10 05 - PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Drains.
- B. Domestic water piping, above grade.
- C. Storm drainage piping, buried within 5 feet of building.
- D. Storm drainage piping, above grade.
- E. Natural gas piping, buried within 5 feet of building.
- F. Natural gas piping, above grade.
- G. Pipe flanges, unions, and couplings.
- H. Pipe hangers and supports.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
- C. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- D. Section 22 07 19 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing; 2019.
- B. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).
- C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- E. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

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- F. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.
- G. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2017.
- H. ASME B31.1 - Power Piping; 2022.
- I. ASME B31.9 - Building Services Piping; 2020.
- J. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2023.
- K. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Potable Water Distribution Systems; 2020.
- L. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- M. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.
- N. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023.
- O. ASTM B32 - Standard Specification for Solder Metal; 2020.
- P. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.
- Q. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- R. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.
- S. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- T. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- U. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2020.
- V. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2020.
- W. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

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- X. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- Y. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.
- Z. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2017.
- AA. AWWA C651 - Disinfecting Water Mains; 2014, with Addendum (2020).
- BB. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
- CC. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.
- DD. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- EE. MSS SP-67 - Butterfly Valves; 2022.
- FF. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- GG. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- HH. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- II. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.04 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.

1.05 QUALITY ASSURANCE

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- A. Perform Work in accordance with State of California, standards.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

1.06 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with State of California plumbing code.
- B. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.
- C. Conform to applicable code for installation of backflow prevention devices.
- D. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED

- A. Cast Iron Pipe: CISPI 301, hubless.
 - 1. Fittings: Cast iron.

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2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies. Heavy duty, Husky SD4000, .015 inch thick 304 stainless steel shield, 4-band coupling.

B. PVC Pipe: Schedule 40 Solid Core. ASTM D1785, ASTM D2665.

1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement and ASTM F656 primer.

2.03 DRAIN PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: Schedule 40 Solid Core. ASTM D1785, ASTM D2665.

1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement and ASTM F656 primer.

C. Copper Tube: ASTM B 306, DWV or ASTM B 88 (ASTM B 88M), Type M (C), Drawn (H).

1. Application: Condensate drains inside building (non-acidic).
2. Fittings: ASME B16.29, wrought copper, or ASME B16.23, solvent.
3. Joints: ASTM B32, alloy Sn50 solder.

D. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.

1. Application: Condensate drains outside building (non-acidic).
2. Threaded Joints: ASME B16.3 malleable iron fittings.

E. PVC Pipe: ASTM D2665.

1. Application: Condensate drains (acidic).
2. Fittings: PVC.

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3. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 WATER PIPING, BURIED

- A. Copper Pipe: ASTM B 42, hard drawn, Type K.
 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 2. Joints: ASTM B32, alloy Sn95 solder.
 3. Joints: For sizes 2" and larger, AWS A5.8M/A5.8, BCuP copper and silver braze.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 1. Fittings: ASME B16.18, cast copper alloy.
 2. Joints: For sizes 1-1/2" and smaller, ASTM B 32, alloy Sn95 solder.
 3. Joints: For sizes 2" and larger, AWS A5.8, BCuP5 silver braze.
- B. Provide full solder cup for all fittings.
- C. Schedule 40 Screwed Brass: Capped or plugged outlets.

2.06 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Storm drainage piping below grade to match sanitary drain piping below grade.

2.07 STORM DRAINAGE PIPING, ABOVE GRADE

- A. Storm drainage piping above grade to match sanitary drain piping above grade.

2.08 NATURAL GAS PIPING, BURIED BEYOND 5 FEET OF BUILDING

- A. Polyethylene Pipe: ASTM D2513, SDR 11.
 1. Fittings: ASTM D2683 or ASTM D2513 socket type.
 2. Joints: Fusion welded.

2.09 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

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1. Fittings: ASTM A234/A234M, wrought steel welding type.
2. Joints: ASME B31.1, welded.
3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2.10 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 1. Pipe size 2" and smaller: Malleable iron threaded fittings.
 2. Pipe size 2-1/2" and larger: Steel butt welded fittings.
 3. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 4. Joints: Threaded or welded to ASME B31.1.
- B. Flexible Gas Piping:
 1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.
 2. Comply with ASTM E84.
 3. Fittings: Provided by piping system manufacturer.

2.11 PIPE FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 2 Inches and Under:
 1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Sizes Over 2 inch:
 1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.12 PIPE HANGERS AND SUPPORTS

- A. See Section 22 05 29 for additional requirements.

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2.13 GAS PRESSURE REGULATING VALVES

- A. Provide single stage, steel jacketed, corrosion resistant gas pressure regulating valves with atmospheric vent and elevation compensator sized for inlet and outlet pressures , specific gravity and volume indicated on the drawings.
- B. Compliance requirements:
 - 1. Appliance Regulator: ANSI Z21.18/CSA 6.3.
 - 2. Line Pressure Regulator: ANSI Z21.80/CSA 6.22.
- C. For sizes 2" and smaller: threaded ends.
- D. For sizes 2-1/2" and larger: flanged ends.
- E. Provide high and low pressure cutout and internal relief for each regulator.

2.14 SEISMIC GAS SHUTOFF VALVES

- A. Manufacturers: Safetquake, Quakemaster or equal.
- B. Valve is fabricated of aluminum, incorporates a stainless steel ball and bubble level, is vertically mounted, has a single step manual reset lever, operates at ambient temperature range of -40 deg F to +150 Deg F, minimum pressure .5 psi and maximum allowable pressure of 60 psi.
- C. Valves actuates within 5 seconds when subjected to a horizontal sinusoidal oscillation having a peak acceleration of anyone of the following: (1) 0.70g and period of 0.13 second, (2) 0.40g and period of 0.20 second, (3) 0.30g and period of 0.40 second, (4) 0.25g and period of 1.00 second.
- D. Meets or exceeds California standard, ANSI (Z21 1995), California Office of State Architect (Label Numbers CA-OSA 19.49 and CA-OSA 27.02, IAPMO, UPC (file 3D94), AGA P-70-2A, U.L. Building and Safety RR 4996.

2.15 WATER PRESSURE REDUCING VALVES

- A. 2 inch and Smaller:
 - 1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
 - 2. Pressure Reducing Pilot-Operator:
 - a. Operating Range: 5 to 50 psi.

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- b. Connected into brass or bronze pilot piping and fittings.
 - c. Fixed flow restrictor, pressure gauges, and isolation valves.
- B. 2 inch and Larger:
 - 1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.
 - 2. Pressure Reducing Pilot-Operator:
 - a. Operating Range: 5 to 50 psi.
 - b. Connected into brass or bronze pilot piping and fittings.
 - c. Fixed flow restrictor, strainer, pressure gauges, and isolation valves.

2.16 PRESSURE RELIEF VALVES

- A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
- B. Temperature and Pressure:
 - 1. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME BPVC-IV certified and labelled.

2.17 STRAINERS

- A. Size 2 inch and Smaller:
 - 1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
 - 2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

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- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- 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 clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Provide anodeless transition riser at gas piping transition from below grade to above grade.
- J. All natural gas piping exposed to outdoors shall be primed and painted, color by architect.
- K. All ABS and PVC pipe material exposed to outdoors shall be primed and painted, color by architect.
- L. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
- M. Install valves with stems upright or horizontal, not inverted. See Section 22 05 23.
- N. Install water piping to ASME B31.9.
- O. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

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P. Sleeve pipes passing through partitions, walls, and floors.

Q. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.
2. Support horizontal piping as indicated.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Provide copper plated hangers and supports for copper piping.
7. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
8. Support cast iron drainage piping at every joint.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed, and clean.

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- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

- a. Pipe Size: 1/2 inch to 1-1/4 inch:
 - 1) Maximum Hanger Spacing: 6.5 ft.
 - 2) Hanger Rod Diameter: 3/8 inches.
- b. Pipe Size: 1-1/2 inch to 2 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.
- c. Pipe Size: 2-1/2 inch to 3 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 1/2 inch.
- d. Pipe Size: 4 inch to 6 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 5/8 inch.

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SECTION 23 05 10 - MECHANICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. References.
- B. Description of Work.
- C. Drawings and Specifications.
- D. Industry Standards and Codes.
- E. Site Examination.
- F. Permits, Fees and Utility Connections.
- G. Coordination of Work.
- H. Progress of Work.
- I. Submittals
- J. Operation and Maintenance Manuals.
- K. Project Record Documents.
- L. Warranty.
- M. Quality and Care
- N. Access Doors.
- O. Starting Equipment and Systems.

1.02 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

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1.03 REFERENCES

- A. ANSI - American National Standards Institute.
- B. ASTM - American Society for Testing Materials.
- C. CEC - California Electric Code.
- D. NEMA - National Electric Manufacturers' Association.
- E. NFPA - National Fire Protection Association.
- F. OSHA - Occupational Safety and Health Act.
- G. UL - Underwriters' Laboratories.
- H. See detailed References that are listed in individual sections.

1.04 DESCRIPTION OF WORK

- A. The work included in this division of the specifications consists of furnishing labor, tools, equipment, supplies and materials, unless otherwise specified, and in performing operations necessary for the installation of the complete Mechanical System as required by these specifications or shown on the Drawings, subject to the terms and conditions of the Contract Agreement.
- B. The work shall also include the completion of details of mechanical work not mentioned or shown which are necessary for the successful operation of mechanical systems described on the drawings or required by these specifications. Furnish and install any incidental work not shown or specified which is required to provide a complete and operational system.

1.05 DRAWINGS AND SPECIFICATIONS

- A. Drawings are schematic and diagrammatic. Drawings indicate the general arrangement of equipment, piping, ductwork and other mechanical work. Use judgement and care to install mechanical work to fit the job conditions within the building construction and finishes, and to function properly.
- B. The Contractor shall investigate the building conditions affecting the Work and shall arrange his work accordingly providing offsets, fittings, valves and accessories to fit the actual job conditions. The Contractor shall be responsible to field measure and confirm new and existing mechanical systems locations with respect to other architectural, structural, and electrical work, existing and new. Do not scale distances off of the mechanical drawings. Use actual building dimensions.

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- C. The drawings and specifications are complimentary each to the other. What is required by one shall be as binding as if called for by both.
- D. Examine all drawings and specifications prior to bidding the Work. Report any discrepancies to the Engineer.

1.06 INDUSTRY STANDARDS AND CODES

- A. The Mechanical Contractor shall comply with the latest provisions of all codes, regulations, laws and ordinances applicable to the work involved. This does not relieve the Contractor from furnishing and installing work shown or specified which may exceed the requirements of such codes, regulations laws and ordinances.
- B. All materials, products, devices, fixtures forms or types of construction included in this project shall meet or exceed the published requirements of the publications listed below. These publications form a part of this specification.
 - 1. California Building Code, 2022.
 - 2. California Mechanical Code, 2022.
 - 3. California Plumbing Code, 2022.
 - 4. California Electrical Code, 2022.
 - 5. National Fire Protection Association.
 - 6. California Fire Code, 2022.
 - 7. California State Fire Marshal.
 - 8. Occupational Safety and Health Administration, including CAL-OSHA.
 - 9. California Energy Code, 2022.
 - 10. California Green Building Standards Code, 2022.
 - 11. State of California Code of Regulations, Title 24.
 - 12. Other applicable state laws.
- C. Nothing in the Drawings or Specifications shall be construed to permit work that does not conform these codes. When Contract Documents differ from governing codes, furnish and install to the higher standard required at no extra charge. The Contract Documents are not intended to repeat the code requirements except where necessary for clarity.

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- D. No material or product installed as a part of the Work shall contain asbestos in any form.

1.07 SITE EXAMINATION

- A. Contractor shall examine the site, verify dimensions and locations with Drawings, check utility connection locations, and familiarize himself with the existing conditions and limitations. No extras will be allowed because of the Contractor's misunderstanding of the amount of work involved or his lack of knowledge of any site condition which may affect his work. Any apparent variance of the drawings or specifications from the existing conditions at the site shall be called to the attention of the Engineer immediately.

1.08 PERMITS, FEES AND UTILITY SERVICES

- A. Contractor shall pay for and obtain all permits and service required in the installation of this work.
- B. Contractor shall arrange for all required inspections and will secure approvals from authorities having jurisdiction.

1.09 COORDINATION OF WORK

- A. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the mechanical work, and in its interface with other work and that such establishment is the exclusive responsibility of the contractor.
- B. The Contractor shall give careful consideration to the work of the General, Electrical and other contractors on the job and shall organize his work so that it will not interfere with the work of other trades. He shall consult the drawings and specifications for work of other trades for correcting information, and the pertinent drawings for details and dimensions.
- C. Arrange mechanical work in a neat, well-organized manner with the piping, conduit, and similar services running parallel and/or perpendicular to primary lines of the building construction. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.
- D. Verify the location of all equipment, and devices, etc. and if interference develops, the Owner/Engineer's decision will be final and no additional compensation will be allowed for the moving of misplaced air devices or equipment.

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1.10 PROGRESS OF WORK

- A. This Contractor shall organize his work so that the progress of the mechanical work will conform to the progress of the other trades, and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from defective or ill timed work performed under this section shall be borne by this Contractor.

1.11 STRUCTURAL DESIGN REQUIREMENTS AND SEISMIC RESTRAINTS

- A. Mechanical systems and equipment shall be anchored and seismically braced in accordance with all applicable codes and industry standards.
- B. Mechanical systems and equipment shall include, but are not limited to, all piping, heating and ventilating equipment, electrical and control panels, conduits and other components.
- C. For all non-standard installations not detailed in one of the approved systems, the Contractor shall provide details of supports, anchorages and restraints, including attachments to building structure, with supporting calculations all stamped and signed by a licensed professional structural engineer registered in the state in which the Work is performed.

1.12 SUBMITTALS

- A. See Section 013300 - Submittal Procedures, for additional submittal procedures.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project.
- D. Organize submittals in sequence according to Specification Section. Submit in bound document with tabs identifying each Specification Section. Provide a Table of Contents identifying the Specifications Sections being submitted and the contents within each tabbed section. Prepare Submittals in multiple volumes if required. Provide a complete Submittal package at one time. Do not submit individual Sections piecemeal.
- E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

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- F. Furnish, upon request, installation instructions for all equipment and materials to Inspector of Record prior to installation.
- G. Maintain a copy of the fire and smoke damper installation instructions on site for use by the Inspector of Record.

1.13 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. LP Consulting Engineers, Inc. will consider requests for substitutions only within 7 days after date of Agreement.
- C. Substitutions may be considered when a product becomes unavailable through no fault of the .
- D. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.
- E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- F. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner and LP Consulting Engineers, Inc. for review or redesign services associated with reapproval by authorities including obtaining reapproval by authorities.
- G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

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- H. If excessive review, as judged by the Engineer, is required caused by complicated, numerous or repetitive requests, Contractor shall reimburse Engineer and its Consultants for such review at their standard billing rates.
- I. Substitution Submittal Procedure:
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 - 3. The LP Consulting Engineers, Inc. will notify in writing of decision to accept or reject request.
 - 4. Present each substitution individually. If a proposed substitute is not found to be acceptable, then the specified item shall be supplied.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01700 Closeout Submittals for Operation and Maintenance Manual requirements.
- B. Provide operating and maintenance instructions, diagrams and parts lists for all components of all mechanical systems and each piece of equipment furnished under these specifications.
- C. Operating and maintenance instructions shall be furnished for the following equipment and systems:
 - 1. Ventilating Systems.
 - 2. Air Conditioning Systems.
 - 3. Piping Systems.
 - 4. Temperature Controls Systems.
 - 5. Motors.
 - 6. Testing, Adjusting, and Balancing Reports.
- D. Provide manufacturer's model number, design data, capacities, etc. for each piece of mechanical equipment furnished as a part of the Work.
- E. The operating instructions shall include procedures for starting, stopping and emergency manual operation for all equipment and systems.

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- F. Provide maintenance instructions of each item of individual equipment including applicable maintenance data as recommended by the manufacturer, including frequency of lubrication, lubricants, inspections required, adjustment procedures, belt and pulley sizes, etc.
- G. Provide manufacturer's parts bulletins with part numbers for each item of equipment included in the Work. Parts bulletins shall be specific to the equipment provided. Extraneous information that does not apply to the equipment provided shall be eliminated from the literature.
- H. Include copies of test reports (startup, check, etc.) and inspections performed for each piece of equipment provided in the Work.
- I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- J. Provide supplier and manufacturer contacts, telephone numbers and addresses in the front portion of the operation and maintenance manual.

1.15 PROJECT RECORD DOCUMENTS

- A. See Section 017700 - Closeout Procedures.
- B. Provide red-lined drawings accurately showing location of equipment and devices and size and routing of ductwork. Include notes explaining installed condition for complete understanding.

1.16 QUALITY ASSURANCE

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from LP Consulting Engineers, Inc. before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

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- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

1.17 PROJECT CONDITIONS

- A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.18 WARRANTY

- A. See Section 01700 - Closeout Procedures, for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 QUALITY AND CARE

- A. All materials shall be new and in perfect condition when installed unless specifically indicated otherwise. Materials shall be tested within the Continental United States by an independent, nationally recognized testing agency and shall be listed in accordance with testing agency requirements. When not otherwise specified, all material shall conform to applicable National Standards (ANSI).
- B. All capacities, sizes and efficiency ratings shown on the drawing are minimum.
- C. Each category of material or equipment shall be of the same brand or manufacturer throughout the Work wherever possible.
- D. The quality of materials and equipment to be provided is defined by the brand names, manufacturers, model and catalog numbers listed on the Drawings and in the Specifications. Contractor shall provide each item listed, of the quality specified, or equal.
- E. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.
- F. Inspect and report concealed damage to carrier within their required time period.

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- G. Store materials in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect from dirt, water, construction debris, and traffic.
- H. Equipment which has been damaged, exposed to weather or is, in the opinion of the Engineer or Owner, otherwise unsuitable because of improper fabrication, storage or installation shall be removed and replaced by this Contractor at his expense.

2.02 ACCESS DOORS

- A. Coordinate access door requirements with Section 083113. The more stringent requirements shall govern.
- B. Provide access doors where access through floors, walls or ceilings is required to access mechanical, plumbing, control system components, fire dampers and fire alarm system components (such as smoke detectors, fire/smoke dampers, etc.) or other systems requiring access for maintenance, test or observation.
 - 1. Access doors requiring hand access or access for observation only shall be 14"x14" minimum usable opening.
 - 2. Access doors where entrance of a service person may be required shall be 24"x30" minimum usable opening.
- C. Established standard: Milcor of types listed below. Other acceptable manufacturers: CESCO, J.L. Industries, Karp, Larsen's, or equal. Comply with the following:
 - 1. Form doors and frames of welded, ground smooth steel construction, 14 gauge for doors, 16 gauge for frames. Provide prime coat finish except for stainless steel type.
 - 2. Concealed hinges to allow 175 degree opening.
 - 3. Locks: flush, screw driver operated cam lock(s).
 - 4. Provide anchoring devices suitable for the construction into which the doors are framed.
- D. Application (as applicable):
 - 1. In gypsum drywall walls and ceilings: Type DW.
 - 2. In ceramic tile walls: Type MS (stainless steel).

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3. In fire rated walls: Type Fire Rated (rating as required for wall or ceiling), self closing, 250 F in 30 min. temperature rating.

PART 3 EXECUTION

3.01 INSTALLATION

A. Access Doors

1. Coordinate the exact location of access doors to provide proper access to the item concealed. Obtain written approval for access door locations from Architect.
2. Coordinate installation of access doors with the trades performing the construction assemblies into which the access doors are placed.
3. Install all access doors neatly and securely, to open and close completely, and to operate freely and without binding. Install rated doors in accordance with their listing requirements.
4. Test operate all doors and make all adjustments required for satisfactory operation. Replace all damaged materials.
5. Install in accordance with manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with the requirements within this section.
- B. Test all piping with no leak or loss in pressure in accordance with the requirements within this section.

3.03 GENERAL TESTING REQUIREMENTS FOR MECHANICAL AND PLUMBING SYSTEMS

- A. Contractor shall assign a responsible person to be an independent representative to witness testing and to sign as witness of times, pressure and losses of testing media for all hydronic piping and duct testing.
 1. Test all piping as noted below with no leak or loss of pressure. Repair or replace defective piping until tests are accomplished successfully.
 2. Submit to the Engineer for review a log of all tests made which shall include time, temperature, pressure, water makeup and other applicable

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readings, necessary to indicate the systems have been operated and tested in the manner outlined in the construction documents.

3. After producing the specified test pressure, disconnect the pressurizing source; do not introduce further pressure for the duration of the test period, repair leaky piping and retest. Repeat the procedure until the entire system is proven tight.
- B. Test the following systems with the medium listed to the pressure indicated for the time period listed:
1. Hydronic Piping: Pressure=125 Psig / Medium= Water / Duration=4 Hours.

3.04 CUTTING AND PATCHING

- A. Submit written request in advance of cutting or alteration which affects:
1. Structural integrity of any element of Project.
 2. Integrity of weather exposed or moisture resistant element.
 3. Efficiency, maintenance, or safety of any operational element.
 4. Visual qualities of sight exposed elements.
 5. Work of Owner or separate Contractor.
- B. Execute cutting and patching to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.
- C. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new Products in accordance with requirements of Contract Documents.

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- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Code requirements , to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.05 PRIMING AND PAINTING

- A. Apply primer to all exposed ferrous metals that are not factory primed, factory finished, galvanized, stainless steel or anodized. Exposed black steel piping shall be primed and finish painted to match Architectural finish requirements.
 - 1. Primer shall be as recommended by the paint manufacturer for each specific application.
 - 2. Acceptable Products include: Fuller O'Brien Blox-Rust Metal All Purpose Primer, equivalent Rust-Oleum product, or equal. See Section 092216 for other acceptable products.
- B. Apply two coats of primer to metal surfaces of items to be insulated or jacketed, except ductwork and piping, or factory primed or finished.
- C. Preparation:
 - 1. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.
 - 2. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; seal stains and marks which cannot be completely removed using Devco KILSTAIN primers, shellac, or other coating acceptable to paint manufacturer any marks or defects that might bleed through paint finishes.
 - 3. Remove mildew from impervious surfaces by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow substrate to thoroughly dry.
 - 4. Galvanized Surfaces:
 - a. Remove surface contamination and oils by solvent cleaning in accordance with SSPC-SP 1 and allow to dry.

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- b. Apply Devoe MIRROLAC Galvanized Metal Primer in accordance with manufacturer instructions.
 - 5. Uncoated Steel And Iron Surfaces:
 - a. Remove grease, rust, scale, and dust from steel and iron surfaces using solvent in accordance with SSPC-SP 1.
 - b. Where heavy coatings of scale or contaminants are evident, hand tool clean in accordance with SSPC-SP 2 or use other approved SSPC SP method as needed.
 - 6. Shop Primed Steel Surfaces: Remove loose primer and dust. Sand and feather edges to smooth surface. Clean areas with solvent and spot prime bare metal surfaces with appropriate Devoe MIRROLAC metal primer or primer recommended by manufacturer.
- D. Application:
- 1. Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.
 - 2. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.
 - 3. Remove dust and other foreign materials from substrate immediately prior to applying each coat.
- E. Finish Painting: See Section 09900.

3.06 STARTING EQUIPMENT AND SYSTEMS/COMMISSIONING

- A. Start equipment and systems in accordance with manufacturer's written instructions..
- B. Adjust for proper operation within manufacturer's published tolerances.
- C. Demonstrate proper operation of equipment to Owner's designated representative.
- D. Description:
 - 1. Comply with all start up of mechanical and electrical equipment systems as required in the various sections and herein.

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2. Coordinate all testing and startup procedures with all other trades so that all non-mechanical and non-electrical work is completed and operational so that the specified testing can be performed.

E. Preliminary Work:

1. Prior to the startup, the Contractor shall ensure that the systems are ready to operate, and the following items have been completed and checked including but not limited to:
 - a. Proper motor and pump rotation.
 - b. Flushing and cleaning of the system.
 - c. Wiring
 - d. Auxiliary connections
 - e. Lubrication.
 - f. Venting.
 - g. Controls.
 - h. Installation of filters and strainers.
 - i. Setting of relief and safety valves .
2. All electrical testing must be completed and test results submitted before equipment startup to avoid power interruptions during mechanical equipment startup and testing.
3. The Contractor shall submit at least 10 days in advance a schedule listing the date of completion of his work as it will be ready for equipment startup of Electrical/Mechanical equipment. This schedule shall include work on a system by system, floor by floor basis.
4. Two weeks prior to the startup of any major equipment, the Contractor shall certify in writing that the systems will be complete and ready for startup. Completeness shall not only include physical installation of individual pieces of equipment, but all related elements of other crafts to make all equipment operate as a system.
 - a. The startup checklist will cover all related crafts, e.g., controls, electrical, mechanical, and a clean environment for equipment startup.

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5. The Contractor shall schedule a tour with the Owner's representative and the Engineer to review startup conditions prior to equipment startup. This tour shall take place during the associated Engineer's regularly scheduled visit. This tour does not relieve the Contractor of any responsibilities to properly start equipment. The Engineer will issue a notice of deficiencies that will be required to be corrected prior to equipment startup. The Contractor will be required to reschedule a back check with the Engineer prior to attempting an equipment startup.
6. Equipment of systems should not be started until systems and associated subsystems are completed. Verify that other continuing work could not possibly damage completed systems if they are in operation. Furnish signed off prestartup check sheet.

F. Startup and Commissioning:

1. System Startup and Operation:
 - a. The Contractor shall provide all labor, materials and services necessary for the initial startup and operation of all systems and equipment furnished and installed under this section.
 - b. The Contractor and the factory representative shall check all equipment during initial startup to insure correct rotation, proper lubrication, adequate fluids or air flows, nonoverloading electrical characteristics, proper alignment and vibration isolation. Systems shall be checked for air and/or water flows throughout without blockages. Air handling systems shall be checked for proper damper connections and positions, aligned and adjusted belt drives, proper lubrication, temporary air filters installed, nonexcessive electrical characteristics and minimal vibration. Other miscellaneous equipment shall be started and operated as described above as applicable. Manufacturer's representative shall submit a preliminary written copy of equipment startup check sheet prior to leaving job site.
 - c. After initial startup and operation of systems, the Contractor shall submit a report, showing proper operation before commencement of the final "Operation Test".
 - d. During initial operation of the system and until substantial completion, qualified personnel shall be provided and designated for maintaining the equipment and systems in good running order. Items such as strainers, cleanouts, filter replacement, bearing lubrication, packing

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replacement, and other consumables shall be provided without cost to the Owner. Failure of equipment during this period due to lack of proper supervision is the responsibility of the Contractor and continued failures shall be grounds for the Owner to provide such services with back charges to the Contractor. Submit written schedule of completed maintenance to the Engineer.

G. System Acceptance:

1. General: The system installation shall be complete and tested for proper operation prior to acceptance testing "Operation Test" for the Owners authorized representative. A letter shall be submitted to the Engineer requesting system acceptance. This letter shall certify that all controls are installed and the software programs have been completely exercised for proper equipment operation. Acceptance testing shall commence at a mutually agreeable time within ten (10) calendar days of request. When the field test procedures have been demonstrated to the Owner's representative and pass, the system will be accepted. The warranty period may begin at this time.

H. Operation Test:

1. Provide all labor, equipment, and materials required to perform test.
2. The test shall occur after all major equipment startup and balance services have been performed as specified. The purpose is to demonstrate that individual pieces of equipment and all related elements operate as one complete system and not to identify incomplete or defective work.
3. All equipment is to be run in an automatic operating position and exercised for 72 hours to verify that they perform in accordance with the specified sequence of operation and designed operation logic.
4. The Engineer's representative shall be notified and may be present for the initiation of the test.
5. A log shall be prepared by the Contractor, to be submitted to the Engineer, of all tests including, but not limited to: time, temperatures, pressures, and other readings to prove all equipment is operating as specified.
6. All temperatures, pressures, status indication, etc., shall be verified by at least one other means of measurement or visual verification of condition.
7. Change set points and simulate conditions as directed to demonstrate:

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- a. Ability to control to new set point.
 - b. Interface between systems, fire alarm/fire sprinkler systems.
 - c. Proper sequence and operation.
 - d. Equipment safety systems and all automatic changeover/backup systems and alarms are functioning or will function.
8. If unsatisfactory performance or a system failure is experienced for any reason, the test shall be repeated until 72 hour consecutive hours are achieved. The Engineer's representative shall make all final decisions of a satisfactory test.

END OF SECTION 23 05 10

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SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Strut systems for pipe or equipment support.
- B. Beam clamps.
- C. Pipe hangers.
- D. Pipe rollers and roller supports.
- E. Pipe supports, guides, shields, and saddles.
- F. Seismic bracing hardware.
- G. Nonpenetrating rooftop supports for low-slope roofs.
- H. Anchors and fasteners.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2022.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

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- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
- I. 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; 2018a.
- J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.
- L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).
- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- N. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
- C. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

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- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of mechanical work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
- D. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
- E. Fire Resistance: Provide hardware rated for 120 minutes resistance unless specifically indicated by the authority having jurisdiction.
- F. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.
 - 1. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
- G. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.
 - 1. Indoor Dry Locations: Use approved equivalent or galvanized steel unless otherwise indicated.
 - 2. Outdoor, Damp, or Wet-Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

2.02 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

- A. Strut Channels:
 - 1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
 - 2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
- B. Hanger Rods:

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1. Threaded zinc-plated steel unless otherwise indicated.
2. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Piping up to 4 inch: 3/8 inch diameter.
 - c. Piping larger than 4 inch: 1/2 inch diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch in length.

C. Channel Nuts:

1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

2.03 BEAM CLAMPS

- A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
- B. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- C. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.04 PIPE HANGERS

A. J-Hangers, Adjustable:

1. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
2. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.

B. Swivel Ring Hangers, Adjustable:

1. MSS SP-58 type 10, epoxy-painted, zinc-colored.
2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

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3. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.

C. Clevis Hangers, Adjustable:

1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.
2. Felt-Lined: MSS SP-58 type 1, zinc-plated, silicone-free carbon steel.
3. Light-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
4. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

2.05 PIPE CLAMPS

A. Riser Clamps:

1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.

B. Extension Split Pipe Clamp:

1. MSS SP-58 type 12, hinged split ring and yoke roller hanger with epoxy copper or plain finish.
2. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
3. Provide hanger rod and nuts of the same type and material for a given pipe run.
4. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

C. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

D. Strut Clamps:

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1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
2. Cushioned Pipe or Tubing Strut Clamp: Provide strut clamp with thermoplastic elastomer cushion having dielectric strength of 670 V/mil.

E. Insulation Coupling:

1. Two bolt-type clamps designed for installation under insulation.
2. Material: Carbon steel with epoxy copper or zinc finish.

2.06 PIPE ROLLERS AND ROLLER SUPPORTS

- A. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.
- B. Steel Yoke Type: MSS SP-58 type 44, vertically adjustable, nonconductive, and corrosion resistant.
- C. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

2.07 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

- A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- B. Stanchions:
 1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
 2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
 3. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.
- C. U-Bolts:
 1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.
- D. Pipe Alignment Guides, Galvanized steel:

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1. Pipe Sizes 8 inch and Smaller: Spider or sleeve type.
2. Pipe Sizes 10 inch and Larger: Roller type.

E. Pipe Shields for Insulated Piping:

1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
2. General Construction and Requirements:
 - a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
 - b. Shields Material: UV-resistant polypropylene with glass fill.
 - c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
 - d. Service Temperature: Minus 40 to 178 degrees F.
 - e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

F. Pipe Supports:

1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Liquid Temperatures Up to 122 degrees F:
 - a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
 - b. Support From Below: MSS SP-58 types 35 through 38.
3. Operating Temperatures from 122 to 446 degrees F:
 - a. Overhead Support: MSS SP-58 type 1 or 3 through 12 clamps with appropriate saddle of MSS SP-58 type 40 for insulated pipe.
 - b. Roller Chair: MSS SP-58 types 41 or 43 through 46 roller chair support with appropriate saddle of MSS SP-58 type 39 for insulated pipe.
 - c. Sliding Support: MSS SP-58 types 35 through 38.

G. Pipe Supports, Thermal Insulated:

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1. General Requirements:

- a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- b. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.
- c. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
- d. Provide pipe supports for 1/2 to 30 inch iron pipes.
- e. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.

2. PVC Jacket:

- a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
- b. Minimum Service Temperature: Minus 40 degrees F.
- c. Maximum Service Temperature: 180 degrees F.
- d. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
- e. Minimum Thickness: 60 mil, 0.06 inch.

2.08 SEISMIC BRACING HARDWARE

A. Cable Sway Bracing Systems:

- 1. Cable wire hanger with fix and release spring mechanism enclosed using zinc housing with 302 stainless steel components for pipe or equipment suspension to surface-mounted end-fixing fittings.
- 2. Provide cable wire and end-fixing as required to hold minimum weight of 100 lb.

B. NONPENETRATING ROOFTOP SUPPORTS FOR LOW-SLOPE ROOFS

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- C. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
- D. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
- E. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
- F. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
- G. ANCHORS AND FASTENERS
- H. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
- I. Concrete: Use preset concrete inserts or expansion anchors.
- J. Solid or Grout-Filled Masonry: Use expansion anchors.
- K. Hollow Masonry: Use toggle bolts.
- L. Hollow Stud Walls: Use toggle bolts.
- M. Steel: Use beam clamps, machine bolts, or welded threaded studs.
- N. Sheet Metal: Use sheet metal screws.
- O. Wood: Use wood screws.
- P. Plastic and lead anchors are not permitted.
- Q. Powder-actuated fasteners are not permitted.
- R. Hammer-driven anchors and fasteners are not permitted.
- S. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
- T. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - 1. Channel Material: Use galvanized steel.

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2. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- D. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- H. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

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- 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
- 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- J. Secure fasteners according to manufacturer's recommended torque settings.
- K. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 23 05 29

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SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Ceiling tacks.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.04 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Air Terminal Units: Nameplates.
- C. Control Panels: Nameplates.

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- D. Dampers: Ceiling tacks, where located above lay-in ceiling.
- E. Heat Transfer Equipment: Nameplates.
- F. Major Control Components: Nameplates.
- G. Piping: Pipe markers.
- H. Pumps: Nameplates.
- I. Small-sized Equipment: Tags.
- J. Tanks: Nameplates.
- K. Thermostats: Nameplates.
- L. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Seton Identification Products: www.seton.com/aec.

2.03 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: Air Handling Units, Control panels: 1 inch.
 - 3. Letter Height: All others: 1/4 inch.
 - 4. Background Color: Black.
 - 5. Plastic: Comply with ASTM D709.

2.04 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.05 PIPE MARKERS

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- A. Color: Comply with ASME A13.1.
- B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Secure to pipe using two (2) bands of adhesive tape with flow arrows supplied by the manufacturer. Install securing bands completely around pipe and overlapped.
- C. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

2.06 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
 - 1. Fire Dampers and Smoke Dampers: Red.
 - 2. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- D. Identify fans and filter boxes with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- E. Identify chilled/hot water equipment, including chillers, boilers, pumps, expansion tanks, air separators, etc. with plastic nameplates.
- F. Identify air conditioning units, air handling units, heating and ventilating units, exhaust fans, pumps, heat transfer equipment, tanks, fire/smoke damper

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access doors, and water treatment devices with nameplates. Small devices, such as terminal units, in-line pumps, may be identified with tags.

- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify thermostats/sensors relating to fan unit and/or zone unit with nameplates.
- I. Identify valves in main and branch piping with tags.
- J. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) 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.
- K. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 23 05 53

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SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Commissioning activities.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

1.03 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, with Errata (2017).
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.04 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component and include controls contractor to assist in testing, adjusting, and balancing procedures. Submit plan for each phase.
 - 1. Submit to LP Consulting Engineers, Inc..
 - 2. Submit to the Commissioning Authority.
 - 3. Submit four weeks prior to starting the testing, adjusting, and balancing work.
 - 4. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the

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LP Consulting Engineers, Inc. and other installers to sufficiently understand the design intent for each system.

5. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. List of all air flow measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - c. Completed planned test sheets listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - d. Single-line drawings with system test locations.
 - e. Identification and types of measurement instruments to be used and their most recent calibration date.
 - f. Detailed step-by-step procedures for TAB work for each system and issue, including:
 - 1) SA, RA, EA, OA, for each AHU.
 - 2) Economizer proportioning and VFD speed adjustments.
 - 3) Rechecking.
 - g. Confirmation of understanding of the outside air ventilation criteria under all conditions.
 - h. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
 - i. Method of checking building static and exhaust fan and/or relief damper capacity.
 - j. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
- C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

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1. Submit to LP Consulting Engineers, Inc. within 2 days after completion of testing, adjusting, and balancing.
 2. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 3. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 4. Units of Measure: Report data in I-P (inch-pound) units only.
 5. Test Reports: Indicate data on AABC MN-1 forms, forms prepared following ASHRAE Std 111, or NEBB forms.
 6. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Engineer.
 - g. Project altitude.
 - h. Report date.
- D. Test and balance shall be performed by an independent test and balance agency.
- E. Perform total system balance in accordance with AABC MN-1, ASHRAE Std 111, or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- F. TAB Agency Qualifications: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC or NEBB.
- G. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor experienced in performance of this Work and licensed at the .

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PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. SMACNA (TAB).
- B. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- C. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of three years documented experience.
 - 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 TESTING, ADJUSTING, AND BALANCING AGENCIES

- A. RS Analysis Inc.; www.rsanalysis.com; (888-330-1935).
- B. Mesa 3; www.mesa3.com; (408-928-3000).
- C. Raglen System Balance; www.raglensystembalance.com; (775-747-0100).

3.03 EXAMINATION

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- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 4. Duct systems are clean of debris.
 - 5. Fans are rotating correctly.
 - 6. Fire and volume dampers are in place and open.
 - 7. Air coil fins are cleaned and combed.
 - 8. Access doors are closed and duct end caps are in place.
 - 9. Air outlets are installed and connected.
 - 10. Hydronic systems are flushed, filled, and vented.
 - 11. Pumps are rotating correctly.
 - 12. Proper strainer baskets are clean and in place.
 - 13. Service and balance valves are open.
- B. Contractor to inspect ductwork and piping systems at 60% and 90% completion to verify systems are ready for testing and balancing.
- C. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- D. Beginning of work means acceptance of existing conditions.

3.04 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to LP Consulting Engineers, Inc. to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

3.05 ADJUSTMENT TOLERANCES

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- A. Air Handling Systems: Adjust total airflow(s) to within plus 10 percent and minus 5 percent of design.
- B. Air Outlets and Inlets: Adjust outlets and inlets in space to within plus 10 percent and minus 5 percent of design.
- C. Hydronic Systems: Adjust to within plus 10 percent and minus 5 percent of design.

3.06 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure 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 or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner.

3.07 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.

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- D. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- E. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- F. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- G. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

3.08 TITLE 24 TESTING

- A. Complete applicable Title 24 Acceptance Testing as delineated in contract drawings.

3.09 COMMISSIONING

- A. See Division 1, 22, 23 and 26 Commissioning specifications for requirements. Coordinate all requirements with Commissioning Agent.
- B. Perform prerequisites prior to starting commissioning activities.
- C. Assist Commissioning Agent in field verification of test and balance report.
- D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

3.10 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Air Handling Units.
 - 2. Fans.
 - 3. Air Filters.
 - 4. Air Inlets and Outlets.

3.11 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer.

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2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

B. Cooling Coils:

1. Location.
2. Service.
3. Manufacturer.
4. Air flow, design and actual.
5. Entering air DB temperature, design and actual.
6. Entering air WB temperature, design and actual.
7. Leaving air DB temperature, design and actual.
8. Leaving air WB temperature, design and actual.
9. Saturated suction temperature, design and actual.
10. Air pressure drop, design and actual.

C. Air Moving Equipment:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.

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7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Sheave Make/Size/Bore.
13. Number of Belts/Make/Size.
14. Fan RPM.

D. Return Air/Outside Air/Exhaust Air:

1. Identification/location.
2. Design air flow (determined by initial test)
3. Actual air flow.
4. Design return air flow (determined by initial test)
5. Actual return air flow.
6. Design outside air flow (determined by initial test)
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Actual mixed air temperature.

E. Duct Traverses:

1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.

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6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

END OF SECTION 23 05 93

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SECTION 23 07 13 - DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.
- C. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 23 31 00 - HVAC Ducts and Casings: Ductwork.

1.03 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- E. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- F. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- G. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

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- I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).
- J. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2021.
- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

1.05 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

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- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. Owens-Corning Fiberglas; Model [All Service Faced Duct Wrap].
 - 2. Knauf Insulation: www.knaufinsulation.com.
 - 3. Johns Manville: www.jm.com/#sle.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Duct Application: 2" thick, 3/4 pound density.
 - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

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3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

2.03 GLASS FIBER, RIGID

A. Manufacturer:

1. CertainTeed Corporation: www.certainteed.com/#sle.
2. Knauf Insulation: www.knaufinsulation.com.
3. Johns Manville: www.jm.com/#sle.
4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

B. Insulation: ASTM C612; rigid, noncombustible blanket.

1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent.
4. Density: 3.0 lb/cu ft.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

2.04 JACKETING AND ACCESSORIES

A. Aluminum Jacket:

1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.

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2. Thickness: 0.020 inch sheet.
3. Finish: Embossed.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.05 DUCT LINER

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com/#sle.
2. Knauf Insulation: www.knaufinsulation.com.
3. Johns Manville: www.jm.com/#sle.
4. Owens Corning Corp: www.owenscorning.com.

B. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket; impregnated surface and edges coated with acrylic polymer shown to be fungicidal and bacteria resistant by testing to ASTM G 21.

1. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
2. Duct Application (Indoors): 1" thick, 1-1/2 pound density.
3. Duct Application (Outdoors): 2" thick, 1-1/2 pound density.
4. Service Temperature: Up to 250 degrees F.
5. Acoustical Requirements
 - a. Sound absorption coefficients of the material (with and/or without erosion resistive coating) shall be greater than or equal to the coefficients listed in the specifications when tested under the specified conditions.
 - b. All acoustical measurements shall be performed in accordance with ANSI/ASTM C423 and shall be performed in the ASTM E795 mounting configuration as indicated.
 - c. An independent acoustical laboratory shall perform the tests.

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d. The sound absorption coefficient provided by the material shall meet or exceed the following values in each octave band listed:

6. Thickness, 1 inch Hz/Coefficient: 125/.05, 250/.20, 500/.65, 1k/.90, 2k/.95, 4k/.95.

C. Liner Fasteners: Galvanized steel, welded with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated Ducts Conveying Air Below Ambient Temperature:

1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated Ducts Conveying Air Above Ambient Temperature:

1. Provide with or with standard vapor barrier jacket.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 100 percent coverage.

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2. Secure insulation with mechanical liner fasteners. Liner shall start within 3 inches of the upstream transverse edges of the liner and 3 inches from the longitudinal joints, and shall be spaced at a maximum of 12 inches on center around the perimeter of the duct (except that they shall be a maximum of 12 inches from a corner break). Elsewhere, they shall be a maximum of 18 inches on center, except that they shall not be placed more than 6 inches from a longitudinal joint of the liner or 12 inches from a corner break. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
3. Seal and smooth joints. Seal and coat transverse and longitudinal joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are inside dimensions and do not include consideration for liner thickness.

3.03 SCHEDULES

- A. Supply and Return Ducts: Insulate all unlined supply ducts, except ducts exposed in conditioned spaces.
- B. Exterior Applications:
 1. Supply and Return Ducts exposed to outdoors to be internally lined except ductwork conveying direct evaporatively cooled air.
 2. Supply and Return ductwork exposed to outdoors for direct evaporatively cooling systems to be externally insulated. Cover insulation with with calked aluminum jacket with seams located on bottom side of horizontal duct section.
- C. Supply and Return Ducts: Install lining on ductwork and plenums where shown or noted on drawings.

END OF SECTION 23 07 13

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SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 23 21 13 - Hydronic Piping: Placement of hangers and hanger inserts.
- C. Section 23 23 00 - Refrigerant Piping: Placement of inserts.

1.03 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.
- C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.
- D. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2022.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.
- G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

2.02 GLASS FIBER, RIGID

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville Corporation: www.jm.com/#sle.
 - 3. Knauf Insulation: www.knaufusa.com.

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4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 1. "K" value: ASTM C 177:
 - a. 0.24 to 0.28 at 100 degrees mean rating temperature.
 - b. 0.25 to 0.29 at 125 degrees mean rating temperature.
 - c. 0.27 to 0.30 at 150 degrees mean rating temperature.
 - d. 0.29 to 0.31 at 200 degrees mean rating temperature.
 - e. 0.32 to 0.34 at 250 degrees mean rating temperature.
 2. Maximum Service Temperature: 850 degrees F.
 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- D. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
 1. Armacell LLC: www.armacell.us/#sle.
 2. K-Flex USA LLC: www.kflexusa.com/#sle.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 1. Minimum Service Temperature: Minus 40 degrees F.
 2. Maximum Service Temperature: 180 degrees F.
 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

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- D. Weather Barrier Coating: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.
- E. Insulation Exposed to the Weather: Finish with two coats Armstrong white Armaflex finish. Provide aluminum jacketing.

2.04 JACKETING AND ACCESSORIES

A. PVC Plastic.

- 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil, 0.010 inch.
 - e. Connections: Brush on welding adhesive.

B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.

- 1. Thickness: 0.016 inch sheet.
- 2. Finish: Embossed.
- 3. Joining: Longitudinal slip joints and 2 inch laps.
- 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
- 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

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- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert material: Pipe saddle.
- D. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 84 00.
- E. Pipe Exposed in Mechanical Closets or Finished Spaces: Finish with PVC jacket and fitting covers.
- F. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

3.03 SCHEDULE

- A. Heating Systems:
 - 1. Heating Water Supply and Return:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: 1 inches and smaller.
 - (a) Thickness: 1-1/2 inch.
 - 2) Pipe Size Range: 1-1/2 inches and larger.
 - (a) Thickness: 2 inch.

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B. Cooling Systems:

1. Chilled Water:

a. Glass Fiber Insulation:

- 1) Pipe Size Range: 1 inches and smaller.
(a) Thickness: 1 inch.
- 2) Pipe Size Range: 1-1/2" and larger.
(a) Thickness: 1-1/2 inch.

2. Refrigerant Suction:

a. Flexible Elastic Cellular Insulation:

- 1) Pipe Size Range: 3/4 inch and smaller.
(a) Thickness: 1 inch.
- 2) Pipe Size Range: 1 inch and larger.
(a) Thickness: 1.5 inch.

3. Refrigerant Hot Gas:

a. Flexible Elastic Cellular Insulation:

- 1) Pipe Size Range: 3/4 inch and smaller.
(a) Thickness: 1 inch.
- 2) Pipe Size Range: 1 inch and larger.
(a) Thickness: 1.5 inch.

END OF SECTION 23 07 19

COMMISSIONING FOR HVAC

SECTION 23 08 00 COMMISSIONING FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
- B. The Work of this Section is supplemental to and does not supersede any other requirements of the Contract Documents.

1.2 SUMMARY

- A. The commissioning process is described in Section 01 91 00 Commissioning.
- B. Provide all labor and materials required to complete the commissioning of those Division 23 systems and equipment identified as Commissioning Systems and Equipment in Section 01 91 00 Commissioning.
- C. Related Sections include:
 - 1. Section 01 91 00 Commissioning.
 - 2. All Sections of Division 23.

1.3 SUBMITTALS

- A. Refer to Section 01 91 00 Commissioning.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. Refer to Section 01 91 00 Commissioning.

PART 3 EXECUTION

3.1 COMMISSIONING RESPONSIBILITIES – COMMISSIONING PROVIDER

- A. Refer to Section 01 91 00 Commissioning.

3.2 COMMISSIONING RESPONSIBILITIES – SUBCONTRACTOR

- B. Refer to Section 01 91 00 Commissioning.

3.3 FACTORY ACCEPTANCE TESTING

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- A. Refer to Section 01 91 00 Commissioning.

3.4 MEETINGS

- A. Refer to Section 01 91 00 Commissioning.

3.5 INSTALLATION, CHECK-OUT, START-UP, AND PREFUNCTIONAL CHECKLISTS

- A. Refer to Section 01 91 00 Commissioning.

3.6 FUNCTIONAL TESTING

- A. Refer to Section 01 91 00 Commissioning.

3.7 INTEGRATED SYSTEMS TESTING

- A. Refer to Section 01 91 00 Commissioning.

3.8 TRAINING

- A. Refer to Section 01 91 00 Commissioning.

END OF SECTION 23 08 00

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SECTION 23 31 00 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ducts.
- B. Flexible ducts.
- C. Air plenums and casings.
- D. Ducts for kitchen exhaust applications.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 230713 - Duct Insulation.
- C. Section 23 33 00 - Air Duct Accessories.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 126 - Method of Testing HVAC Air Ducts; 2020.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.
- F. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- G. ASTM E2336 - Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems; 2020.

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- H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- I. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2021.
- J. NFPA 91 - Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids; 2020.
- K. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2021.
- L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2021.
- M. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.
- N. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- P. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.
- Q. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

1.04 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

1.05 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide data for duct materials.

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- C. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all ductwork systems. Provide 1/4"=1'-0" ductwork layout plans showing duct routing, offsets, fittings, duct accessories, fire/smoke dampers, hydronic piping, seismic bracing, etc. Shop drawings shall be fully coordinated with all other trades, including the building structure, finishes, fire sprinkler piping, plumbing piping, hydronic piping and electrical systems.
- D. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.07 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A, NFPA 90B, and SMACNA (DCS) guidelines unless stated otherwise.
- B. Ductwork to be galvanized steel unless otherwise indicated.
- C. Duct Sealing and Leakage in accordance with Static Pressure Class:
 - 1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
 - a. Supply Air: 2 in-wc pressure class, galvanized steel.
 - b. Outside Air Intake: 1/2 in-wc pressure class, galvanized steel.

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- c. Return and Relief Air: 1 in-wc 2 in-wc pressure class, galvanized steel.
 - d. General Exhaust Air: 1/2 in-wc pressure class, galvanized steel.
 - 2. Low Pressure Service: Up to 2 in-wc:
 - a. Seal: Class C, apply to seal off transverse joints.
 - 3. Low Pressure Service: From 2 in-wc to 3 in-wc:
 - a. Seal: Class B, apply sealing of transverse joints and longitudinal seams.
 - 4. Medium and High Pressure Service: Above 3 in-wc:
 - a. Seal: Class A, apply sealing of transverse joints, longitudinal seams, and duct wall penetrations.
- D. Duct Fabrication Requirements:
- 1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
 - 2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
 - 3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
 - 4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
 - 5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
 - 6. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.
 - 7. Exposed ductwork within occupied spaces shall be 20 gauge minimum.

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2.02 METAL DUCTS

A. Material Requirements:

1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
2. Stainless Steel: ASTM A666, Type 304.
 - a. Application: Kitchen exhaust.

B. Round Spiral Duct:

1. Round spiral lock seam duct with galvanized steel outer wall.
2. Manufacturers:
 - a. EHG, a DMI Company: www.ehgduct.com/#sle.
 - b. Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.
 - c. Linx Industries, Inc, a DMI Company: www.li-hvac.com/#sle.
 - d. MKT Metal Manufacturing: www.mktduct.com/#sle.

C. Connectors, Fittings, Sealants, and Miscellaneous:

1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
 - a. Manufacturers:
 - 1) Carlisle HVAC Products: www.carlislehvac.com/#sle.
 - 2) Ductmate Industries, Inc, a DMI Company
: www.ductmate.com/#sle.
 - 3) Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.
3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

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- a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - b. VOC Content: Not more than 250 g/L, excluding water.
 - c. Sealants intended for use outdoors to include UV inhibitors.
 - d. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
 - e. Manufacturers:
 - 1) Carlisle HVAC Products; Hardcast Duct-Seal 321 Indoor/Outdoor Water Based Duct Sealant: www.carlislehvac.com/#sle.
 - 2) Design Polymerics; DP 1010 Water Based Smooth Duct Sealant, Premium Quality: www.designpoly.com/#sle.
 - 3) Ductmate Industries, Inc, a DMI Company
: www.ductmate.com/#sle.
4. Gasket Tape:
- a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.
 - b. Manufacturers:
 - 1) Design Polymerics; DP 1040 100 Percent Solids, High Pressure/High-Velocity Butyl Gasket Tape: www.designpoly.com/#sle.
 - 2) Elgen Manufacturing Company, Inc; 440 Butyl Gasket Tape: www.elgenmfg.com/#sle.

2.03 FLEXIBLE DUCTS

A. Flexible Air Ducts:

- 1. UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound spring steel wire.
- 2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.

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3. Pressure Rating: From 4 in-wc positive to 0.5 in-wc negative.
4. Maximum Velocity: 4,000 fpm.
5. Temperature Range: Minus 20 to 210 degrees F.
6. Manufacturers:
 - a. JP Lamborn Co: www.jpflex.com/#sle.
 - b. Atco Rubber Products, Inc..

2.04 AIR PLENUMS AND CASINGS

- A. Fabricate in accordance with SMACNA (DCS) for indicated operating pressures indicated.
- B. Minimum Fabrication Requirements:
 1. Fabricate acoustic plenum or casing with reinforcing turned inward.
 2. Provide 16-gauge, 0.059-inch sheet steel back facing and 22-gauge, 0.029-inch perforated sheet steel front facing with 3/32 inch diameter holes on 5/32 inch centers.
 3. Construct panels 1 inches thick, packed with 4.5 pcf minimum glass fiber insulation media, on inverted channel of 16-gauge, 0.059-inch sheet steel.
- C. Access Doors:
 1. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
 2. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.

2.05 DUCTS FOR KITCHEN EXHAUST APPLICATIONS

- A. Provide ductwork, fittings, and appurtenances per NFPA 96, SMACNA (KVS), UL 1978, and UL 2221 requirements and guidelines.
- B. Class 1 duct for air with gas and grease particle exhaust at an air velocity of 1,500 to 2,500 fpm.
- C. Where ducts are not self-draining back to equipment, provide low-point drain pocket with the copper drain pipe to a sanitary sewer.

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D. Design, fabricate, and install liquidtight preventing exhaust leakage into building.

E. Dishwasher Exhaust Duct:

1. Duct Size: 1 in-wc pressure class stainless steel.
2. Fabricate using single wall, 16-gauge, 0.059-inch sheet steel with continuous external welded joints to form rectangular sections.

F. Kitchen Hood and Grease Exhaust Duct:

1. Fabricate in accordance with ductwork manufacturer's instructions, SMACNA (DCS), SMACNA (KVS), and NFPA 96.
2. Round, Single-Wall, Premanufactured Grease Exhaust Duct:
 - a. UL Listed and labeled to UL 1978.
 - b. Construct of 20-gauge, 0.035-inch Type 304 stainless steel.
3. Rectangular, Single-Wall, Premanufactured Grease Exhaust Duct:
 - a. UL Listed and labeled to UL 1978.
 - b. Construct of 16-gauge, 0.059-inch sheet steel using continuous external welded joints in rectangular sections.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install products following the manufacturer's instructions.
- C. Comply with safety standards NFPA 90A and NFPA 90B.
- D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.
- E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

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- F. Ductwork exposed to view outdoors shall be primed and painted, color by architect.
- G. Flexible Ducts: Connect to metal ducts with adhesive plus sheet metal screws.
- H. Flexible Ducts: Maximum length of single runout to air inlet or outlet to be 5 feet per CMC.
- I. Duct sizes indicated are outside dimensions. For lined ducts, duct sizes must be increased to account for lining.
- J. Seal all standing seams and transverse joints in all sheetmetal ductwork with Hardcast DT tape, 4 inches wide, and Hardcast FTA-20 adhesive.
- K. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- L. Use double nuts and lock washers on threaded rod supports.
- M. Connect diffusers boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
- N. Use stainless steel for ductwork exposed to view in Kitchen areas.
- O. Kitchen hood exhaust ductwork shall so be constructed and installed that grease cannot be pocketed in any portion thereof, and the system shall slope not less than 1/4 unit vertical in 12 units horizontal (2% slope) toward the hood or toward an approved grease reservoir.
- P. Kitchen hood exhaust ductwork shall be wrapped with a 2 hour fire resistive duct wrap designed for use specifically with kitchen grease ducts, installed in accordance with manufacturer's installation instructions.
- Q. Grease ductwork systems shall be leakage tested per CMC 510.5.3.1 and CMC 510.5.6. Perform light test: A light of no less than 100 watts is passed through the entire duct system, including the hood-to-duct connection. If any light shines through any portion of the ductwork in a darkened room, the hole must be found and welded so that the light is no longer visible.

END OF SECTION 23 31 00

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SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air turning devices.
- B. Backdraft dampers - metal.
- C. Combination fire and smoke dampers.
- D. Duct access doors.
- E. Duct test holes.
- F. Fire dampers.
- G. Flexible duct connectors.
- H. Volume control dampers.
- I. Miscellaneous Products:
 - 1. Damper operators.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 23 31 00 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- D. NFPA 92 - Standard for Smoke Control Systems; 2021.
- E. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2021.

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- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2021.
- G. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- H. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
- I. UL 555C - Standard for Safety Ceiling Dampers; Current Edition, Including All Revisions.
- J. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.
- K. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

1.04 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.
- D. Section 013300 - Submittals.

1.05 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

1.06 PROJECT RECORD DOCUMENTS

- A. Record actual locations of access doors and test holes.

1.07 QUALITY ASSURANCE

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

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- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES

- A. Manufacturers:
 - 1. ProRail, Ductmate Industries, Inc.
 - 2. Duro Dyne Corp.
- B. Manufactured turning vanes with 2" single thickness curved blades set at 1-1/2" on-center mounted in 2" vane rails, self-aligning, hot dipped galvanized steel.
- C. Turning vanes, vane rails and mounting shall be constructed and installed in accordance with the SMACNA "HVAC Duct Construction Standards".

2.02 BACKDRAFT DAMPERS - METAL

- A. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.
- B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.03 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers:
 - 1. Pottorff: www.pottorff.com/#sle.
 - 2. Ruskin Company: www.ruskin.com/#sle.
- B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
- C. Provide factory sleeve and collar for each damper.

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- D. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.
- E. Operators: UL listed and labelled oil immersed with spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft. Provide circuitry to activate pilot light on remote key (test) switch located in corridor ceiling adjacent to damper.
- F. All actuators for combination fire and smoke dampers or smoke dampers shall be rated for continuous "On" duty and shall have a cycle time requirement of no more frequently than every six months.

2.04 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
 - 2. Ruskin Company: www.ruskin.com/#sle.
 - 3. or equal.
- B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ducts, install minimum 1-inch thick insulation with sheet metal cover.
 - 1. High Temperature Duct Access Doors:
 - a. Comply with NFPA 96.
 - b. Comply with UL 1978.
- C. Access doors with sheet metal screw fasteners are not acceptable.

2.05 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.06 FIRE DAMPERS

- A. Manufacturers:

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1. Pottorff: www.pottorff.com/#sle.
 2. Ruskin Company: www.ruskin.com/#sle.
- B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C. Ceiling (Radiation) Dampers: Galvanized steel, 22-gauge, 0.0299-inch frame and 16-gauge, 0.0598-inch flap, two layers of 0.125-inch thick ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
1. Rated for three hour service in compliance with UL 555C.
- D. Horizontal Dampers: Galvanized steel, 22-gauge, 0.0299-inch frame, stainless steel closure spring, and lightweight, heat-retardant, non-asbestos fabric blanket.
- E. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1-inch pressure-class ducts up to 12 inches in height.
- F. Multiple Blade Dampers: 16-gauge, 0.0598-inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- G. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.07 FLEXIBLE DUCT CONNECTORS

- A. Manufacturers:
1. Carlisle HVAC Products: www.carlislehvac.com/#sle.
 2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections (Indoors): Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.
 - a. Net Fabric Width: Approximately 2 inches wide.
 2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.

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- D. Flexible Duct Connections (Outdoors): Fabric crimped into metal edging strip.
1. Fabric: Ventfabrics Ventlon UL listed fire-retardant duPont's Hypalon coated woven glass fiber fabric to NFPA 90A, minimum density 26 oz per sq yd, sunlight, ozone and weather resistant.
 - a. Net Fabric Width: Approximately 3 inches wide.
 2. Metal: 3 inches wide, 24 gage thick galvanized steel.

2.08 VOLUME CONTROL DAMPERS

- A. Manufacturers:
1. Nailor Industries, Inc: www.nailor.com/#sle.
 2. Ruskin Company: www.ruskin.com/#sle.
 3. United Enertech: www.unitedenertech.com/#sle.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Single Blade Dampers for Round Ductwork and Rectangular Ductwork up to 10 inches in Height: 18 gauge steel minimum.
- D. Multi-Blade Damper for Rectangular Ductwork: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware; Model CD35 Manufactured by Ruskin. Provide Ruskin Model CD50 for installation in medium pressure ductwork and/or ducts with velocities exceeding 1500 FPM.
- E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings, Ventlok Model 607. On multiple blade dampers, provide oil impregnated nylon or sintered bronze bearings.
- F. Quadrants:
1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.09 MISCELLANEOUS PRODUCTS

LP CONSULTING ENGINEERS
24-2053

Air Duct Accessories
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- A. Remote Balancing Damper Operator: Cable operated remote damper controller.
 - 1. Manufacturers:
 - a. Young Regulator Co.; www.youngregulator.com
 - 2. "Bowden" damper regulator with mounting bracket, hub and cable coupling.
 - 3. "Bowden" stainless steel operating cable and control wrench. Cable to be 50 foot length standard.
 - 4. Recessed control box with control shaft, cable coupling and cover plate.
 - 5. Provide options and accessories as needed for balancing damper.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 31 00 for duct construction and pressure class.
- B. Coordinate fire/smoke damper requirements with Division 26 and Division 28.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 14 by 14 inch size access door for hand and shoulder access, or as indicated on drawings.
- D. For concealed balancing dampers only where damper is inaccessible, provide Young Regulator "Bowden" cable operated damper controller.
- E. Provide duct test holes where indicated and required for testing and balancing purposes.
- F. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with

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required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

- G. Install combination smoke and fire dampers in accordance with NFPA 92A.
- H. Demonstrate re-setting of fire dampers to Owner's representative.
- I. Provide balancing dampers at points on supply, return, outside air and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION 23 33 00

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SECTION 23 34 23 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof exhausters.
- B. Ceiling exhaust fans.
- C. Inline centrifugal fans and blowers.
- D. Kitchen hood upblast roof exhausters.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.

1.03 REFERENCE STANDARDS

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- B. AMCA 99 - Standards Handbook; 2016.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.
- E. AMCA 211 - Certified Ratings Program Product Rating Manual for Fan Air Performance; 2022.
- F. AMCA 260 - Laboratory Methods of Testing Induced Flow Fans for Rating; 2020.
- G. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.
- H. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.
- I. AMCA 311 - Certified Ratings Program Product Rating Manual for Fan Sound Performance; 2016.

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- J. ANSI Z9.5 - Laboratory Ventilation; 2022.
- K. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- L. NFPA 91 - Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids; 2020.
- M. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2021.
- N. UL 705 - Power Ventilators; Current Edition, Including All Revisions.
- O. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.04 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.
- D. Section 013300 - Submittals.

1.05 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate installation instructions.
- D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.06 QUALITY ASSURANCE

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

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- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Protect units from physical damage by storing indoors or off site until roof mounting curbs or other mountings are in place, ready for immediate installation of units.

1.08 WARRANTY

- A. See Section 01700 - Contract Closeout, for additional warranty requirements.
- B. Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Greenheck Fan Corporation: www.greenheck.com/#sle.
- B. Loren Cook Company: www.lorencook.com/#sle.

2.02 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: Comply with AMCA 204.
- B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.
- C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.
- D. Fabrication: Comply with AMCA 99.
- E. UL Compliance: UL 705, listed, labeled, designed, manufactured, and tested.
- F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- G. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

2.03 ROOF EXHAUSTERS

- A. Product Requirements:

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1. Performance Ratings: Conform to AMCA 210 and bearing the AMCA Certified Rating Seal.
 2. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.
 3. Fabrication: Conform to AMCA 99.
 4. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- B. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
- C. Roof exhaust fans fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure. The fan shroud shall have a rolled bead for added strength.
- D. Motors shall be heavy duty ball bearing type, carefully matched to the fan load, and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted on vibration isolators, out of the airstream. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance.
- E. A disconnect switch shall be factory installed and wired from the fan motor to a junction box installed within the motor compartment.
- F. A fan conduit chase shall be provided through the curb cap to the motor compartment for ease of installation.
- G. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.
- H. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.
- I. Roof Curb: 12 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, and insulation.
- J. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.

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- K. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm gets attained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.
- L. See drawing schedule for additional optional equipment requirements.

2.04 CEILING EXHAUST FANS

- A. The fan wheel shall be of the galvanized steel, forward curved, centrifugal type. Wheels shall be dynamically and statically balanced.
- B. Motors shall be of the heavy duty type with permanently sealed ball bearings. The wheel shaft shall be ground and polished steel mounted in permanently sealed pillow block bearings. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the machined cast iron type, keyed and securely attached to the wheel and motor shafts. The motor pulleys shall be adjustable for final system balancing.
- C. All fans shall bear the AMCA Certified Ratings Seal for air performance.
- D. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- E. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing , resilient mounted motor.
- F. Disconnect Switch: Cord and plug-in housing for thermal overload protected motor and wall mounted switch.
- G. Grille: Aluminum with baked white enamel finish.
- H. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is reached with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.05 INLINE CENTRIFUGAL FANS AND BLOWERS

- A. Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with acoustic insulation, resiliently-mounted motor, gravity backdraft damper in discharge.
- B. Disconnect Switch: Cord and plug-in housing for thermal overload protected motor and wall mounted switch.

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- C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm gets reached with sheaves set at mid-position; fan shaft with self-aligning prelubricated ball bearings.
- D. Provide flexible duct connections at inlet and outlet of fan.
- E. Provide housed spring isolators for fan support.

2.06 KITCHEN HOOD UPBLAST ROOF EXHAUSTERS

- A. Direct Drive Fan:
 - 1. Fan Wheel:
 - a. Type: Non-overloading, backward inclined centrifugal.
 - b. Material: Aluminum, statically and dynamically balanced.
 - 2. Statically and dynamically balanced.
 - 3. Motors:
 - a. Open drip-proof (ODP).
 - b. Heavy duty ball bearing type.
 - c. Mount on vibration isolators or resilient cradle mounts, out of air stream.
 - d. Fully accessible for maintenance.
 - 4. Housing:
 - a. Construct of heavy gauge aluminum including curb cap, windband, and motor compartment.
 - b. Rigid internal support structure.
 - c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
 - d. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.
 - e. Provide breather tube for fresh air motor cooling and wiring.

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B. Shafts and Bearings:

1. Fan Shaft:
 - a. Ground and polished steel with anti-corrosive coating.
 - b. First critical speed at least 25 percent over maximum cataloged operating speed.
2. Bearings:
 - a. Permanently sealed or pillow block type.
 - b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
 - c. 100 percent factory tested.

C. Drive Assembly:

1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
2. Belts: Static free and oil resistant.
3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
4. Motor pulley adjustable for final system balancing.
5. Readily accessible for maintenance.

D. Disconnect Switches:

1. Factory mounted and wired.
2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
3. Positive electrical shutoff.
4. Wired from fan motor to junction box installed within motor compartment.

E. Roof Curb: 12 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, ventilated double wall, and factory installed nailer strip.

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- F. Drain Trough: Allows for single-point drainage of water, grease, and other residues.
- G. Options/Accessories:
 - 1. Clean Out Port: Removable grease repellent compression rubber plug allows access for cleaning wheel through windband.
 - 2. Roof Curb Extension: Vented curb extension where required for compliance with minimum clearances required by NFPA 96.
 - 3. Grease Trap:
 - a. Aluminum.
 - b. Built-in drain connection.
 - c. Container system to collect grease residue.
 - 4. Hinge Kit:
 - a. Aluminum hinges.
 - b. Hinges and restraint cables mounted to base sleeve.
 - c. Allows fan to tilt away for access to wheel and ductwork for inspection and cleaning.
 - 5. Heat Baffle: Prevents heat from radiating into motor compartment.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with stainless steel lag screws to roof curb. See drawings for additional mounting requirements.
- C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- D. Provide sheaves required for final air balance.
- E. Provide speed control on direct drive fans required for final air balance.
- F. Install backdraft dampers on inlet to roof exhausters.

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- G. Provide backdraft dampers on outlet from cabinet and ceiling exhaust fans and as indicated.

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SECTION 23 37 00 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers
- B. Registers/grilles
- C. Door grilles.
- D. Louvers:
- E. Gravity ventilators.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 09 91 23 - Interior Painting: Painting of ducts visible behind outlets and inlets.

1.03 REFERENCE STANDARDS

- A. ADC 1062: GRD - Test Code for Grilles, Registers & Diffusers; Air Diffusion Council; 1984.
- B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012 (Reapproved 2015).
- C. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021.
- D. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers; 2022.
- E. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2006 (Reaffirmed 2021).
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

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- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.
- I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- J. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2021.
- K. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2021.

1.04 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

1.05 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- C. Project Record Documents: Record actual locations of air outlets and inlets.

1.06 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Krueger-HVAC: www.krueger-hvac.com/#sle.
- B. Price Industries: www.price-hvac.com/#sle.
- C. Ruskin Company: www.ruskin.com/#sle.
- D. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com/#sle.
- E. Tuttle and Bailey: www.tuttleandbailey.com/#sle.

2.02 DIFFUSERS

- A. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.
- B. Fabrication: Steel or aluminum with baked enamel finish.
- C. Color by Architect.
- D. Accessories: Provide radial opposed blade, butterfly, combination splitter, and volume control damper; removable core, sectorizing baffle, safety chain, wire guard, equalizing grid, operating rod extension, and gaskets for surface mounted diffusers with damper adjustable from diffuser face.
- E. SEE DRAWINGS FOR DIFFUSER SPECIFICATIONS.

2.03 REGISTERS/GRILLES

- A. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.
- B. Fabrication: Steel or aluminum with baked enamel finish.
- C. Color by Architect.
- D. Accessories: Provide radial opposed blade, butterfly, combination splitter, and volume control damper; removable core, sectorizing baffle, safety chain, wire guard, equalizing grid, operating rod extension, and gaskets for surface mounted diffusers with damper adjustable from diffuser face.

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E. SEE DRAWINGS FOR REGISTER/GRILLE SPECIFICATIONS.

2.04 DOOR GRILLES

- A. Type: V-shaped louvers of 20 gauge, 0.0359 inch thick steel, 1 inch deep on 1/2 inch centers.
- B. Frame: 20 gauge, 0.0359 inch steel with auxiliary frame to give finished appearance on both sides of door, with factory prime coat finish.

2.05 COMBINATION LOUVERS

- A. Damper-combined, drainable louver:
- B. Size: As indicated on the drawings.
- C. Material: Extruded aluminum.
- D. Paint Finish and Color: To be selected by Architect from manufacturer's full range.
- E. Sleeve or Flange: Factory-mounted standard.
- F. Linkage: Concealed in frame.

2.06 GRAVITY VENTILATORS

- A. Hood Intake and Relief Gravity Ventilator:
 - 1. Manufacturers:
 - a. Greenheck Fan Corporation: www.greenheck.com/#sle.
 - b. Loren Cook Company: www.lorencook.com/#sle.
 - 2. General:
 - a. Low silhouette for intake and relief applications with natural gravity or negative pressure system(s).
 - b. Performance ratings and factory testing in accordance with AMCA 511 and AMCA 550.
 - c. Suitable for non-ducted applications.
 - d. Equipment to bear permanently affixed manufacturer's nameplate listing model and serial number.

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3. Hood and Base:
 - a. Material: Aluminum.
 - b. Hood Construction: Precision formed, arched panels with interlocking seams.
 - c. Vertical End Panels: Fully locked into hood end panels.
4. Birdscreen:
 - a. Fabricate in accordance with ASTM B221 (ASTM B221M).
 - b. Construction: 1/2 inch Galvanized mesh.
 - c. Horizontally mounted across hood intake area.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air tight connection.
- E. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.
- F. Paint ductwork visible behind air outlets and inlets matte black, see Section 09 91 23.

END OF SECTION 23 37 00

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SECTION 23 74 13 - PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING
UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged Heat Pump Unit.

1.02 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Division 16 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015, with Addendum (2016).
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- D. Unit shall be designed to conform to ASHRAE 15, latest revision, and in accordance with UL 1995.
- E. Units shall be UL tested and certified in accordance with ANSI Z21.47 Standard. Units may be ETL listed.
- F. New roof curbs shall be designed to conform to NRCA Standards.
- G. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

1.04 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

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- C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.

1.07 WARRANTY

- A. See Section 01700 - Contract Closeout, for additional warranty requirements.
- B. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- C. Provide a one year warranty to include coverage for refrigeration compressors.
- D. Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.
- E. Provide five year limited warranty for heat exchanger including materials only.
- F. Furnish one complete set of fan motor drive belts.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Packaged Air Conditioning Units

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1. The Carrier Corporation.
2. The Trane Company.
3. York International, Inc..
4. Daikin.

2.02 PACKAGED HEAT PUMP UNITS

A. General

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing hermetic scroll compressor(s) for cooling duty and heat pump for heating duty.
2. Factory assembled, single piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.
3. Unit shall use R-410a refrigerant.
4. Unit shall be installed in accordance with the manufacturer's instructions.
5. Unit must be selected and installed in compliance with local, state, and federal codes.
6. Unit shall meet ASHRAE 90.1 and IECC minimum efficiency requirements.
7. Unit shall be rated in accordance with AHRI Standards 210/240 and 340/360.
8. Unit shall be designed to conform to ASHRAE 15.
9. Unit shall be UL-tested and certified in accordance with ANSI Z21.47 Standards and UL or ETL-listed and certified under Canadian standards as a total package for safety requirements.
10. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
11. Unit internal insulation linings shall be resistant to mold growth in accordance with "mold growth and humidity" test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the "Erosion Test" in UL 181, as part of ASTM C1071.

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12. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
13. Roof curb shall be designed to conform to NRCA Standards.
14. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
15. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.
16. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.

B. Delivery, Storage, and Handling:

1. Unit shall be stored and handled per manufacturer's recommendations.
2. Unit shall only be stored or positioned in the upright position.

C. Operating Characteristics:

1. Unit shall be capable of starting and running at 125°F (52°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at $\pm 10\%$ voltage.
2. Compressor with standard controls shall be capable of operation down to 30°F (−1°C), ambient outdoor temperatures. Accessory Low Ambient controls are available if mechanically cooling at ambient temperatures below 30°F (−1°C).
3. Unit shall be capable of simultaneous heating duty and defrost cycle operation when using accessory electric heaters.

D. Unit Cabinet:

1. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces.
2. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 340/360 minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum 1/2-in. thick, 1 lb density, flexible

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fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the heat compartment.

3. Unit internal insulation linings shall be resistant to mold growth in accordance with "mold growth and humidity" test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the "Erosion Test" in UL 181, as part of ASTM C1071.
4. Condensate Pan and Connections:
 - a. Shall be a sloped condensate drain pan made of a non-corrosive material.
 - b. Shall comply with ASHRAE Standard 62.
5. Gas Connections:
 - a. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location.
6. Electrical Connections:
 - a. All unit power wiring shall enter unit cabinet at a single, factory-prepared, knockout location.
7. Component Access Panels (standard):
 - a. Cabinet panels shall be easily removable for servicing.

E. Coils:

1. Standard Aluminum Fin/Copper Tube Coils:
 - a. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
2. Optional Pre-Coated Aluminum-Fin Condenser Coils:
 - a. Shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments.
 - b. Corrosion durability of fin stock shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90.

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F. Refrigerant components:

1. Refrigerant circuit shall include the following control, safety, and maintenance features:
 - a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
 - 1) Refrigerant filter drier on each refrigerant circuit.
 - 2) Service gauge connections on suction and discharge lines.
 - 3) Suction line accumulator to provide protection in all operating modes from cooling, heating and reverse cycle switching. Standard on each refrigerant circuit.
2. Compressors:
 - a. Unit shall use fully hermetic, scroll compressors.
 - 1) Compressor motors shall be cooled by refrigerant gas passing through motor windings.
 - 2) Compressors shall be internally protected from high discharge temperature conditions.
 - 3) Compressors shall be protected from an overtemperature and over-amperage conditions by an internal, motor overload device.
 - 4) Compressor shall be factory mounted on rubber grommets.
 - 5) Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.
 - 6) Crankcase heaters shall be utilized on all models to protect compressor with specific refrigerant charge.

G. Filter section:

1. Shall consist of factory-installed, low velocity, throw-away 2-in. thick fiberglass filters.
2. Filters shall be standard, commercially available sizes.

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H. Evaporator fan and motor:

1. Evaporator fan motor:

- a. Shall have permanently lubricated bearings.
 - 1) Shall have inherent automatic-reset thermal overload protection or circuit breaker.
 - 2) Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating shall be required.

2. Evaporator fan:

- a. Blower fan shall be double inlet type with forward curved blades.
 - 1) Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.

I. Condenser Fans and Motors:

1. Condenser fan motors:

- a. Shall be a totally enclosed motor.
 - 1) Shall use permanently lubricated bearings.
 - 2) Shall have inherent thermal overload protection with an automatic reset feature.

2. Condenser fans:

- a. Shall be a direct driven propeller type fan and shall be dynamically balanced.

J. Special features, options, and accessories:

1. Head pressure control package:

- a. Controller shall control coil head pressure by condenser fan speed modulation or condenser fan cycling and wind baffles.
- b. Shall consist of solid state control and condenser coil temperature sensor to maintain condensing temperature between 90°F (32°C) and 110°F (43°C) at outdoor ambient temperatures down to -20°F (-29°C).

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2. Condenser Coil Hail Guard Assembly:
 - a. Shall protect against damage from hail.
 - b. Shall be louvered style design.
3. DDC Controls
 - a. Unit shall be provided with electro-mechanical controls for control by 3rd party BMS. If electro-mechanical control is not an option, factory onboard controller may be utilized as long as it meets the following conditions:
 - 1) Unit manufacturer unitary controller has BACnet MSTP interface for integration with 3rd party BMS
 - 2) All internal sensors and devices necessary for a complete sequence of operation, must be provided, installed, and wired by the unit manufacturer.
 - 3) All external sensors and devices need to be provided by the unit manufacturer and terminate on the unit manufacturer's controller. Field wiring by controls contractor.
 - 4) Unit Manufacturer unitary controller shall be able to meet the complete sequence of operation without the need for additional devices or integration by a 3rd party.
 - 5) Mechanical startup and commissioning must be performed by unit manufacturer.
 - 6) A certified factory technician must provide Integration support for Controls contractor.
4. Economizer:
 - a. Independent modules for vertical or horizontal return configuration shall be available. Vertical return modules shall be available as a factory-installed option.
 - b. Ultra low leak design meets California Title 24 and, ASHRAE 90.1 and IECC requirements.
 - c. Shall be capable of introducing up to 100% outdoor air.

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- d. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
 - e. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below setpoints if unit is provided with factory controller by the unit manufacturer. If unit is provided with electro-mechanical controls, unit is to be provided with belimo actuators at the economizer and no economizer controller as economizer control will be the responsibility of the control's contractor.
 - f. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
 - g. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1-2016 and IECC-2015 requirements.
 - h. Shall be designed to close damper(s) during loss-of-power situations with spring return built into motor.
 - i. Dampers shall be completely closed when the unit is in the unoccupied mode.
 - j. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
 - k. Combined minimum and DCV maximum damper position potentiometers with compressor staging relay.
 - l. On-board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, per California Title 24.
 - m. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory-installed only. Outdoor air sensor setpoint shall be adjustable and shall range from 40 to 100°F (4 to 38°C). Additional sensor options shall be available as accessories.
5. Propeller power exhaust:
- a. Power exhaust shall be used in conjunction with an integrated economizer.

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- b. Independent modules for vertical or horizontal return configurations shall be available.
 - c. Horizontal power exhaust shall be mounted in return ductwork.
 - d. Power exhaust shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0 to 100% adjustable setpoint on the economizer control.
6. Roof curbs (vertical):
- a. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
 - b. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.
7. Anti-short Cycle Timer:
- a. Shall prevent compressor short cycling by providing a 5-minute delay (± 2 minutes) before restarting a compressor after shutdown for any reason.
 - b. One device shall be required per compressor.
8. Electric Heat:
- a. Heating Section:
 - 1) Heater element open coil resistance wire, nickel-chrome alloy, 0.29 inches inside diameter, strung through ceramic insulators mounted on metal frame. Coil ends are staked and welded to terminal screw slots.
 - 2) Heater assemblies are provided with integral fusing in the single point box (if applicable) for protection of internal heater circuits not exceeding 48 amps each. Electric heaters use a combination of 24v control side break/auto-reset, line-break/non-resettable "one shot" limit switches to protect the unit against over-temperature situations. All heaters use magnetic heater contactors (24 v coil) and terminal block all mounted in electric heater control box (minimum 18 ga galvanized steel) attached to end of heater assembly.
9. Hinged Access panels:

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- a. Shall provide easy access through integrated quarter turn latches.
- b. Shall be on major panels of filter, control box, fan motor and compressor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 90A.
- C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.03 SYSTEM STARTUP

- A. Provide factory start-up and supervise installation by Contractor.

END OF SECTION 23 74 13

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SECTION 23 81 26 - SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air-source heat pumps.
- B. Forced air furnaces.
- C. Air cooled condensing units.
- D. Indoor air handling (fan and coil) units for ducted systems.
- E. Indoor air handling (fan and coil) units for ductless systems.

1.02 RELATED REQUIREMENTS

- A. Section 22 10 05 - Plumbing Piping: Includes indoor coil condensate drain.
- B. Section 23 31 00 - HVAC Ducts and Casings.
- C. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015, with Addendum (2016).
- C. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2019, with All Amendments and Errata.
- E. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- F. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017, with Addendum (2022).

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- G. ASHRAE Std 103 - Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; 2022.
- H. NEMA MG 1 - Motors and Generators; 2021.
- I. NFPA 54 - National Fuel Gas Code; 2021.
- J. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- K. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2021.
- L. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; 2019.
- M. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.
- N. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- F. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

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

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Mitsubishi Electric: www.mitsubishicomfort.com
- B. LG: www.lghvac.com
- C. Carrier Corporation: www.carrier.com/#sle.
- D. Trane Inc: www.trane.com/#sle.

2.02 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator; auxiliary electric heat.
 - 2. Heating: Natural gas fired.
 - 3. Cooling: Outdoor electric condensing unit with evaporator coil in central ducted indoor unit.
 - 4. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.

2.03 INDOOR AIR HANDLING UNITS FOR DUCTED SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.

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1. Air Flow Configuration: horizontal and upflow.
 2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.
 2. Motor Electrical Characteristics:
- C. Air Filters: 2 inch thick glass fiber disposable type arranged for easy replacement.
- D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
 2. Manufacturers: System manufacturer.

2.04 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
- B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
 2. Manufacturer: System manufacturer.

2.05 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
1. Comply with AHRI 210/240.

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2. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
 3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.
- B. Compressor: Hermetic, two speed 1800 and 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high-pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.
- C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
- D. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
1. Provide thermostatic expansion valves.
 2. Provide heat pump reversing valves.
- E. Operating Controls:
1. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.

2.06 GAS FURNACE COMPONENTS

- A. Heat Exchanger: Aluminized and stainless steel tubular type.
- B. Insulation: Foil-faced.
- C. Burner: Atmospheric type with adjustable combustion air supply,
1. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
 2. Combustion air damper with synchronous spring return damper motor.
 3. Non-corrosive combustion air blower with permanently lubricated motor.
- D. Burner Safety Controls:

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1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
 2. Flame Rollout Switch: Installed on burner box and prevents operation.
 3. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
 4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.
- E. Operating Controls:
1. Cycle burner by room thermostat to maintain room temperature setting.
 2. Supply fan energized from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation.
- F. Flue Termination: Concentric roof kit.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.
- C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.
- C. Install gas fired furnaces in accordance with NFPA 54.
- D. Provide vent connections in accordance with NFPA 211.
- E. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION 23 81 26

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SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 CONTRACT PROVISIONS

- A. The requirements of this Section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.02 SUMMARY

- A. This section describes the requirements for the electrical work includes, among others, the furnishing and installation of the following:
 - 1. Electrical service from the existing Main Switchboard to the building Distribution Panel(s), conduit and trenching, conductors.
 - 2. Power distribution system.
 - 3. Grounding system.
 - 4. Wiring systems including power wiring to plumbing and HVAC and other misc. appliances and equipment.
 - 5. Testing and commissioning for all electrical work installed under this contract and as described in these specifications and indicated on the drawings.
- B. Furnish and install all electrical equipment and systems as shown on the Drawings and as described in this Division of the Specifications to provide a complete and functional electrical installation. This work includes but is not limited to all material and labor required for installation of electrical and special systems complete as described herein this specification and drawings; and connections (and installation where not otherwise provided for) of electrical equipment furnished by others. Provide and install all items of equipment, devices, supports, etc., which are incidental to the major components shown on the Drawings or described in these Specifications.

1.03 DEFINITIONS

- A. The meaning of words shall be as defined in the CEC Article 100, Definitions, unless defined otherwise in an individual specification section.
- B. The following specification development organizations are referenced throughout the various specification sections of Division 26:
 - 1. ADAAG – Americans with Disabilities Act Accessibility Guidelines.

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2. ANSI – American National Standards Institute.
3. AQMD – Air Quality Management District.
4. ASTM – American Society for Testing and Materials.
5. CBC – California Building Code.
6. 10. CCR – California Code of Regulations Title 24 State Chapters.
7. 11. CEC – California Electrical Code.
8. 12. CFC – California Fire Code.
9. 15. EIA – Electronic Industries Association.
10. 16. FCC – Federal Communications Commission.
11. 19. ICEA – Insulated Cable Engineers Association.
12. 20. IEC – International Electromechanical Commission.
13. 21. IEEE – Institute of Electrical and Electronic Engineers.
14. 24. ISO – International Organization for Standardization.
15. 27. NECA – National Electrical Contractors Association.
16. 28. NEMA – National Electrical Manufacturing Association.
17. 29. NETA – National Electrical Testing Association.
18. 30. NFPA – National Fire Protection Association.
19. 32. OSHA – Occupational Safety and Health Administration.
20. 34. UL – Underwriters Laboratories.

1.04 RELATED WORK INCLUDED IN OTHER DIVISIONS

- A. Finish painting except factory applied finishes and repair of factory finishes shall be provided in accordance with appropriate sections of this Specification. Coordinate "painting" requirements of this Division with other trades as required to assure timely and satisfactory completion of required work. In finished areas, all exposed raceway, boxes, galvanized steel box covers (where allowed), and other electrical "structure" shall be finished to match adjacent structures. Verify that all raceway openings are closed and box covers are in place prior to finishing work done by others.

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- B. Examine the drawings and specification for mechanical and plumbing equipment and provide electrical installation for heating, ventilation and air conditioning equipment, motors, and associated motor starters and controls as described Division 23.
- C. Examine the Architectural drawings and specification for electrical appliances and equipment which may not be shown on the plans to include and provide electrical installations as described in the architectural division of work.
- D. Examine the Architectural drawings and provide all construction necessary to maintain the integrity of the fire rated barriers.
- E. Examine the Architectural drawings and coordinate with the Architect to provide access doors, whether shown on drawings or not, where floors, walls, or ceiling must be penetrated for access to electrical equipment, outlet boxes, devices, etc., and as specified in this specification.
- F. Provide and install, as part of the work described in this Division, all power and control wiring fed from a source of 30 Volts or more (i.e. all wiring except temperature control wiring) for mechanical equipment described in Division 23.

1.05 APPLICATION OF OTHER DIVISIONS

- A. Where carpentry, masonry, concrete work, painting, etc., is required in the installation of equipment specified under this Division, the work shall be done in accordance with the applicable Division of these Specifications. This work could include for example: work associated with panelboard installation, equipment pads or bases, support structures, etc.

1.06 DRAWINGS AND SPECIFICATIONS

- A. The information presented in these Specifications, and on the drawings, is intended to describe the utilitarian and physical aspects of the systems shown as well as the quality of the entire installation. All information is as complete and thorough as possible, but every condition or situation cannot be anticipated. Exact locations, dimensions, elevations, etc. must be determined "on the job" with careful attention to the "intent" of the Drawings and Specifications.
- B. The above paragraph shall not be construed as to allow significant deviation from either the Drawings or Specifications without prior approval of the Architect, but minor changes in conduit routing or equipment locations may be required or desired due to specific conditions encountered. This work shall be accomplished in accordance with these Specifications and no "extra charges" are to be created for any unanticipated labor or material.

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- C. Any error or omissions of detail in either the drawings or the specifications shall not relieve the Contractor from correctly installing all materials necessary for complete and operating electrical systems.
- D. Contractor shall inspect the site and verify all measurements and conditions. No extra compensation will be allowed because of differences between work shown on the drawings and measurements at the site.
 - 1. The Drawings are diagrammatic in nature, but the locations of devices, equipment, outlets, and lighting fixtures are shown approximately where installations are intended. Architectural, structural, mechanical, audio/video, theatrical lighting and other drawings shall be examined, noting all conditions that may affect this work. Report conflicting conditions to the Architect/Engineer for adjustment before proceeding with the work. Should the Contractor proceed with work without reporting the matter, he does so on his own responsibility and shall alter work if directed by the Architect/Engineer at his own expense.
- E. Examine the architectural, structural, mechanical, fire sprinkler and manufacturer's drawings for various equipment in order to determine exact routing and final terminations for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment enclosure.
- F. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Owner reserves the right to require minor changes in location of outlets or equipment, prior to rough in without incurring any additional cost or changes.
- G. If significant departures from the Drawings or Specifications are considered necessary by the Contractor, details of the changes and the reasons therefore shall be submitted to the Architect as within thirty days after award of contract. Prior written acceptance of the Architect is required for these departures.
- H. Clarification of plans and specifications for the purpose of facilitating construction, but not involving additional labor and materials, may be prepared during construction by the Architect/Engineer. Said revised plans and specifications shall become a part of the contract. The Contractor shall conform to the revised plans and specifications at no additional cost to the Owner.

1.07 CODES, STANDARDS, RULES AND REGULATIONS

- A. All work and materials shall be in full accordance with the latest rules, codes, and/or regulations and not limited to the following:

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- B. NFPA 70 - National Electrical Code; National Fire Protection Association, 2020 with 2022 California Electrical Code amendments
- C. NFPA 101 - Life Safety Code
- D. NFPA 72 - Fire Alarm Code
- E. Title 24 - State of California Administrative Code
- F. California Building Code (CBC)
- G. City or County Electrical Code as applicable.
- H. Utility rules and regulations.
- I. Any applicable additional codes and regulatory documents effective at the project site.
- J. Nothing on the Drawings or in the Specifications shall be construed to allow work not in conformance with these rules, codes, and regulations.
 - 1. The Drawings and/or Specifications shall take precedence where work and material described therein exceeds that required by rules, codes, or regulations.

1.08 MANUFACTURER'S INSTRUCTIONS

- A. Follow the manufacturer's instructions when specific installation or connection details are not indicated or specified on the contract documents.
- B. Notify the Architect/Engineer of conflicts between the manufacturer's instructions and installation or connection details prior to the installation of materials.

1.09 WORKMANSHIP

- A. High quality workmanship shall be evidenced in the installation of all electrical equipment and materials. Use the National Electrical Contractors Association's "Standard of Installation" as a guide to the workmanship required. Be prepared to replace or repair any material or equipment damaged by or installed in a manner exhibiting evidence of poor workmanship.

1.10 COORDINATION WITH OTHER TRADES

- A. Examine the Electrical Drawings and refer to the Drawings and Specifications describing other work to be accomplished. Verify and coordinate prior to bid. Continue to coordinate work planning and all work in the field to avoid conflicts,

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errors, and/or delays. No compensation will be allowed for extra work necessitated by lack of coordination.

1.11 AUTHORITY OF THE ARCHITECT

- A. As used in this paragraph only, the word "Architect" shall mean the Architect of record or his designated representative.
- B. The authority of the Architect shall be absolute with respect to all performance under this Specification. In case of dispute, the decision of the Architect shall be final.
- C. Where optional materials, methods, or installation techniques are allowed under the provisions of this Specification, they may be used at the discretion of the Architect. The Architect may require specific materials, methods, or techniques to be used in specific situations where use of other materials, methods, or techniques might in his judgment result in loss of aesthetics, accidental damage, life safety hazard, or loss of utility over the system design lifetime.
- D. No additional charges will be allowed for work or material require to be supplied under the conditions of this paragraph unless the need for such material or work could not have been anticipated by thorough study of the site, Drawings, and Specifications and knowledge of all applicable codes, laws, and ordinances.

1.12 EXAMINATION OF THE SITE

- A. The contractor is required to visit the site of construction prior to bid to determine existing conditions and their effect upon the work he will be required to perform. No additional compensation will be allowed for any extra expenses incurred by failure to detect and evaluate all existing conditions that will affect his work to be included in the bid to accomplish this contract document's goal.

1.13 STRUCTURAL REQUIREMENTS

- A. Secure all anchors for electrical equipment in a manner, which will not decrease the structural value of any structure to an unsafe level. Install all equipment, fixtures, etc. to resist seismic movements. Inform the Architect in advance and provide drawings of any proposed modifications to the structure that involves cutting or patching of concrete, masonry, steel, or wood in this project.

1.14 PERMITS, FEES, AND, INSPECTIONS

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- A. Obtain all permits and licenses as required and pay all fees incidental to construction.
- B. Inspections required by prevailing Local Authorities, and/or ordinances, shall be coordinated and arranged by the contractor. Provide the Architect with a schedule of inspections, where applicable, and submit all certificates of inspection to the Architect.
- C. The Contractor shall cooperate with the Architect and shall provide assistance at all times for the inspection of the electrical work. Remove covers, operate equipment, or perform any reasonable work, which, in the opinion of the Architect, will be necessary to determine the quality or adequacy of the work. Work shall not be closed in or covered before inspection and approval by the Architect. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor. If any material does not conform with these specifications the Contractor shall, within three days after being notified by the Architect, remove the materials from the premises.

1.15 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and equipment to project site in manufacturer's original packaging with labeling showing product name, brand, model, project name, address, and Contractor's name. Store in a location as agreeable to the Owner. Secure material from weather or accidental damage.

1.16 SEQUENCING AND SCHEDULING

- A. Sequence work under provisions of Division 1.
- B. Coordinate the incoming electrical, telephone and cable television services with the local serving utility companies. Install utility service trench and duct systems in accordance with the respective serving utility company requirements.
- C. Coordinate hand hole locations with the existing site conditions. Hand holes are to be located approximately five feet from building or as indicated on drawings.

1.17 SHORT CIRCUIT AND PROTECTIVE DEVICE COORDINATION STUDY

- A. The contractor shall provide short circuit, protective device and arc flash studies for the complete electrical distribution system. Submit to the Electrical Engineer of Record for review. Provide all short circuit device and equipment characteristic information for all electrical components. Provide Time-Current curves for all overcurrent protective devices in the submittal. Set and adjust all devices in accordance with the results of this study prior to energizing equipment. Refer to Section 26 05 73, Power Systems Studies for additional

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requirements.

- B. The Contractor shall be responsible for obtaining all pertinent information necessary in order to perform the required short circuit, protective device coordination and arc flash studies to include but not limited to the following:
 - 1. Contacting the serving power utility to obtain the available short circuit current at the project point of connection and/or secondary of the serving utility company service transformer(s).
 - 2. Field investigation to determine the short circuit current rating for any existing electrical service and distribution equipment.
 - 3. Electrical characteristics for all proposed new electrical service and distribution equipment.
 - 4. The Contractor shall provide approved permanent labels for all electrical service and distribution equipment to clearly identify the available short circuit current and arc flash energy levels and required PPE (Personnel Protective Equipment).

1.18 OPERATING INSTRUCTIONS

- A. Instruct the Owner as to function, operation, maintenance, and adjustment of each system and piece of equipment provided.

1.19 RECORD DRAWING

- A. The Contractor shall keep a separate set of Electrical Drawings at the job site to be used as RECORD Drawings. These Drawings are to be kept current and in a neat and clean condition at all times. They are to be available for inspection by the Architect or Engineer at any time during site visitations. These Drawings shall be "red lined" to indicate all changes in equipment, device, and outlet locations; and to indicate the true locations of all concealed or underground work where different from that shown on the Drawings. Each sheet of this set shall be clearly and permanently marked "RECORD DRAWINGS".
- B. Upon completion of the project and prior to final payment, transfer all RECORD DRAWINGS information to the provided original drawings. All information shall be clearly drawn with "RED" ink. The drawings shall be scanned, 100% edited, and converted into an AutoCAD ".dwg" version 2018 (or higher) electronic file. Deliver the original, final sets, and electronic files (CD) to the Architect for review and delivery to the Owner.

1.20 SPARE PARTS

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- A. Spare parts shall be provided and maintained by the Contractor to support the maintenance response requirements defined in this document.
- B. At a minimum, the following spare parts shall be stored onsite at a location identified by the Owner's representative. The spare parts shall be the property of the Owner. The spare parts shall be of the same type submitted and installed in the facility to include the following:
 - C. Lighting fixture LED driver, one for each fixture type.
 - D. Branch circuit panelboard circuit breaker, one for each circuit breaker type.
 - E. Fuses, one set of three for each fuse type and size.
 - F. Lighting occupancy sensors and switches, one for each sensor and switch type.

1.21 GUARANTEE

- A. All electrical work, material, and equipment shall be guaranteed to be free from defects in workmanship or material for a period of two (2) year from the date of final acceptance. Repair or replace all such defects in a timely manner and any damage to the owner's property resulting from such defect or repair thereof. All equipment and material provided and all work accomplished under the requirements of this section shall be at no expense to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Unless specifically indicated otherwise, all material shall be new and free from defects; it shall be listed by Underwriters' Laboratories where applicable. Like items shall be of the same manufacturer (except lighting fixtures - which shall be as specified).
- B. Except as noted otherwise, where material of a particular manufacturer is specified, the intent is to describe the quality and function of the item. The term "...or acceptable equal" is implied. A substitution of any of these items will require that the item be presented in a submittal whether specifically listed in the "Submittals" paragraph below or not.

2.02 SUBMITTALS

- A. Material submittals shall be complete and submitted all at the same time. The individual groups of submittal types (e.g.: lighting fixtures, wiring devices, distribution equipment, etc.) MUST be prefaced with a list of contents

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identifying each item by its project name or symbol, manufacturer, and complete catalog number. Each copy of each submittal group shall have the list of contents attached. These lists will be used to report submittal comments.

The Contractor is responsible for submitting this information in a timely manner so that material may be ordered early enough to meet the construction schedule. If material is not ordered in time for whatever reason, pay such premium prices and special handling charges as are required to meet the construction schedule. No substitution of an "accepted" item will be allowed due to failure to plan for adequate material procurement lead time.

- B. Shop drawings shall be drawn to scale or completely dimensioned and shall give all information required to completely describe the item. The Contractor shall carefully check all the shop drawings for compliance with these specifications and the Plans.
- C. If the shop drawings show variations from the Contract requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in order that if (acceptable) suitable action may be taken for proper adjustment of the Contract. The Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract, even though the shop drawings have been reviewed.
- D. Work requiring shop drawings shall not be started before receipt of the Architect's review and acceptance.
- E. The Architect's/Engineer's review of the submitted materials, items and shop drawings are for general compliance with the plans and specifications and general design and arrangement only. Therefore, it shall not relieve the Contractor from responsibility for errors of any sort in the materials, items, shop drawings or schedules. The Contractor shall verify all dimensions and job site conditions affecting the work, and shall be responsible for furnishing and installing the proper materials required by the Contract, whether or not indicated on the drawings and specifications.
- F. As a minimum, submittals are required for the following items:
 - 1. RACEWAY COMPONENTS
 - 2. WIRE AND CABLE
 - 3. PANELBOARDS
 - 4. PULL BOXES
 - 5. SAFETY SWITCHES, DISCONNECTS AND CIRCUIT BREAKERS

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2.03 SUBSTITUTIONS

- A. Specific brand names and catalog numbers are used to describe materials in order to establish of performance and quality.
- B. Only one substitution will be considered for any item. Substitute materials must be equal in quality and function to that specified. Allowance of a substitution does not permit any reduction of system performance or utility, and the Contractor is responsible for additional costs incurred due to use of a substituted item. If the proposed substitute item is "rejected", the specified item shall be provided (re-submittal required) without further discussions or delay.
- C. Any Contractor's proposed substitution of material, article, or method in the opinion of the Architect/Engineer are equal to that specified will be accepted, provided the Contractor submits a single written request, in triplicate, to the Architect, with the following information for each item:
 - D. Name of Manufacturer or supplier.
 - E. Trade or brand names.
 - F. Type, model, style, and/or catalog number.
 - 1. Size or capacity rating.
- G. After receipt of a written request from the contractor, the engineer of record will review product substitutions fourteen (14) days prior to the bid date. If system substitutions are submitted after the award of the project contract, the analysis for the whole system substitution will be charged to the contractor at senior engineer hourly rates.
- H. The decision of the Architect/Engineer shall govern as to what is equal to the item specified in the plans and specifications. Equality will be judge on the basis of the following:
 - 1. Conformance with description or performance required.
 - 2. Equal in quality.
 - 3. Comparable in appearance and artistic effect where these are in considerations.
 - 4. Comparable operation, maintenance and performance.
 - 5. Equal in longevity and service under conditions of climate and usage.

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6. Conformance with space allocations and requirements for operations from in details and construction of related work.
7. Conformance with all applicable codes and regulations.
- I. If the Architect/Engineer considers it necessary, tests to determine the quality of the proposed materials shall be made, at the expense of the Contractor, by an unbiased laboratory, satisfactory to the Architect.

2.04 ENCLOSURES

- A. Provide enclosures suitable for the specific type of location in which they are installed.
 1. Provide NEMA 1 or NEMA 12 boxes and enclosures for dry locations. Dry locations are all indoor areas that do not fall within the definitions below for wet or damp locations.
 2. Provide NEMA 3R boxes and enclosures for wet locations. Wet locations are all locations exposed to weather, whether under a roof or not.
 3. Provide NEMA 4 boxes and enclosures for damp locations. Damp locations are all indoor spaces wholly or partially underground or any area subject to water spray.
 4. Provide NEMA 4X, stainless steel enclosures in all kitchen and wash down areas.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All equipment shall be set square and plumb, securely mounted, adequately supported, and permanent. Provide workspace around items of electrical equipment as required by California Electrical Code (CEC). In general, equipment is to be installed in accordance with manufacturer's instructions; but the requirements of these specifications shall take precedence where conflicts exist.
- B. WIRING METHODS: The cables and conductors of all systems specified in the Specification are required to be installed in raceway.
- C. Coordinate electrical work with the Owner's representative and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the facility during construction.

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- D. Check and coordinate the approximate locations of electrical stub-ups, light fixtures, electrical outlets, equipment, and other electrical system components shown on the Drawings for conflicts with openings, structural members, and components of other systems and equipment having fixed locations. In the event of conflicts, notify the architect in writing. The architect's decision shall govern. Make modifications and changes required to correct conflicts as required.

3.02 ELECTRICAL WORK FOR EQUIPMENT PROVIDED UNDER OTHER SECTIONS

- A. Install power conductors and terminate on equipment provided under other specification sections. Verify specific requirements.
- B. Install and terminate electrical controls as described on the Electrical Drawings (For mechanical equipment specified in Division 23).
- C. Line voltage control wiring of exhaust fans is to be accomplished under this Division. The controlling device may be specified elsewhere.
- D. Provide and install all disconnect/safety switches and motor starters except those devices specified to be furnished with equipment specified elsewhere.
- E. Unless provided for in another Division, install all items of electrical equipment provided by others.
- F. Assist others in equipment testing to verify that wiring and connections made under this Division are correct.

3.03 EQUIPMENT IDENTIFICATION

- A. Nameplates shall be installed on all items of electrical equipment as follows: switchboard(s) and switchboard circuit breakers, panelboards, terminal cabinets, time switches, contactors, motor control switches, wall switches (where noted on the Drawings), motor starters provided under this Division where the function is not immediately obvious, and safety switches.
- B. The nameplate shall identify the item by Drawing name where applicable and describe its use or function in this installation.
- C. Permanently mark all utility outlets to show source of power panel and circuit breaker number.
- D. Provide nameplates per Section 26 05 53.

3.04 EXCAVATION AND BACKFILL

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- A. Excavation and backfill shall be accomplished as required for installation of electrical equipment as shown on the Drawings. Restore all surfaces, roadways, walks, etc., and any existing underground structures which might be disturbed during this work to their original condition in a manner acceptable to the Architect.
- B. Trenches shall be straight except where otherwise indicated. Depth shall be as noted on the Drawings and at least as required to provide the minimum cover specified by applicable codes and regulations for the equipment installed. Bottom of trench shall be smooth and free of any rock points. Place a 4" sand bed in trench if these conditions cannot be met with native material.
- C. Backfill shall be clean and free of rocks and debris. Backfill is to be tamped in 6" layers to nominal 95% compaction using a mechanical tamper manufactured specifically for this purpose. In an area of engineered fill or other area of specified compaction, backfill shall be compacted to match that specified for that area.
- D. At a depth of 12" below finished grade and at least 6" above installed equipment, lay a 6" wide yellow warning tape on the compacted backfill for the full length of the trench. Do not stretch the tape. Use Brady "Identoline" stating: "CAUTION BURIED ELECTRICAL LINE". Installation under building slabs is not required unless noted otherwise.
- E. If at any time during a period of one-year dating from the date of final acceptance of the project, there shall be any settlement of conduit trenches, the Architect may notify the Contractor to immediately provide additional fill and to make such repairs or replacements in paving, planting, or structures, as may be deemed necessary at the Contractor's expense.
- F. Cooperate and coordinate with others in planning for and execution of all trench work.
 - 1. The Contractor is expected to exercise due care when excavating in an area of existing utilities to avoid damage to these facilities. Where it can be determined that underground facilities are likely to exist (either from the Drawings or inspection of the site), the Contractor is required to determine the exact locations of these existing installations. Damage to existing facilities, due to failure to properly accomplish the above, shall be repaired at the Contractors expense to the approval by the Architect and satisfaction of the Owner.
 - 2. CALL AN UNDERGROUND SERVICE FIRM BEFORE TRENCHING, CALL U.S.A. (800) 624-2444.

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3.05 SEALING PENETRATIONS

- A. Flash and counter flash roof and wall penetrations with equipment manufactured for the purpose and as described in other Divisions of these Specifications or as Directed by the Architect. Apply mastic as required to seal absolutely watertight.
- B. Conduits penetrating floor slabs or block or concrete walls shall be grouted and sealed watertight.

3.06 CUTTING AND PATCHING

- A. Obtain the Architect's acceptance prior to cutting existing surfaces or surfaces under construction. All such surfaces must be repaired or patched to the satisfaction of the Architect.

3.07 EQUIPMENT ANCHORING

- A. Seismic Withstand Requirements: Freestanding or wall-hung equipment shall be anchored in place by methods, which will meet the requirements of the applicable codes for seismic loads. The CONTRACTOR shall submit calculations in accordance with "Contractor Submittals", for the design of the anchoring systems for all equipment, including panels, transformers, etc. in excess of 250 pounds. Calculations shall be performed, signed and stamped by a Structural Engineer or a Civil Engineer experienced in structural design and licensed in the State of California. The calculation shall provide an analysis of lateral and overturning forces and shall include a factor of safety against overturning equal to 1.5. The calculation shall also provide an analysis of both the anchoring system and the foundation or wall system to receive the anchor loads and shall show that the foundation is capable of resisting all anchor loads. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria.
- B. Seismic bracing for light fixtures cable or pendant suspended from ceiling or roof structure shall be seismically braced to prevent fixture from swaying 45 degree in either direction of suspension point. Contractor shall use same cable used to suspend light fixture. Where pendants are use the contractor shall use air craft light fixture suspension cable. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria referred to in above paragraph.

3.08 HOUSEKEEPING PADS AND FOUNDATIONS

- A. Concrete work required for housekeeping pads and foundations shall be provided by General Construction Work.

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- B. Furnish required dimensional drawings and specify locations for all equipment pads and foundations. Minimum height of housekeeping pads shall be four inches and shall extend out six inches from the footprint of the equipment. Extend pad dimensions where required to maintain accessibility and meet all code requirements.
- C. Furnish anchor bolts and sleeves, verify accuracy of installation.
- D. Provide housekeeping pads for the following:
 - 1. Outdoor distribution panels.
 - 2. Other equipment as required or as noted on the drawings.

3.09 PROTECTION CLEANING AND REPAIRS

- A. All electrical equipment shall be protected from damage or degradation during construction. Electrical equipment stored or installed shall be protected from dust, water, or damage from other sources.
- B. After all other work has been accomplished, such as plastering, painting, etc., and prior to final review by the Architect; all electrical equipment, especially equipment enclosures, panelboards, switchboards, and lighting fixtures shall be thoroughly cleaned (inside and out) of all dirt, water, grease, plaster, paint, or other construction debris. All surfaces shall be clean and in "new" condition. All scratches, dents, marks, cracks, etc., shall be repaired to the satisfaction of the Architect or the equipment shall be replaced at no additional cost.

3.10 ELECTRICAL EQUIPMENT DELIVERABLES

- A. Retain and safeguard all detachable and spare devices, equipment, and literature (O&M manuals, instruction books, wiring diagrams, test reports, keys, fixtures, etc.) until completion of work. At this time, all items will be delivered to the Owner as directed by the Architect.

3.11 TESTS

- A. Prior to energization of equipment, check the insulation resistance of listed circuits, with a 500 volt "Megger".
- B. Take precaution during the testing period to insure the safety of personnel and equipment.
- C. Test all wiring for continuity and grounds before any fixtures or equipment are connected. Where such tests indicate faulty installation or other defects, the fault(s) shall be located and repaired at the Contractor's expense. The repaired

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installation shall then be retested.

- D. Verify rotation of all three phase motors and reconnect if necessary.
- E. Verify the resistance of the grounding electrode system(s).
- F. Balance all loads on each panelboard and all other types of distribution equipment as applicable.

3.12 ADJUSTING

- A. Inspect all equipment and put into good working order.

3.13 CLEANING

- A. Clean work under provisions of Division 01.
- B. Clean all electrical items. Fixtures and equipment shall be free of dirt, dust and other construction debris.

3.14 START UP

- A. Operate all electrical systems in good working order for a period of five consecutive days at a time period agreed to by the Owner's representative.

END OF SECTION 26 05 00

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SECTION 26 05 05 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.
- B. The requirements of this Section are in addition to the requirements of Division 1 – General Conditions and Supplementary Conditions.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00-Common Work Results for Electrical.

1.03 SUBMITTALS

- A. Sustainable Design Documentation: Submit certification of removal and appropriate disposal of abandoned cables containing lead stabilizers.

1.04 REQUIREMENTS INCLUDED

- A. The Contractor shall furnish materials, equipment, and labor necessary to perform and complete demolition work.
- B. The work includes demolition of the existing electrical system and equipment.
- C. The work shall include, but not limited to. Removal of existing electrical equipment and devices, conduits, and wiring.
- D. Manufactured articles, materials, equipment, and accessories shall be demolished in accordance with the manufacturer's specifications and recommendations, and industry standards.
- E. Notify the Owner's Representative at least 72 hours prior to any electrical systems shutdown and receive approval prior to proceeding.

1.05 PROTECTION

- A. It is essential that there be minimal interruption of existing systems such as power, fire protection, and other systems, in addition to the normal operations of the Owner's facilities.
- B. Take care to ensure that there will be no damage to structural elements or portions there-of-which are not to be removed. Erect and maintain temporary shoring, bracing and other means to safeguard the structural integrity of the existing building(s) and structures.

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- C. Erect and maintain temporary bracing, shoring, lights, barricades, signs, and other means to protect the public, workers, and other persons; finishes, and improvements to remain; and adjoining property from damage from demolition work; all in accordance with applicable regulatory requirements.
- D. Protect existing structures, facilities, and plant life from damage. Items damaged as a result of demolition operations shall be repaired or replaced, at no cost to the Owner.
- E. Perform demolition to provide the least interference and most protection to existing facilities and improvements to remain.
- F. Demolish concrete in small sections.
- G. Perform demolition as much as possible with small tools.
- H. Jackhammering:
 - 1. Jackhammering will be permitted only to a limited degree, and only with the prior written approval of the Owner.
 - 2. Do not jackhammer within 2-inches of reinforcing or structural steel to remain; remove final 2-inches of material with chipping gun.

1.06 CUTTING AND PATCHING

- A. Make new openings neat, as close as possible to profiles indicated, and only to extent necessary for new work.
- B. Do not cut or alter structural members unless specifically indicated or approved, and do not damage reinforcing or structural steel to remain.
- C. At concrete, masonry, paving, and other materials where edges of cuts and holes will remain exposed in the completed work, make cuts using power-sawing and coring equipment. Do not over cut at corners of cut openings – saw overruns will not be permitted. Core hole at corner of proposed openings to insert blade and chip square.
- D. Upon completion of cutting and coring, clean remaining surfaces of loose particles and dust.
- E. Repair and patch all holes and openings from the removed electrical equipment, outlet boxes, etc.: Coordinate with the General Contractor and Architect to include and provide finishes to match adjacent surfaces.

1.07 PIPES, DUCTS AND CONDUITS

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- A. Remove deactivated electrical conduits, including fasteners, connections, and other related appurtenances and accessories which would otherwise be exposed in the completed work or interfere with construction operations.
- B. Unless noted otherwise, remove existing exposed conduits and abandon existing concealed conduits in walls, ceilings and underground whether shown on drawings or not.
- C. Cap deactivated piping systems at point of cutoff.

1.08 DEMOLITION DEBRIS

- A. All demolished equipment and associated materials must be disposed of in an approved manner and in accordance with all applicable federal, state and local laws.
- B. Regularly remove debris from the site so that it's presence will not delay the progress of the work.
- C. Nothing removed from the site shall be stored, sold, or burned on site without the Owner's prior written acceptance.

1.09 RECONDITIONING EXISTING SUBSTRATES

- A. Clean surfaces on which new materials will be applied, removing adhesives, bitumen, and other adhering materials, as necessary to furnish acceptable substrates for new materials.
- B. Perform sandblasting, chipping, grinding, acid washing, etching, and other work as required by conditions encountered and new materials involved.
- C. Use of acids or other cleaning agents shall include neutralizing, washing, rinsing, and drying, as applicable.
- D. Determine substrate requirements for reconditioned surfaces in cooperation with the manufacturer's representative and installer of each new installer involved.

1.10 DISPOSAL OF FLUORESCENT LAMPS AND BALLASTS

- A. All existing fluorescent lamps and ballasts shall be properly disposed or recycled according to the Environmental Protection Agency (EPA) and Resource Conservation and Recovery Act (RCTA) standards. Include all costs for disposal or recycling in the bid proposal.

- 1. Lamps: Dispose or recycle through "Allied Technology Group", 47375 Fremont Blvd., Fremont, CA, 94538, (510) 490-3008 or equal.

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2. Ballasts: Dispose or recycle through "Fulcircle Ballast Recyclers", 550 Montori Court, Pleasanton, CA, 94556, (510) 417-5967 or equal.

1.11 ASBESTOS

- A. In the event asbestos is found to be present in areas conflicting with electrical work, before continuation of work in these areas, notify the General Contractor and/or Owner's Representative and if applicable, for the removal of such hazardous material by a certified asbestos contractor.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on field observation and existing record documents.
- D. Report discrepancies to Architect and Owner before disturbing existing installation.
- E. Report discrepancies to Electrical Engineer on Record before disturbing existing installation.
- F. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make

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switchovers and connections. Minimize outage duration.

1. Obtain permission from Owner Representative at least 24 hours and receive approval before partially or completely disabling system.
2. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
 1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
 2. PCB- and DEHP-containing lighting ballasts.
 3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove abandoned panelboards and distribution equipment.
- G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- I. Repair adjacent construction and finishes damaged during demolition and extension work.

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- J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- K. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or that are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION 26 05 05

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SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Scope: furnish all labor, materials, equipment, and incidentals required to install wire and cable for a complete operable electrical system as shown on the drawings and as described in the specifications.
- B. Section Includes:
 - 1. Single conductor building wire
 - 2. Metal-clad cable.
 - 3. Wire and cable for 600 volts and less.
 - 4. Wiring connectors.
 - 5. Electrical tape.
 - 6. Heat shrink tubing.
 - 7. Oxide inhibiting compound.
 - 8. Wire pulling lubricant.
 - 9. Cable ties.
 - 10. Firestop sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00-Common Work Results for Electrical.
- B. Section 26 05 05 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 31 23 33: Trenching and backfilling.

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1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).
- F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018.
- G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- H. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); 2008a (Validated 2019).
- I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- J. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- K. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- N. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

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- O. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.
- P. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- Q. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- R. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- S. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
- T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- U. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

- 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
- 2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
- 3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
- 4. Notify Electrical Engineer of Record of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- B. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.

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- C. Product Data: Provide for each cable assembly type.
- D. Test Reports: Indicate procedures and values obtained.
- E. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.
- F. Field Quality Control Test Reports.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
- J. Project Record Documents: Record actual locations of components and circuits.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. All wire and cable shall comply with applicable standards of the Underwriters Laboratories Inc.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

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- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify the Electrical Engineer or Record and obtain direction before proceeding with work.

1.09 PROJECT CONDITIONS

- A. Existing Conditions
 - 1. Wire and cable routing shown on the Drawings is approximate unless dimensioned. Route wire and cable as required to meet project conditions.
 - 2. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.
- B. Verify that field measurements are as shown or indicated on the Drawings.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Metal-clad cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet.
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.

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2. In addition to other applicable restrictions, may not be used:
 - a. Unless approved by the Owner.
 - b. Where not approved for use by the authority having jurisdiction.
 - c. Where exposed to view.
 - d. Where exposed to damage.
 - e. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
 - f. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.
 - g. For patient care areas of health care facilities requiring redundant grounding.
- D. Concealed Dry Interior Locations: Use only building wire in raceway.
- E. Exposed Dry Interior Locations: Use only building wire in raceway.
- F. Above Accessible Ceilings: Use only building wire in raceway.
- G. Wet or Damp Interior Locations: Use only building wire in raceway.
- H. Exterior Locations: Use only building wire with Type THWN/THW insulation in raceway.
- I. Underground Installations: Use only building wire with Type THWN/THW insulation in raceway.
- J. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- K. Use stranded conductors for control circuits.
- L. Use conductor not smaller than 12 AWG for power and lighting circuits.
- M. Use conductor not smaller than 14 AWG for control circuits.
- N. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
- O. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 150 feet.
- P. Conductor sizes are based on copper unless indicated as aluminum or "AL".

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2.02 WIRE MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

- A. Cerro Wire LLC: www.cerrowire.com.
- B. Industrial Wire & Cable, Inc: www.iewc.com.
- C. Southwire Company: www.southwire.com.
- D. Or approved equal.

2.03 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide conductors and cables with lead content less than 300 parts per million.
- D. Provide new conductors and cables manufactured not more than one year prior to installation.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- F. Comply with NEMA WC 70.
- G. Comply with FS A-A-59544 where applicable.
- H. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- I. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- J. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
- K. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.
- L. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.
- M. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as

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suitable for use in return air plenums.

N. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.

O. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
2. Control Circuits: 14 AWG.

P. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

Q. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:

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- 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
- b. Equipment Ground, All Systems: Green.
 - c. Isolated Ground, All Systems: Green with yellow stripe.
 - d. Travelers for 3-Way and 4-Way Switching: Pink.
 - e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
 - f. For control circuits, comply with manufacturer's recommended color code.

2.04 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:

1. Copper Building Wire:

- a. Cerro Wire LLC: www.cerrowire.com/#sle.
- b. Encore Wire Corporation: www.encorewire.com/#sle.
- c. General Cable Technologies Corporation:
www.generalcable.com/#sle.
- d. Service Wire Co: www.servicewire.com/#sle.
- e. Southwire Company: www.southwire.com/#sle.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:

1. Feeders and Branch Circuits:

- a. Size 10 AWG and Smaller: Solid.
- b. Size 8 AWG and Larger: Stranded.

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- 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.
 - a. Size 4 AWG and Larger: Type XHHW-2 or THHN/THWN.
 - b. Installed Underground: Type XHHW-2 or THHN/THWN.
 - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.
- F. Conductor: Copper.
 - 1. For Sizes Smaller Than 4 AWG: Copper.
 - 2. For Sizes 4 AWG and Larger: Copper.
- G. Insulation Voltage Rating: 600 volts.
- H. Insulation: NFPA 70, Type THHN/THWN.

2.05 METAL-CLAD CABLE

- A. Manufacturers:
 - 1. AFC Cable Systems Inc: www.afcweb.com/#sle.
 - 2. Encore Wire Corporation: www.encorewire.com/#sle.
 - 3. Service Wire Co: www.servicewire.com/#sle.
 - 4. Southwire Company: www.southwire.com/#sle.
- B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- C. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.

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- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Provide oversized neutral conductors where indicated or required.
- G. Provide dedicated neutral conductor for each phase conductor where indicated or required.
- H. Grounding: Full-size integral equipment grounding conductor.
 - 1. Provide additional isolated/insulated grounding conductor where indicated or required.
- I. Armor: Steel, interlocked tape.
- J. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.06 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective

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device.

4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 6. Aluminum Conductors: Use compression connectors for all connections.
 7. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
 8. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - c. NSI Industries LLC: www.nsiindustries.com/#sle.
 - d. Or approved equal.
- H. Push-in Wire Connectors: Rated 600 V, 221 degrees F.
1. Manufacturers:
 - a. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - b. NSI Industries LLC: www.nsiindustries.com/#sle.
 - c. Wago Corporation: www.wago.us/#sle.

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- d. Or approved equal.
- I. Mechanical Connectors: Provide bolted type or set-screw type.
 - 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com/#sle.
 - b. IlSCO: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Or approved equal.
- J. Compression Connectors: Provide circumferential type or hex type crimp configuration with prestressed insulation to equal the insulation of wire being installed. .
 - 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com/#sle.
 - b. IlSCO: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Or approved equal.
- K. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
 - 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com/#sle.
 - b. IlSCO: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Or approved equal.
- L. Power Conductor Splicers
 - 1. Blackburn.
 - 2. Burndy "Hylug".
 - 3. Ilso.

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4. O.Z. Gedney.

2.07 ACCESSORIES

A. Electrical Tape:

1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
 - c. Or approved equal.
2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

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1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Burndy LLC: www.burndy.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Or approved equal.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com/#sle.
 - b. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - c. IlSCO: www.ilsco.com/#sle.
 - d. Or approved equal.
- D. Wire Pulling Lubricant:
 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. American Polywater Corporation: www.polywater.com/#sle.
 - c. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - d. Or approved equal.
 2. Listed and labeled as complying with UL 267.
 3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
 4. Suitable for use at installation temperature.
- E. Cable Ties: Material and tensile strength rating suitable for application.
 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com/#sle.

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- b. Scotchflex.
 - c. Thomas & Betts.
 - d. Or approved equal.
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- 1. Products:
 - a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
 - b. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
- 1. Products:
 - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that raceway installation is complete and supported.
- E. Verify that field measurements are as indicated.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

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- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
 - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
 - b. Increase size of conductors as required to account for ampacity derating.
 - c. Size raceways, boxes, etc. to accommodate conductors.
 - d. Record any circuit changes on record drawings.
8. Common Neutrals: Sharing of neutral/grounded conductors among branch circuits is not permitted.
9. Provide oversized neutral/grounded conductors where indicated and as specified below.
 - a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.

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- b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- H. Terminate cables using suitable fittings.
 - 1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

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- c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.
- I. Install conductors with a minimum of 12 inches of slack at each outlet.
- J. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
- K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- M. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
 - 5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
 - 6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of

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vinyl insulating electrical tape.

- b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
- 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
- 3. Wet Locations: Use heat shrink tubing.
- O. Insulate ends of spare conductors using vinyl insulating electrical tape.
- P. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- Q. Identify conductors and cables in accordance with Section 26 05 53.
- R. Color Code Legend: Provide identification label identifying color code for ungrounded conductors at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- S. Install firestopping to preserve fire resistance rating of partitions and other elements.
- T. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.
- U. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.
- V. Route wire and cable as required to meet project conditions.
 - 1. Wire and cable routing indicated is approximate unless dimensioned.

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2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
 3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.
- W. Use wiring methods indicated.
- X. Pull all conductors into raceway at same time.
- Y. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- Z. Protect exposed cable from damage.
- AA. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
- BB. Use suitable cable fittings and connectors.
- CC. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- DD. Clean conductor surfaces before installing lugs and connectors.
- EE. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- FF. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- GG. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- HH. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- II. Identify and color code wire and cable under provisions of Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

3.04 FIELD QUALITY CONTROL

- A. Inspect wire for physical damage and proper connections.
- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's values.

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- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Perform inspections and tests listed in NETA ATS. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
 - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- E. Correct deficiencies and replace damaged or defective conductors and cables.
- F. Perform field inspection
- G. Megger test and record all feeder conductors.
 - 1. Replace conductors failing test.
 - 2. Test replaced conductors in same manner.

END OF SECTION 26 05 19

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SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Scope: provide a complete grounding and bonding system as shown on the electrical drawings and as described in the specifications such that the entire raceway system including all equipment enclosures, data racks, telephone backboards and cabinets, fixtures, and outlets, etc. are effectively connected to ground.
- B. Grounding and bonding requirements.
- C. Section includes:
 - 1. Materials and methods for grounding systems and equipment.
 - 2. Grounding electrodes and conductors.
 - 3. Equipment ground conductors.
 - 4. Bonding
 - 5. Grounding well.
 - 6. Ground bars.
 - 7. Ground plate electrodes.
- D. Connectors for grounding and bonding.
- E. Ground bars.
- F. Ground rod electrodes.
- G. Chemically-enhanced ground electrodes.
- H. Ground plate electrodes.
- I. Ground enhancement material.
- J. Ground access wells.
- K. Pre-fabricated signal reference grids.
- L. Provide all components necessary to complete the grounding system(s) consisting of:

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1. Metal underground water pipe.
2. Metal frame of the building.
3. Concrete-encased electrode.
4. Existing metal underground gas piping system.
5. Metal underground gas piping system.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00-Common Work Results for Electrical.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables:
Additional requirements for conductors for grounding and bonding, including
conductor color coding.
 1. Includes oxide inhibiting compound.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products
and requirements.

1.03 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and
Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode
Couplings; 2022.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical
Power Equipment And Systems; 2021.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority
Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2023.
- G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All
Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

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1. Verify exact locations of underground metal water service pipe entrances to building.
2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
3. Notify Electrical Engineer of Record of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance:

1. Building grounding electrode: 10 ohms.
2. Separately Derived Sources Grounding Electrode: 10 ohms
3. Non-current carrying metal parts: 25 ohms
4. Grounds not covered above: 25 ohms

1.06 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- B. Shop Drawings:
1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.
- C. Product Data: Provide for grounding electrodes and connections.
- D. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Field quality control test reports.

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- G. Project Record Documents: Record actual locations of grounding electrode system components and connections.
- H. Project Record Documents: Record actual locations of components and grounding electrodes.
- I. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.07 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

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- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Electrical Engineer of Record. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- F. Grounding Electrode System:
1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
 3. Metal In-Ground Support Structure:
 - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.

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4. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
 - c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
 - d. Provide ground enhancement material around electrode where indicated.
 - e. Provide ground access well for each electrode.
6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
 - a. Ground Bar Size: 1/4 by 4 by 12 inches unless otherwise indicated or required.
 - b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
 - c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
8. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

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G. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:

1. Provide grounding electrode system for each separate building or structure.
2. Provide equipment grounding conductor routed with supply conductors.
3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

I. Separately Derived System Grounding:

1. Provide grounding electrode conductor to connect derived system grounded conductor to common grounding electrode conductor ground riser. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
2. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
3. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.

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4. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

J. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

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- b. Metal gas piping.
- c. Metal process piping.
- 8. Provide bonding for interior metal air ducts.
- 9. Provide bonding for metal building frame.
- 10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
- 11. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.

K. Pole-Mounted Luminaires: Also comply with Section 26 56 00.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

- 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
- 2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:

- 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- 2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gauge of specified conductors.

C. Connectors for Grounding and Bonding:

- 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

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2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 - a. Exceptions:
 - 1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use mechanical connectors for accessible connections.
 - a. Exceptions:
 - 1) Use exothermic welded connections for connections to metal building frame.
4. Manufacturers - Mechanical and Compression Connectors:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
 - b. Burndy LLC: www.burndy.com/#sle.
 - c. Harger Lightning & Grounding: www.harger.com/#sle.
 - d. Thomas & Betts Corporation: www.tnb.com/#sle.
 - e. Or approved equal.
5. Manufacturers - Exothermic Welded Connections:
 - a. Burndy LLC; _____: www.burndy.com/#sle.
 - b. ThermOweld, subsidiary of Continental Industries; division of Burndy LLC; _____: www.thermoweld.com/#sle.
 - c. Or approved equal.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.
4. Manufacturers:

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- a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
- b. Harger Lightning & Grounding: www.harger.com/#sle.
- c. ThermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.
- d. Or approved equal.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.
5. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
 - b. Galvan Industries, Inc: www.galvanelectrical.com/#sle.
 - c. Harger Lightning & Grounding: www.harger.com/#sle.
 - d. Or approved equal.

F. Ground Plate Electrodes:

1. Material: Copper.
2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.
3. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
 - b. Harger Lightning & Grounding: www.harger.com/#sle.
 - c. ThermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.
 - d. Or approved equal.

G. Ground Enhancement Material:

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1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.
2. Resistivity: Not more than 20 ohm-cm in final installed form.
3. Manufacturers:
 - a. Harger Lightning & Grounding: www.harger.com/#sle.
 - b. ThermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.
 - c. Or approved equal.

H. Ground Access Wells:

1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
 - a. Areas Exposed to Vehicular Traffic: Rated for not less than 2000 pounds vertical design load.
2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
 - a. Round Wells: Not less than 8 inches in diameter.
 - b. Rectangular Wells: Not less than 12 by 12 inches.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
4. Cover: Factory-identified by permanent means with word "GROUND".
5. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
 - b. Harger Lightning & Grounding: www.harger.com/#sle.
 - c. ThermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.
 - d. Or approved equal.

I. Oxide Inhibiting Compound: Comply with Section 26 05 19.

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2.03 MANUFACTURERS

- A. Cooper Power Systems: www.cooperpower.com.
- B. Framatome Connectors International: www.fciconnect.com.
- C. Or approved equal.

2.04 ELECTRODES

- A. Manufacturers:
 - 1. Cooper Power Systems: www.cooperpower.com.
 - 2. Framatome Connectors International: www.fciconnect.com.
 - 3. Or approved equal.
- B. Rod Electrodes: Copper.
 - 1. Diameter: 3/4 inch.
 - 2. Length: 10 feet.
- C. Foundation Electrodes: 3/0 AWG. unless noted on plan.

2.05 CONNECTORS AND ACCESSORIES

- A. Mechanical Connectors: Bronze.
- B. Exothermic Connections: Weld
- C. Wire: Stranded copper.
- D. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.
- E. Grounding Well:
 - 1. Well Pipe: 8 inch by 24 inch long clay tile pipe with belled end.
 - 2. Well Cover: Cast iron with legend "GROUND" embossed on cover.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.

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- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Verify existing conditions prior to beginning work.
- E. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Electrodes: Provide a grounding electrode system in the main electrical room/space of each building as follows:
 - 1. Provide a 2-inch x 1/4-inch copper ground bar. Length shall be a minimum of 12 inches but longer as required for the number of connections made to the bar. This bar shall serve as the connection point for all grounding electrodes in the building. Install the copper ground bar in a NEMA 1 screw cover cabinet, minimum size 18 inches x 12 inches x 6 inches.
 - 2. Connect the copper ground bar to the underground metal pipe (other than gas).
 - a. Connect to metal pipe with approved pipe clamp near the pressure reducing valve.
 - b. Connect to ground bar with exothermic weld.
 - c. Connect to metal pipe with copper clamp where copper water pipe occurs and with a malleable iron clamp where cast iron pipe occurs.
 - d. Install grounding conductor, sized as indicated on plans, in a 3/4-inch metal conduit from the ground cabinet to the water pipe. Provide grounding bushings at each end of the conduit.
 - 3. Connect the copper ground bar to the metal frame of the building.
 - a. At all steel framed buildings, provide a connection to the closest column.
 - b. Connect to column with exothermic weld.

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- c. Connect to the ground bar with exothermic weld or bolted-type connector.
 - d. Install grounding conductor, sized as indicated on the plans, in a 3/4-inch metal conduit from the ground cabinet to the column. Provide grounding bushing at each end of the conduit.
4. Connect the copper ground bar to a concrete-encased electrode/Ufer.
- a. Install a minimum of 20 feet of #3/0 AWG conductor (minimum unless noted otherwise) encased in a minimum of 3 inches of concrete. Provide a non-metallic protective sleeve, minimum 6 inches long (3 inches in the concrete and 3 inches out of the concrete), located where the conductor exits the concrete.
 - b. Install a #3/0 conductor from the ground bar to the concrete-encased electrode in a 3/4-inch metal conduit with grounding bushings. Make connections to the concrete-encased electrode with a bolted-type connector and transition from the metal conduit and non-metallic sleeve.
 - c. Connect to the ground bar with exothermic weld or bolted-type connector.
5. Provide additional ground rod or concrete-encased electrodes as required to meet the performance requirements listed in these specifications at the ground bar.
- a. Install additional ground rods a minimum of 5 feet from any other rod.
 - b. Notify the Owner's Representative if performance requirements have not been met after installing 2 additional ground rods or concrete-encased electrodes.
6. Install other grounding electrodes as indicated on the single line diagram and other Contract Documents.
- D. Grounding Electrode Conductor
- 1. Install grounding electrode conductor from the main normal and emergency power panels and each separately derived system in the building to the ground bar (grounding electrode system). Install grounding electrode conductor in steel conduit and bond grounding conductor to conduit at entrance and exit. Connect to the ground bar (grounding electrode system) with exothermic weld.

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- a. Unless otherwise indicated, install main ground unspliced.
 - b. Make connections easily accessible for inspection in ground bar cabinet.
2. Grounding electrode conductor shall be of the same type and quality as other conductors in the building.
 3. The main neutral to ground bonding jumper will be located at the site utilities switchboard. Locate additional neutral to ground bonding jumper at separately derived systems only, or at the main service panel when the building is served from a dedicated transformer. Neutral bar with all interior secondary neutrals shall be isolated from the common equipment grounding bus at all other locations.

E. Bonding

1. Provide bonding to meet requirements of CEC.
2. Bond together metal siding not attached to grounded structure, bond to ground.
3. Bond prefabricated metal building to grounding electrode system at a minimum of one location.
4. Bond together all metallic conduit, boxes, cabinets, and enclosures.

F. Grounding Conductors

1. Provide grounding conductor for each branch circuit indicated.
2. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder circuit raceway and within each motor feeder raceway. Terminate each end on suitable lug, bus, or bushing.
3. Provide separate, isolated grounding conductor for each circuit which is installed (all or in part) in non-metallic conduit.
4. Provide separate grounding conductor for circuits installed in flexible steel conduit. Terminate each end on a suitable lug, bus or bushing.
5. Ground all conduit systems, cabinets, equipment, motor frames, etc., in accordance with CEC and applicable codes.

G. Grounding Connections

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1. Ground shields of shielded power cable and signal cable at each splice or termination in accordance with recommendations of the splice or termination manufacturer.
 2. Ground metal sheathing and exposed metal vertical structural elements of buildings. Ground metal fences enclosing electrical equipment. Bond any metal equipment platforms which support electrical equipment to that equipment. Provide good electrical contact between metal frames and railings supporting pushbutton stations, receptacles, instrument cabinets, etc., and raceways carrying circuits to these devices.
 3. Ground all fencing as shown on the grounding details on the Drawings.
 4. Bond neutrals of transformers within buildings to the system ground network, and to additional indicated grounding electrodes.
 5. Unless shown otherwise, make connections of grounding conductors to ground rods at the upper end of the rod with the end of the rod and the connection point below finished grade.
 6. Make connections of sections of outdoor ground mats (counterpoise) for substations or other equipment underground. Make connections of other grounding conductors generally accessible.
 7. In manhole pull boxes, install ground rods with ends 4 to 6 inches above the floor with connections of grounding conductors fully visible and accessible.
 8. When making thermite welds, wire brush or file the point of contact to a bare metal surface. Use thermite welding cartridges and molds in accordance with the manufacturer's recommendations. After welds have been made and cooled, brush slag from the weld area and thoroughly clean the joint. Re-galvanize area if required. For compression connectors, use homogeneous copper, anti-corrosion, surface treatment compound at connectors in accordance with connector manufacturer's recommendations. Use connectors of proper size for conductors and ground rods specified. Use connector manufacturer's compression tool. Notify the Owner's Representative prior to backfilling any ground connections.
 9. Grounding pad plates shall be cast into the slab with the surface flush with the finished floor.
- H. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation,

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install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
 2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.
 3. Provide ground well for future access to rod electrodes.
- I. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.
- J. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- K. Identify grounding and bonding system components in accordance with Section 26 05 53.
- L. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- M. Provide grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.
- N. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing . Bond steel together.
- O. Provide bonding to meet requirements described in Quality Assurance.

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- P. Provide isolated grounding conductor for circuits supplying electronic cash registers and other similar electronic equipment loads. .
- Q. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.03 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS except Section 4.
- B. Perform inspections and tests listed in NETA ATS.
- C. Site Tests:
 - 1. Notify the Owner's Representative five days before inspection and testing.
 - 2. Use suitable test instruments to measure resistance to ground of systems. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.
 - 3. Remove main bonding jumper at main service switchboard and at each separately derived system and test for infinite resistance between neutral and ground systems. Reconnect bonding jumper(s) after completion of testing.
 - 4. Record test results in accordance with Section 26 05 00 and submit.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION 26 05 26

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SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.
- F. MFMA-4 - Metal Framing Standards Publication; 2004.
- G. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.
- H. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006
- I. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010

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- J. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.
- K. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

- 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
- 2. Coordinate work to provide additional framing and materials required for installation.
- 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
- 4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
- 5. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

- 1. Do not install products on or provide attachment to concrete surfaces until concrete has cured.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.
- 1. Fiberglass Channel/Strut Framing Systems: Include requirements for strength derating according to ambient temperature.

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- B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- C. Design Data
 - 1. Indicate hanger and support framing and attachment methods.
 - 2. Submit seismic and structural calculations for proposed methods of support and attachment.
- D. Derating Calculations for Fiberglass Channel/Strut Framing Systems: Indicate load ratings adjusted for applicable service conditions.
- E. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
- F. Installer's qualification statement.
- G. Product Data: Provide manufacturer's catalog data for fastening systems.
- H. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at project site one copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:

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1. Comply with the following. Where requirements differ, comply with most stringent.
 - a. NFPA 70.
 - b. Applicable building code.
 - c. Requirements of authorities having jurisdiction.
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 25%. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Components for Vibration Isolation and/or Seismic Controls: See Section 26 05 48.
- C. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

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1. Manufacturers:
 - a. ABB: www.electrification.us.abb.com/#sle.
 - b. Eaton Corporation: www.eaton.com/#sle.
 - c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - d. HoldRite, a brand of Reliance Worldwide Corporation:
www.holdrite.com/#sle.
 - e. nVent; Caddy: www.nvent.com/#sle.
2. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
3. Conduit Clamps: Bolted type unless otherwise indicated.
- D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- E. Metal Channel/Strut Framing Systems:
 1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
 2. Comply with MFMA-4.
 3. Channel/Strut Used as Raceway, Where Indicated: Listed and labeled as complying with UL 5B.
 4. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
 6. Minimum Channel Dimensions: 1-5/8 inch width by 1-5/8 inch height.
- F. Fiberglass Channel/Strut Framing Systems:
 1. Description: Factory-fabricated, continuous-slot, fiberglass channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
 2. Channel Material: Use polyester resin or vinyl ester resin.

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3. Minimum Channel Dimensions: 1-5/8 inch wide by 1 inch high.
 4. Flammability: Fire retardant with NFPA 101, Class A flame spread index, maximum of 25, when tested in accordance with ASTM E84; self extinguishing in accordance with ASTM D635.
- G. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2-inch diameter.
 - b. Busway Supports: 1/2-inch diameter.
 - c. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
 - d. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
 - e. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
 - f. Outlet Boxes: 1/4-inch diameter.
 - g. Luminaires: 1/4-inch diameter.
- H. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
 3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
- I. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 4. Hollow Masonry: Use toggle bolts.

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5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Hammer-driven anchors and fasteners are not permitted.
10. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
 - b. Comply with MFMA-4.
 - c. Channel Material: Use galvanized steel.
 - d. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.
11. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

2.02 MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

- A. Thomas & Betts Corporation: www.tnb.com.
- B. Threaded Rod Company: www.threadedrod.com.
- C. Or Approved Equal.

2.03 SUPPORTS

- A. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. The pipe ring shall be malleable iron, split and hinged, or shall be springable wrought steel. Rings shall be bolted to or interlocked with the suspension rod socket.
- B. Pipe racks for groups of parallel conduits shall be constructed of galvanized structural steel preformed channels of length as required, suspended on threaded rods and secured thereto with nuts above and below the cross bar.

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- C. Factory made pipe straps shall be one hole malleable iron or two hole galvanized clamps.
- D. Supporting rods shall be at least 3/8" diameter and channel shall be at least 3/4" deep. Supporting hardware shall be galvanized steel.

2.04 MATERIALS

- A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Supports: Fabricated of structural steel or formed steel members; galvanized.
- C. Anchors and Fasteners:
 - 1. Sheet Metal Screws: Steel
 - 2. Machine Screws Bolts, Nuts and Washers: Steel
 - 3. Precast Inserts: Suitable for the purpose.
 - 4. Anchor Bolts, expansion type (stainless steel).
 - a. Phillips Red-Head
 - b. Hilti Kwik-Bolt.
 - c. WEJ-IT.
 - 5. Cast-in-Place Anchors: Suitable for the purpose (hot-dip galvanized except cadmium plated in dry locations)
 - 6. Beam Clamps: Steel.
- D. Concrete Structural Elements: Use precast inserts, expansion anchors, or preset inserts.
- E. Steel Structural Elements: Use beam clamps or welded fasteners.
- F. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
- G. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
- H. Solid Masonry Walls: Use expansion anchors or preset inserts.
- I. Sheet Metal: Use sheet metal screws.

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- J. Wood Elements: Use wood screws.
- K. Fastener Types:
 - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 - 5. Other Types: As required.
 - 6. Manufacturers:
 - a. Powers Fasteners, Inc: www.powers.com.
 - b. Or approved equal.
- L. Formed Steel Channel as indicated on drawings.
- M. Steel Spring Clips: As indicated on drawings

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. General
 - 1. Install products in accordance with manufacturer's instructions.
 - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 - 3. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- B. Install hangers and supports in accordance with NECA 1.

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- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
 - 1. Concrete – Precast inserts, cast-place anchors, or expansion type anchor bolts.
 - a. When installing drilled-in anchors in non-prestresses reinforced concrete, avoid the reinforcing bars.
 - b. When installing drilled-in anchors into prestressed concrete (Pre- or Post-tensioned) locate tendons by using a non-destructive method prior to installation. Maintain a minimum clearance of one-inch between the reinforcement and the drilled-in anchor.
 - 2. Sheet Metal – Sheet metal screws or machine bolts, nuts, and washers.
 - 3. Structural Steel Members – Beam clamps, machine screws, bolts, nuts, and washers.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Provide required vibration isolation and/or seismic controls; see Section 26 05 48.
- I. Equipment Support and Attachment:
 - 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
 - 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

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4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 3 inches in height.
5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
6. Install surface mounted cabinets and panelboards with minimum of four anchors.
7. In wet and damp locations, use steel channel supports to stand cabinets and panelboards 13/16-inch minimum off wall.
8. Use sheet metal channels to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
9. Support equipment in accordance with manufacturer's instructions.
10. Verify that equipment will fit support layouts indicated.
 - a. Where suitable equipment is used, revise indicated supports to fit at no additional cost.
11. Arrange for necessary openings to allow entry of equipment.
 - a. Where equipment cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves, or other devices to allow for later installation.

J. Conduit Support and Attachment

1. In damp or wet locations, space conduit support directly from concrete or metal structure out at least $\frac{1}{4}$ inch using straps with spacers or, if three (3) or more conduits are located in a parallel run, they shall be spaced out from the wall approximately $\frac{5}{8}$ inch to 1 inch by means of a channel.
2. Runs of individual conduit suspended from the floor or ceiling shall be supported with pipe hangers. Where three (3) or more conduits are suspended from the floor or ceiling, suitable racks shall be constructed from channel material with suitable fittings.
3. Space supporting points no greater than required by CEC.

K. Sleeves

1. Set sleeves in position in formwork. Provide reinforcing around sleeves.

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2. Extend sleeves through floors 1 inch above finished floor levels. Caulk sleeves full depth and provide floor plate.
 3. Where raceway penetrated floor, ceiling, or wall. Close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal.
- L. Conduit Support and Attachment: See Section 26 05 33.13 for additional requirements.
- M. Box Support and Attachment: See Section 26 05 33.16 for additional requirements.
- N. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- O. Secure fasteners in accordance with manufacturer's recommended torque settings.
- P. Remove temporary supports.
- Q. Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.
1. Obtain permission from the Architect and the Structural Engineer before drilling or cutting structural members.
- D. All expansion anchors shall have 50 percent of the bolts (alternate bolts in any group arrangement) proof tested in tension and certified by a recognized testing agency at the values indicated in the following table, except where shown otherwise in the Contract Documents. If there are any failures, the immediately adjacent bolts must then also be tested. Anchor capacities shall not exceed 80 percent of the values in the published ICBO report.

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| ANCHOR CAPACITY (3,000 PSI MINIMUM STONE AGGREGATE CONCRETE) | | | | | | | |
|---|-------------|-------------|-------------|-------------|--------|-----------------|--------|
| | 1/2 inch | 5/8 inch | 3/4 inch | 7/8 inch | 1 inch | 1-1/4 inches | UNITS |
| IN TENSION | 680 | 960 | 1,360 | 1,900 | 2,700 | 3,600 | LBS |
| IN SHEAR | 1,170 | 1,680 | 2,420 | 3,500 | 5,020 | 6,700 | LBS |
| TYPE OF TEST: | | | | | | | |
| DIRECT PULL- TENSION, LBS. | 1,360 | 1,920 | 2,720 | 3,800 | 5,400 | 7,200 | LBS |
| MINIMUM EMBEDMENT | 3 | 3-3/4 | 4-1/2 | 5-1/4 | 6 | 7-1/2 | INCHES |

END OF SECTION 26 05 29

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SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Scope: Provide rigid metallic conduit, rigid non-metallic conduit, intermediate metal conduit, flexible metal conduit, electrical metallic tubing, surface metal and/or non-metallic raceways, cable tray and wireways as shown on the drawings and as described in the specifications.

1.02 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Galvanized steel intermediate metal conduit (IMC).
- C. PVC-coated galvanized steel rigid metal conduit (RMC).
- D. Flexible metal conduit (FMC).
- E. Liquidtight flexible metal conduit (LFMC).
- F. Galvanized steel electrical metallic tubing (EMT).
- G. Rigid polyvinyl chloride (PVC) conduit.
- H. Electrical nonmetallic tubing (ENT).
- I. Reinforced thermosetting resin conduit (RTRC).
- J. Conduit, fittings and conduit bodies.

1.03 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables:
Cable assemblies consisting of conductors protected by integral metal armor.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
 - 1. Includes additional requirements for fittings for grounding and bonding.
- D. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- E. Section 26 05 33.16 - Boxes for Electrical Systems.
- F. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

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G. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

H. Section 31 23 33-Trenching and Backfilling

1.04 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2020.
- D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- G. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.
- H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.
- I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- J. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.
- K. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- L. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- M. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT); 2014 (Reaffirmed 2019).
- N. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
- O. NEMA TC 14.AG - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015 (Reaffirmed 2021).

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- P. NEMA TC 14.BG - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015 (Reaffirmed 2020).
- Q. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- R. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- S. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- T. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.
- U. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- V. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- W. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- X. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- Y. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- Z. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- AA. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.
- BB. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.
- CC. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes

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increased for voltage drop.

2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
5. Notify Electrical Engineer of Record of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.06 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- B. Shop Drawings:
 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
 2. Include proposed locations of roof penetrations and proposed methods for sealing.
- C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.
- D. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings, and conduit bodies.
- E. Project Record Documents: Accurately record actual routing of conduits larger than 1 1/4 inches.

1.07 QUALITY ASSURANCE

- A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

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- B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

1.09 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on drawings.
- B. Verify conduit routing and termination locations of conduits prior to rough in.
- C. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring systems.

1.10 RATED WALLS AND CEILINGS

- A. Inspect architectural plans for locations and fire ratings for all walls, ceilings, and floors. Install materials as required to maintain the fire integrity of the rated assemblies.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

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C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit where emerging from underground.
5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows or PVC-coated galvanized steel rigid metal conduit elbows for bends.
6. Where galvanized rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) emerges from concrete into soil, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.

D. Embedded Within Concrete:

1. Within Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC). Embed within structural slabs only where approved by Structural Engineer.
2. Within Slab Above Ground: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or

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reinforced thermosetting resin conduit (RTRC). Embed within structural slabs only where approved by Structural Engineer.

3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit where emerging from concrete.
 5. Where galvanized steel electrical metallic tubing (EMT) emerges from concrete into salt air, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.
- E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal

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conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
1. Locations subject to physical damage include, but are not limited to:
- a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
 - b. Where exposed below 20 feet in warehouse areas.
 - c. In Correctional Facilities, Galvanized rigid steel only for inmate accessible areas. Locations shall be verified with the architect.
- K. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- M. Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit.
- N. Hazardous/Classified Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit (RMC).
- O. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
1. Maximum Length: 6 feet.
- P. Flexible Connections to Vibrating Equipment:

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1. Dry Locations: Use flexible metal conduit (FMC).
 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
 3. Maximum Length: 6 feet unless otherwise indicated.
 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.
 - c. Engine generators.
- Q. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.
- R. Freezer and Refrigeration Rooms
1. Galvanized rigid steel conduit.
 2. Use sealing fittings on refrigeration and freezer room conduit runs in accordance with CEC 300-7(a).

2.02 CONDUIT - GENERAL REQUIREMENTS

- A. Comply with NFPA 70.
- B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.
- C. Fittings for Grounding and Bonding: See Section 26 05 26 for additional requirements.
- D. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- E. Provide products listed, classified, and labeled as suitable for purpose intended.
- F. Minimum Conduit Size, Unless Otherwise Indicated:
 1. Branch Circuits: 1/2-inch trade size.
 2. Branch Circuit Homeruns: 3/4-inch trade size.
 3. Control Circuits: 1/2-inch trade size.

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4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
 5. Underground, Interior: 1 inch (27 mm) trade size.
 6. Underground, Exterior: 1-inch trade size.
- G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International:
www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.
3. Rymco USA: www.rymcousa.com/#sle.
4. Western Tube, a division of Zekelman Industries:
www.westerntube.com/#sle.
5. Wheatland Tube, a division of Zekelman Industries:
www.wheatland.com/#sle.
6. Or approved equal.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:

1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. Appleton.
 - c. Crouse-Hinds.
 - d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - e. Or approved equal.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.

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3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
5. Connectors and Couplings: Where an expansion type fitting is not required, use a coupling or "Erickson" type coupling as appropriate. Threadless set screw and compression (gland) type fittings are not permitted.
6. At building expansion joints, use expansion type fittings.
7. Make connections to NEMA 12 boxes with a threaded hub.

D. Locknuts

1. Hardened Steel or malleable iron construction, electro zinc plated, capable of insuring positive bond to enclosure.
 - a. Non-bonding: T & B Series 142 or approved equal.
 - b. Bonding: T & B Series 107 or approved equal.

E. Bushings

1. Insulted: T & B Series 223 or approved equal.
2. Insulated Metallic Bushing: T & B Series 1223 or approved equal.
3. Insulated Grounding and Bonding Bushing: T & B Series 3871 or approved equal.

F. Couplings

1. Non-metallic Conduit Coupling: By non-metallic conduit manufacturer for the application.
2. Threaded Rigid Metal Conduit Couplings: By conduit manufacturer for the application.
3. Threadless Coupling: "Erickson" Type Y & B Series 676 or approved equal.
4. Expansion Type: Permit $\frac{3}{4}$ inch movement any direction.
 - a. Exposed: Weatherproof with external bonding jumper.

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- b. Embedded: Watertight with internal bonding jumper.

G. Connectors

1. Non-Metallic Conduit Connector: By conduit manufacturer for the application.
 2. Threaded Hubs: Electro zinc coated with nylon insulated throat and oil/moisture resistant recessed sealing ring, raintight.
 - a. Non-bonding: T & B Series 371 or approved equal.
 - b. Bonding: T & B Series 371 with 107 series bonding locknut or approved equals.
- H. Nipple: "Chase" Type, insulated: T & B Series 5263 or approved equal.
- I. Sealing Gaskets: Oil and moisture resistant rubber bonded to metallic retainer.
1. With rigid conduit – T & B Series 5303 or approved equal.
 2. Fittings not specifically listed but required shall be of similar style and quality.

2.04 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International:
www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.
3. Western Tube, a division of Zekelman Industries:
www.westerntube.com/#sle.
4. Wheatland Tube, a division of Zekelman Industries:
www.wheatland.com/#sle.
5. Or approved equal.

- B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:

1. Manufacturers:

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- a. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
 - b. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - c. Or approved equal.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
 3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
 4. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
- D. Conduit Size: Comply with NFPA 70.
1. Exposed: Use rigid steel conduit or intermediate metal conduit for installation up to 8 feet.

2.05 FLEXIBLE METAL CONDUIT (FMC)

- A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
 2. Electri-Flex Company: www.electriflex.com/#sle.
 3. International Metal Hose: www.metalhose.com/#sle.
 4. Or approved equal.
- B. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
- C. Fittings:
1. Manufacturers:
 - a. ABB; T&B: www.electrification.us.abb.com/#sle.
 - b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.

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- c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
- d. Or approved equal.
- 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
- 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
- D. Description: Interlocked steel construction.
- E. Connectors and Fittings: NEMA FB 1.
 - 1. Flexible metal conduit connector – Insulated throat, suitable as grounding means: T & B Series 3115.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
 - 2. Electri-Flex Company: www.electriflex.com/#sle.
 - 3. International Metal Hose: www.metalhose.com/#sle.
 - 4. Or approved equal.
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
 - 1. Manufacturers:
 - a. ABB; T&B: www.electrification.us.abb.com/#sle.
 - b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
 - c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - d. Or approved equal.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.

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- a. Do not use die cast zinc fittings.
- D. Description: Interlocked steel construction with PVC jacket.
- E. Fittings: NEMA FB 1.

2.07 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

- 1. Allied Tube & Conduit: www.alliedeg.com/#sle.
- 2. Nucor Tubular Products: www.nucortubular/#sle.
- 3. Rymco USA: www.rymcousa.com/#sle.
- 4. Western Tube, a division of Zekelman Industries:
www.westerntube.com/#sle.
- 5. Beck Manufacturing, Inc: www.beckmfg.com.
- 6. Wheatland Tube Company: www.wheatland.com/#sle.
- 7. Or Equal._____.

B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:

- 1. Manufacturers:
 - a. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
 - b. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - c. Or approved equal.
- 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
- 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
- 4. Connectors and Couplings: Use compression/gland type.
 - a. Do not use indenter type connectors and couplings.

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- b. Do not use set-screw type connectors and couplings.
- c. EMT Coupling: Raintight T & B Series 5220 or approved equal.
- d. EMT to Rigid Metal Conduit Connector, Raintight: T & B Series 531 or approved equal.
- 5. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.
- 6. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.
- D. Description: ANSI C80.3; galvanized tubing.
- E. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
 - 1. Cantex Inc: www.cantexinc.com/#sle.
 - 2. JM Eagle: www.jmeagle.com/#sle.
 - 3. Or approved equal.
- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.09 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be

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installed.

- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- E. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.
- F. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
 - 1. Internal to fittings
 - a. Approved by manufacturer for application.
 - 2. Manufacturer
 - a. Crouse-Hinds Chico A-P and Chico X fiber.
 - b. O.Z. Gedney.
 - c. Or approved equal.
- G. Sealing Systems for Concrete Penetrations:
 - 1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
 - 2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.
- H. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
 - 1. Products:
 - a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
 - b. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.
 - c. Or approved equal.

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- I. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
 - 1. Products:
 - a. Quickflash Weatherproofing Products, Inc:
www.quickflashproducts.com/#sle.
 - b. Or approved equal.
- J. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
 - 1. Products:
 - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.
 - b. Or approved equal.
- K. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for conduit/duct arrangement to be installed.
 - 1. Products:
 - a. Advance Products & Systems, LLC; Duct Bank Spacers:
www.apsonline.com/#sle.
 - b. Or approved equal.
- L. Bore Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for installation within casing; furnished with roller wheels to facilitate installation, openings to facilitate grout flow, and holes for stabilization cable; suitable for casing and conduit/duct arrangement to be installed.
 - 1. Products:
 - a. Advance Products & Systems, LLC; Bore Spacers:
www.apsonline.com/#sle.
 - b. Or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

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- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Verify routing and termination locations of conduit prior to rough-in.
- E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
- E. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.
- G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- H. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 5. Unless otherwise approved, do not route exposed conduits:

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- a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
- 6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 7. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
 - 9. Arrange conduit to provide no more than 150 feet between pull points.
 - 10. Route conduits above water and drain piping where possible.
 - 11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
 - 13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
 - 14. Group parallel conduits in same area on common rack.
- I. Conduit Support:
- 1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.
 - 2. Provide required vibration isolation and/or seismic controls; see Section 26 05 48.

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3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 5. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 6. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 7. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 8. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
 9. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
 10. Use of spring steel conduit clips for support of conduits is not permitted.
 - a. Support of electrical metallic tubing (EMT) up to 1-inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.
 11. Use of wire for support of conduits is not permitted.
 - a. For securing conduits to studs in hollow stud walls.
 - b. For suspending conduits supported by spring steel conduit clips, where specifically indicated or permitted.
 12. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.
- J. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

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3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
8. Secure joints and connections to provide mechanical strength and electrical continuity.

K. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Provide metal escutcheon plates for conduit penetrations exposed to public view.

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L. Underground Installation:

1. Minimum Cover, Unless Otherwise Indicated or Required:

- a. Underground, Exterior: 18 inches.
- b. Under Slab on Grade: 12 inches to bottom of slab.

M. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):

- 1. Maximum Conduit Size: 1-inch trade size unless otherwise approved.
- 2. Minimum Conduit Spacing: As indicated on drawings.
- 3. Install conduits within middle one third of slab thickness.
- 4. Secure conduits to prevent floating or movement during pouring of concrete.

N. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

- 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
- 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
- 3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
- 4. Where conduits are subject to earth movement by settlement or frost.

O. Conduit Sealing:

- 1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
 - a. Where conduits enter building from outside.
 - b. Where service conduits enter building from underground distribution system.

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- c. Where conduits enter building from underground.
- d. Where conduits may transport moisture to contact live parts.
- 2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
 - a. Where conduits pass from outdoors into conditioned interior spaces.
 - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- P. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- Q. Provide grounding and bonding; see Section 26 05 26.
- R. Identify conduits; see Section 26 05 53.

3.03 FIELD QUALITY CONTROL

- A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- B. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- C. Correct deficiencies and replace damaged or defective conduits.

3.04 EMPTY CONDUITS

- A. Certain conduits will have no conductors pulled in as a part of this contract. Identify with tags at each end of the origin and destination of each such empty conduits. Provide a permanent cap over each end of each empty conduit. Provide a nylon pull wire in each empty conduit, tie off at both ends.

3.05 TESTING AND INSPECTION

- A. So not cover up conduit work until inspected. Notify the Owner's Representative at least 3 days before desired inspection date.

3.06 CLEANING

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- A. Clean interior of conduits to remove moisture and foreign matter.

3.07 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.
- B. All conduits shall be run concealed in walls and/or ceiling. Where conduits can not be run concealed in wall and/or ceiling space, the Contractor shall coordinate with the architectural and structural plans and the Architect for installing and routing of exposed conduits.

3.08 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements.

END OF SECTION 26 05 33.13

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SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Scope: Provide boxes, pull boxes, racks, and enclosures as shown on drawings or as required by code(s).
- B. Section Includes:
- C. Boxes for hazardous (classified) locations.
- D. Underground boxes/enclosures.
- E. Accessories.
- F. Wall and ceiling outlet boxes.
- G. Pull and junction boxes.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 33.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 28 13 - Fuses: Spare fuse cabinets.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

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- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (Reaffirmed 2020).
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. SCTE 77 - Specifications for Underground Enclosure Integrity; 2017.
- J. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- L. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- M. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- N. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
- O. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.

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4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
 1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.
- B. Samples:
 1. Floor Boxes: Provide one sample(s) of each floor box proposed for substitution upon request.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

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- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 - 3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.

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4. Use cast aluminum boxes where aluminum rigid metal conduit is used.
5. Use nonmetallic boxes where exposed rigid PVC conduit is used.
6. Use suitable concrete type boxes where flush-mounted in concrete.
7. Use suitable masonry type boxes where flush-mounted in masonry walls.
8. Use raised covers suitable for the type of wall construction and device configuration where required.
9. Use shallow boxes where required by the type of wall construction.
10. Do not use "through-wall" boxes designed for access from both sides of wall.
11. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
12. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
13. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
14. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
15. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
 - b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
16. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation:
www.cooperindustries.com/#sle.
 - b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.
 - c. Hubbell Incorporated; RACO Products; _____: www.hubbell-rtb.com/#sle.

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- d. O-Z/Gedney, a brand of Emerson Electric Co; _____:
www.emerson.com/#sle.
 - e. Thomas & Betts Corporation: www.tnb.com/#sle.
 - f. Or equal.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
- 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 - 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
 - c. Kitchens and food prep. Locations: Type 4X, stainless steel, unpainted.
 - 3. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 - b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
 - 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
 - b. Back Panels: Painted steel, removable.
 - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
 - 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
 - 6. Manufacturers:

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- a. Cooper B-Line, a division of Eaton Corporation:
www.cooperindustries.com/#sle.
 - b. Hoffman, a brand of Pentair Technical Products:
www.hoffmanonline.com/#sle.
 - c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.
 - d. Or equal.
- D. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.
1. Manufacturers:
 - a. Appleton, a brand of Emerson Electric Co; _____:
www.emerson.com/#sle.
 - b. Cooper Crouse-Hinds, a division of Eaton Corporation:
www.cooperindustries.com/#sle.
 - c. Hubbell Incorporated; Killark Products: www.hubbell-killark.com/#sle.
 - d. Or approved equal.
- E. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
 2. Size: As indicated on drawings.
 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
 4. Provide logo on cover to indicate type of service.
 5. Applications:
 - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
 - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum

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SCTE 77 Tier 15 load rating.

- c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
- a. Manufacturers:
 - 1) Hubbell Incorporated; Quazite Products:
www.hubbellpowersystems.com/#sle.
 - 2) MacLean Highline: www.macleanhighline.com/#sle.
 - 3) Oldcastle Precast, Inc: www.oldcastleprecast.com/#sle.
 - 4) Or equal.
 - b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.
 - c. Product(s):
 - 1) MacLean Highline PHA Series: Straight wall, all-polymer concrete splice box/pull box; available Tier 8, Tier 15, and Tier 22 load ratings.
 - (a) 11 by 18 by 12 inches nominal; Model PHA111812 (stackable).
 - 2) MacLean Highline CHA Series: Fiberglass/polymer concrete splice box/pull box; available Tier 8 and Tier 15 load ratings.
 - (a) 11 by 18 by 12 inches nominal; Model CHA111812.
 - 3) MacLean Highline CVA Series: Fiberglass/polymer concrete splice vault; available Tier 8, Tier 15, and Tier 22 load ratings.
 - (a) 30 by 48 by 18 inches nominal; Model CVA304818.
 - 4) Or approved equal.

2.02 ACCESSORIES

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

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1. Manufacturers:

- a. Quickflash Weatherproofing Products, Inc:
www.quickflashproducts.com/#sle.
- b. Or approved equal.
- c. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MANUFACTURERS

- A. Appleton Electric: www.appletonelec.com.
- B. Arc-Co./Division of Arcade Technology; Model _____: www.arc-co.com.
- C. Unity Manufacturing: www.unitymfg.com.
- D. Or approved equal.

2.04 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.
- B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.05 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- C. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:
 - 1. Material: Galvanized cast iron.

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2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
3. Cover Legend: "ELECTRIC".

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Boxes are indicated in approximate locations only on the drawings unless specifically dimensioned. Verify all box locations prior to rough-in.
- C. Verify that mounting surfaces are ready to receive boxes.
- D. Verify that conditions are satisfactory for installation prior to starting work.
- E. Verify locations of floor boxes and outlets prior to rough-in.
- F. Verify locations of all boxes required for kitchen equipment with kitchen consultant plans and specifications.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:

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1. Locate boxes to be accessible. Provide access panels as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
4. Locate boxes so that wall plates do not span different building finishes.
5. Locate boxes so that wall plates do not cross masonry joints.
6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.

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- c. Electrical rooms.
- d. Mechanical equipment rooms.
- I. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide required seismic controls in accordance with Section 26 05 48.
 - 3. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 - 4. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 - 5. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- L. Floor-Mounted Cabinets: Mount on properly sized 3 inch high concrete pad.
- M. Install boxes as required to preserve insulation integrity.
- N. Underground Boxes/Enclosures:
 - 1. Install enclosure on gravel base, minimum 6 inches deep.

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2. Flush-mount enclosures located in concrete or paved areas.
 3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
 4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements.
- Q. Close unused box openings.
- R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- S. Provide grounding and bonding in accordance with Section 26 05 26.
- T. Identify boxes in accordance with Section 26 05 53.
- U. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
- V. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 72.
- W. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- X. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
1. Adjust box locations up to 10 feet if required to accommodate intended purpose.
- Y. Maintain headroom and present neat mechanical appearance.
- Z. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- AA. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

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- BB. Install boxes to preserve fire resistance rating of partitions and other elements.
- CC. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- DD. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- EE. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- FF. Use flush mounting outlet box in finished areas.
- GG. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- HH. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in fire-rated and acoustic rated walls.
- II. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- JJ. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- KK. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- LL. Use adjustable steel channel fasteners for hung ceiling outlet box.
- MM. Do not fasten boxes to ceiling support wires.
- NN. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
- OO. Use gang box where more than one device is mounted together. Do not use sectional box.
- PP. Use gang box with plaster ring for single device outlets.
- QQ. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- RR. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- SS. Set floor boxes level.

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TT. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.03 ADJUSTING

- A. Adjust floor boxes flush with finish flooring material.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

3.04 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.05 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 26 05 33.16

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SECTION 26 05 48 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vibration isolation requirements.
- B. Seismic control requirements.
 - 1. Includes requirements for seismic qualification of equipment not specified in this section.
- C. Vibration-isolated equipment support bases.
- D. Vibration isolators.
- E. External seismic snubber assemblies.
- F. Anchoring and seismic restraint systems.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 - Common Work Results for Electrical.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

1.03 SYSTEM DESCRIPTION

- A. Design Requirements
 - 1. Provide the work in compliance with CCR Title 24, Part 2, State Chapters, Drawings, and calculations to be stamped and signed by a California licensed structural engineer.
 - 2. Provide seismic restraints for the listed materials and equipment. The attachments shall resist forces to the center of gravity of the component. Criteria shall be the operating weight of the item times 0.5g for horizontal force to be applied in any direction. Wall-mounted or suspended components shall in addition, resist a downward force of 200 pounds minimum added to the operating weight of the component.

1.04 DEFINITIONS

- A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic

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evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).

- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.05 REFERENCE STANDARDS

- A. ASTM E2265-2003 – Standard Terminology for Anchors and Fasteners in Concrete and Masonry.
- B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- C. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.
- D. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.
- F. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- G. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2020).
- J. MFMA-4 - Metal Framing Standards Publication; 2004.
- K. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

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1.06 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
5. Seismic Controls:
 - a. Coordinate the arrangement of seismic restraints with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
6. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured.

1.07 SUBMITTALS

- A. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
 1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

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2. Seismic Controls: Include seismic load capacities.
- C. Shop Drawings - Vibration Isolation Systems:
1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
 2. Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.
- D. Shop Drawings - Seismic Controls:
1. Include dimensioned plan views and sections indicating proposed electrical component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
 2. Identify mounting conditions required for equipment seismic qualification.
 3. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
 4. Indicate proposed arrangement of distributed system trapeze support groupings.
 5. Indicate proposed locations for distributed system flexible fittings and/or connections.
 6. Indicate locations of seismic separations where applicable.
 7. Include point load drawings indicating design loads transmitted to structure at each attachment location.
- E. Seismic Design Data:
1. Compile information on project-specific characteristics of actual installed electrical components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
 - a. Component operating weight and center of gravity.

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- b. Component elevation in the building in relation to the roof elevation (z/h).
 - c. Component importance factor (I_p).
 - d. For distributed systems, component materials and connection methods.
 - e. Component amplification factor (a_p) and component response modification factor (R_p), determined in accordance with ASCE 7 tables.
 - f. Applicability of overstrength factor (for certain anchorage in concrete and masonry).
2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.
- F. Certification for seismically qualified equipment; identify basis for certification.
- G. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.
- H. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- I. Evidence of qualifications for seismic controls designer.
- J. Evidence of qualifications for manufacturer.
- K. Manufacturer's detailed field testing and inspection procedures.
- L. Field quality control test reports.

1.08 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Seismic Controls Designer Qualifications: Registered professional engineer licensed in California and with minimum five years experience designing

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seismic restraints for nonstructural components.

1. Designer may be employed by the manufacturer of the seismic restraint products.
- E. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

- A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.
- B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:
- C. General Requirements:
1. Select vibration isolators to provide required static deflection.
 2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
 3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
 4. Select vibration isolators for outdoor equipment to comply with wind design requirements.
 5. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.
- D. Conduit Isolation:

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1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.
 - a. Minimum Length: 3 feet unless otherwise indicated.
2. Vibration Isolators:
 - a. Provide vibration isolators for conduit supports:
 - 1) Located within 50 feet of connected vibration-isolated equipment where flexible connection to equipment is not possible.
 - 2) For conduits over 2 inch trade size located below or within 50 feet of noise-sensitive areas indicated.
 - b. Minimum Static Deflection:
 - 1) First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
 - 2) Remainder of Supports: 0.75 inch deflection unless otherwise indicated.
 - c. Suspended Conduits, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
 - d. Suspended Conduits, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
 - e. Use modular seal or approved resilient material where vibration-isolated conduits penetrate building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

2.02 SEISMIC CONTROL REQUIREMENTS

- A. Design and provide electrical component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor electrical components.
- B. Seismic Design Criteria: ICC (IBC)/ASCE 7.

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- C. Component Importance Factor (Ip): Electrical components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.
- D. Seismic Qualification of Equipment:
1. Provide special certification for electrical equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
 2. Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.
 3. Notify LP Consulting Engineers, Inc. and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
 4. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.
- E. Seismic Restraints:
1. Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
 2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
 - a. ASHRAE (HVACA).
 - b. FEMA 413.
 - c. FEMA E-74.
 - d. SMACNA (SRM).
 3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
 4. Seismic Type Vibration Isolators:

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- a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.

5. External Seismic Snubber Assemblies:

- a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
- b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.

6. Seismic Restraint Systems:

- a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
- b. Use only cable restraints to restrain vibration-isolated electrical components, including distributed systems.
- c. Use only one restraint system type for a given electrical component or distributed system (e.g., conduit, cable tray) run; mixing of cable and rigid restraints on a given component/run is not permitted.
- d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain electrical component in all lateral directions; consider bracket geometry in anchor load calculations.
- e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported electrical component weight.
- f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported electrical component weight.
- g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
- h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.

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- i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.
- j. Manufacturer's certified seismic restraint design may be submitted as an alternative to project-specific design and documentation, subject to approval of authorities having jurisdiction.

F. Seismic Attachments:

- 1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
- 2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
- 3. Do not use power-actuated fasteners.
- 4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
- 5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
- 6. Concrete Housekeeping Pads:
 - a. Increase size of pad as required to comply with anchor requirements.
 - b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

G. Seismic Interactions:

- 1. Include provisions to prevent seismic impact between electrical components and other structural or nonstructural components.
- 2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
- 3. Comply with minimum clearance requirements between electrical equipment, distribution systems, and associated supports and fire

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protection sprinkler system drops and sprigs.

H. Seismic Relative Displacement Provisions:

1. Use suitable fittings or flexible connections to accommodate:
 - a. Relative displacements at connections between components, including distributed systems (e.g., conduit, cable tray); do not exceed load limits for equipment utility connections.
 - b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
 - c. Design displacements at seismic separations.
 - d. Anticipated drifts between floors.
2. Include provisions to prevent interruption of utility service due to seismic displacements.

2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Manufacturers:

1. Vibration-Isolated Equipment Support Bases:
 - a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
 - b. Mason Industries: www.mason-ind.com/#sle.
 - c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.
 - d. Korfund Dynamics Corp.
 - e. Amber-Booth Co.
 - f. Consolidated Kinetics.
2. Source Limitations: Furnish vibration-isolated equipment support bases and associated components and accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

B. Vibration-Isolated Structural Steel Bases:

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1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.

C. Vibration-Isolated Concrete Inertia Bases:

1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
2. Minimum Base Depth: 6 inches.
3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.
4. Concrete Reinforcement: Welded or tied reinforcing bars running both ways in a single layer.
5. Concrete: Filled on site with minimum 3000 psi

2.04 VIBRATION ISOLATORS

A. Manufacturers:

1. Vibration Isolators:
 - a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
 - b. Mason Industries: www.mason-ind.com/#sle.
 - c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.
 - d. Korfund Dynamics Corp.
 - e. Amber-Booth Co.
 - f. Consolidated Kinetics.
 - g. Or approved equal.
2. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.

B. General Requirements:

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1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
 2. Spring Elements for Spring Isolators:
 - a. Color code or otherwise identify springs to indicate load capacity.
 - b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
 - c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
 - d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
 - e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
 - f. Selected to function without undue stress or overloading.
 3. Seismic Snubbing Elements for Seismic Isolators:
 - a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
 - b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.
- C. Vibration Isolators for Nonseismic Applications:
1. Resilient Material Isolator Pads:
 - a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
 - b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
 - c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
 2. Resilient Material Isolator Mounts, Nonseismic:

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- a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.
- 3. Open (Unhoused) Spring Isolators:
 - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
 - b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
 - c. Furnished with integral leveling device for positioning and securing supported equipment.
- 4. Housed Spring Isolators:
 - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
 - b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
 - c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
 - d. Furnished with integral leveling device for positioning and securing supported equipment.
- 5. Restrained Spring Isolators, Nonseismic:
 - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.
 - b. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
 - c. Furnished with integral leveling device for positioning and securing supported equipment.
 - d. Provides constant free and operating height.

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6. Resilient Material Isolator Hangers, Nonseismic:

- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.

7. Spring Isolator Hangers, Nonseismic:

- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
- b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

8. Combination Resilient Material/Spring Isolator Hangers, Nonseismic:

- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the upper hanger rod connection.
- b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

D. Vibration Isolators for Seismic Applications:

1. Resilient Material Isolator Mounts, Seismic:

- a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.

2. Restrained Spring Isolators, Seismic:

- a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for

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seismic applications with integral snubbing in all directions.

- b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
 - c. Furnished with integral leveling device for positioning and securing supported equipment.
 - d. Provides constant free and operating height.
3. Resilient Material Isolator Hangers, Seismic:
- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
4. Spring Isolator Hangers, Seismic:
- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
5. Combination Resilient Material/Spring Isolator Hangers, Seismic:
- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) isolator material for the upper hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

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2.05 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

A. Manufacturers:

1. External Seismic Snubber Assemblies:

- a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
- b. Mason Industries: www.mason-ind.com/#sle.
- c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.
- d. Korfund Dynamics Corp.
- e. Amber-Booth Co.
- f. Consolidated Kinetics.
- g. Or approved equal.

2. Source Limitations: Furnish external seismic snubber assemblies and associated accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

B. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.

C. Seismic Snubbing Elements:

1. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

2.06 SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:

1. Seismic Restraint Systems:

- a. AFCON, a brand of Anvil International: www.anvilintl.com/#sle.
- b. Eaton Corporation: www.eaton.com/#sle.
- c. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.

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- d. Mason Industries: www.mason-ind.com/#sle.
- e. Or approved equal.
- 2. Source Limitations: Furnish seismic restraint system components and accessories produced by a single manufacturer and obtained from a single supplier.
- B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.
- C. Cable Restraints:
 - 1. Comply with ASCE 19.
 - 2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
 - 3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
 - 4. Use protective thimbles for cable loops where potential for cable damage exists.
- D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

- A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or LP Consulting Engineers, Inc. and statement of special inspections as required by applicable building code.
- B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.

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1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
 2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.
- C. Seismic special inspections include, but are not limited to:
1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with certificate of compliance.
 2. Anchorage of electric equipment for emergency and standby power systems for Seismic Design Categories C, D, E, and F; periodic inspection.
 3. Anchorage of electrical equipment other than for emergency and standby power systems for Seismic Design Categories E and F; periodic inspection.
 4. Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where Contract Documents require a nominal clearance of 1/4 inch or less between equipment support frame and seismic restraint; periodic inspection.
 5. Verification of required clearances between electrical equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.
- D. Seismic special inspections include, but are not limited to:
1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with certificate of compliance.
 2. Anchorage of electric equipment for emergency and standby power systems for Seismic Design Categories C, D, E, and F; periodic inspection.
 3. Anchorage of electrical equipment other than for emergency and standby power systems for Seismic Design Categories E and F; periodic inspection.

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- 4. Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where Contract Documents require a nominal clearance of 1/4 inch or less between equipment support frame and seismic restraint; periodic inspection.
- E. Prior to starting work, to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.
- F. Special Inspection Agency services do not relieve from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Secure fasteners according to manufacturer's recommended torque settings.
- E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- F. Vibration Isolation Systems:
 - 1. Vibration-Isolated Equipment Support Bases:
 - a. Provide specified minimum clearance beneath base.
 - 2. Spring Isolators:
 - a. Position equipment at operating height; provide temporary blocking as required.
 - b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
 - c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.

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3. Isolator Hangers:

- a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
- b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.

4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.

5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.

6. Adjust isolators to be free of isolation short circuits during normal operation.

7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

G. Seismic Controls:

1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris or other obstructions.

2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.

3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.

4. Equipment with Sheet Metal Housings:

- a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
- b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
- c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.

5. Concrete Housekeeping Pads:

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- a. Size in accordance with seismic design to meet anchor requirements.
 - b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
- a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
 - b. Install restraints within permissible angles in accordance with seismic design.
 - c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
 - d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
 - e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.04 FIELD QUALITY CONTROL

- A. Inspect vibration isolation and/or seismic control components for damage and defects.
- B. Provide services of a manufacturer's authorized representative for vibration isolation systems and seismic controls to observe installation and assist in inspection and testing. Include manufacturer's detailed testing and inspection procedures and field reports with submittals.
- C. Vibration Isolation Systems:
 - 1. Verify isolator static deflections.
 - 2. Verify required clearance beneath vibration-isolated equipment support bases.
 - 3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.
- D. Seismic Controls:
 - 1. Verify snubbing element air gaps.

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- E. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.05 ATTACHMENTS

- A. Statement of special inspections.

END OF SECTION 26 05 48

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SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Floor marking tape.
- G. Warning signs and labels.
- H. Field-painted identification of conduit.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables:
Color coding for power conductors and cables 600 V and less; vinyl color
coding electrical tape.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility
Safety Signs; 2011 (Reaffirmed 2017).
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and
Labels; 2011 (Reaffirmed 2017).
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority
Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- E. UL 969 - Marking and Labeling Systems; Current Edition, Including All
Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

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1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
- C. Samples:
 1. Identification Nameplates: One of each type and color specified.
 2. Warning Signs and Labels: One of each type and legend specified.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of CEC.
- B. Conform to requirements of NFPA 70.
- C. Furnish products listed and classified by UL as suitable for the purpose specified and shown.

1.07 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

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- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - 2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
 - 3. Use voltage marker to identify highest voltage present for each piece of electrical equipment.

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4. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
5. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
6. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
7. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
8. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
9. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
10. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
11. Available Fault Current Documentation: Comply with Section 26 05 73. Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
 - a. Service equipment.
 - b. Industrial control panels.
 - c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
12. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

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13. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.
- C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
 4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
 5. Use underground warning tape to identify direct buried cables.
- D. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
 - a. Maximum Intervals: 20 feet.
 2. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.
 - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.

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- 1) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.
 - 2) Other Owner required color coding systems.
 3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
 4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
 5. Use underground warning tape to identify underground raceways.
 6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.
- E. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
 2. Use voltage markers or color coded boxes to identify systems other than normal power system.
 3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.. Install on back side of box cover.
 - a. For exposed boxes in public areas, use only identification labels.
 4. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
- F. Identification for Devices:
1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
 2. Factory Pre-Marked Wallplates: Comply with Section 26 27 26.
 3. Use identification label to identify fire alarm system devices.
 - a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.

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4. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
 5. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
 6. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.
- G. Identification for Luminaires:
1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.
- H. Buried Electrical Lines: Underground warning tapes.
- I. Communication Cabinets: Nameplates.
- J. Conduit: Conduit markers.
- K. Control Device Station: Labels.
- L. Electrical Distribution and Control Equipment Enclosures: Nameplates.

2.02 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Seton Identification Products: www.seton.com/aec.
- C. HellermannTyton: www.hellermannntyton.com.
- D. E-Z Code by T&B.
- E. Pan-Code by Panduit.
- F. Or approved equal.

2.03 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 1. Manufacturers:

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- a. Brimar Industries, Inc: www.brimar.com/#sle.
 - b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - c. Seton Identification Products: www.seton.com/#sle.
 - d. Or approved equal.
2. Materials:
- a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
- a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
- B. Identification Labels:
1. Manufacturers:
 - a. Brady Corporation: www.bradyid.com/#sle.
 - b. Brother International Corporation: www.brother-usa.com/#sle.
 - c. Panduit Corp: www.panduit.com/#sle.
 - d. Or approved equal.
 2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - a. Use only for indoor locations.

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3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
 - a. System designation where applicable:
 - 1) Emergency Power System: Identify with text "EMERGENCY".
 - b. Equipment designation or other approved description.
 - c. Other information as indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
 - a. System Designation: 1/2 inch.
 - b. Equipment Designation: 1/4 inch.
 - c. Other Information: 1/8 inch.
 - d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
5. Color:
 - a. Normal Power System: White text on black background.
 - 1) 208Y/120 V, 3 Phase Equipment: White text on black background.

D. Format for General Information and Operating Instructions:

1. Minimum Size: 1 inch by 2.5 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch.
5. Color: Black text on white background unless otherwise indicated.

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a. Exceptions:

- 1) Provide white text on red background for general information or operational instructions for emergency systems.
- 2) Provide white text on red background for general information or operational instructions for fire alarm systems.
- 3) Provide white text on black background for all other systems, unless noted otherwise.

E. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
 - a. Include voltage and phase for other than 120 V, single phase circuits.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

G. Format for Control Device Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Load controlled or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

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H. Manufacturers:

1. Kolbi Pipe Marker Co.; Model: www.kolbipipemarkers.com.
2. Seton Identification Product; Model: www.seton.com.
3. Or approved equal.

I. Nameplates: Engraved three-layer laminated plastic, white letters on black background, unless noted otherwise on drawings or specifications.

J. Locations:

1. Each electrical distribution and control equipment enclosure.
2. Communication cabinets.

K. Letter Size:

1. Use 1/8 inch letters for identifying individual equipment and loads.
2. Use 1/4 inch letters for identifying grouped equipment and loads.

L. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations.

2.04 WIRE AND CABLE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradyid.com/#sle.
2. Seton Identification Products: www.seton.com.
3. HellermannTyton: www.hellermannntyton.com/#sle.
4. Panduit Corp: www.panduit.com/#sle.
5. Or approved equal.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, or plastic sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

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- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
 - 1. Do not use handwritten text.
- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.
- H. Description: Vinyl cloth type self-adhesive wire markers.
- I. Description: Cloth type wire markers.
- J. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.
- K. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
 - 2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

2.05 VOLTAGE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com/#sle.
 - 2. Brimar Industries, Inc: www.brimar.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
 - 4. HellermannTyton: www.hellermannntyton.com.
 - 5. Or approved equal.
- B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- D. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches.

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2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- E. Legend:
1. Markers for Voltage Identification: Highest voltage present.
 2. Markers for System Identification:
 - a. Emergency Power System: Text "EMERGENCY".
 - b. Other Systems: Type of service.
- F. Color: Black text on orange background unless otherwise indicated.
- G. Location: Furnish markers for each conduit longer than 6 feet.
- H. Spacing: 20 feet on center.

2.06 UNDERGROUND WARNING TAPE

- A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
 2. Brimar Industries, Inc: www.brimar.com/#sle.
 3. Seton Identification Products: www.seton.com/#sle.
 4. HellermannTyton: www.hellermannntyton.com.
 5. Or approve equal.
- B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- C. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.
- D. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.
- E. Legend: Type of service, continuously repeated over full length of tape.
- F. Color:

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1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.07 FLOOR MARKING TAPE

A. Manufacturers:

1. Brady Corporation: www.bradyid.com/#sle.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Insite Solutions, LLC: www.stop-painting.com/#sle.
4. Seton Identification Products: www.seton.com/#sle.
5. Or approved equal..

- ### B. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

2.08 WARNING SIGNS AND LABELS

A. Manufacturers:

1. Brimar Industries, Inc: www.brimar.com/#sle.
2. Clarion Safety Systems, LLC: www.clarionsafety.com/#sle.
3. Insite Solutions, LLC: www.stop-painting.com/#sle.
4. Seton Identification Products: www.seton.com/#sle.
5. Or approved equal.

- ### B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:

1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.

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2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 3. Minimum Size: 7 by 10 inches unless otherwise indicated.
- D. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - a. Do not use labels designed to be completed using handwritten text.
 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 3. Minimum Size: 2 by 4 inches unless otherwise indicated.
- E. Floor Signs:
1. Materials: Use factory preprinted, self-adhesive vinyl, polyester, or rubber labels with protective overlamine; removable.
 2. Minimum Size: 17-inch diameter unless otherwise indicated.
- F. Description: 3 inch wide polyethylene tape, detectable type colored red with suitable warning legend describing buried electrical lines.
- G. Description: 4 inch wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.
- B. Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

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1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Enclosure front.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conduits: Legible from the floor.
 8. Boxes: Outside face of cover.
 9. Conductors and Cables: Legible from the point of access.
 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

- A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 26 05 53

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SECTION 26 05 83 - WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 05 33.13 - Conduit for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 28 16.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in of electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.

1.05 SUBMITTALS

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- A. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Comply with NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
 - 4. Product: As noted on drawings or as required for the application.
- B. Disconnect Switches: As described and in individual equipment sections.
- C. Wiring Devices: As specified in Section 26 05 33.13.
- D. Flexible Conduit: As specified in Section 26 05 33.13.
- E. Wire and Cable: As specified in Section 26 05 19.
- F. Boxes: As specified in Section 26 05 33.16.

2.02 EQUIPMENT CONNECTIONS

- A. Connection Types and Ratings::

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1. Electrical Connection: Flexible conduit, metallic or liquid tight flexible conduit as required by the application.
2. Electrical Connection: Cord and plug (Verify NEMA configuration and rating with equipment installer at jobsite).
3. Provide field-installed disconnect switch.
4. Voltage: Verify with equipment nameplate.
5. Load rating: Verify with equipment nameplate.
6. FLA: Verify with equipment nameplate.
7. WSA: Verify with equipment nameplate.
8. Branch Circuit: Verify with equipment nameplate.
9. Location: As indicated on drawings. Verify with equipment installer at jobsite.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL 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. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

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- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION 26 05 83

COMMISSIONING FOR ELECTRICAL

SECTION 26 08 00 COMMISSIONING FOR ELECTRICAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
- B. The provisions of Division 26 sections, Basic Electrical Requirements apply to work specified in this Section.
- C. The Work of this Section is supplemental to and does not supersede any other requirements of the Contract Documents.

1.2 SUMMARY

- A. The commissioning process is described in Section 01 91 00 Commissioning.
- B. Provide all labor and materials required to complete the commissioning of those Division 26 systems and equipment identified as Commissioning Systems and Equipment in Section 01 91 00 Commissioning.
- C. Related Sections include:
 - 1. Section 01 91 00 Commissioning.
 - 2. All Sections of Division 26.

1.3 SUBMITTALS

- A. Refer to Section 01 91 00 Commissioning.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. Refer to Section 01 91 00 Commissioning.

PART 3 EXECUTION

3.1 COMMISSIONING RESPONSIBILITIES – COMMISSIONING PROVIDER

- A. Refer to Section 01 91 00 Commissioning.

3.2 COMMISSIONING RESPONSIBILITIES – SUBCONTRACTOR

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- A. Refer to Section 01 91 00 Commissioning.

3.3 MEETINGS

- A. Refer to Section 01 91 00 Commissioning.

3.4 INSTALLATION, CHECK-OUT, START-UP, AND PREFUNCTIONAL CHECKLISTS

- A. Refer to Section 01 91 00 Commissioning.

3.5 FUNCTIONAL TESTING

- A. Refer to Section 01 91 00 Commissioning.

3.6 INTEGRATED SYSTEMS TESTING

- A. Refer to Section 01 91 00 Commissioning.

3.7 TRAINING

- A. Refer to Section 01 91 00 Commissioning.

END OF SECTION 26 08 00

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SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Lighting and appliance panelboards.
- B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
 - 1. Includes requirements for the seismic qualification of equipment specified in this section.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 28 13 - Fuses: Fuses for fusible switches and spare fuse cabinets.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
- F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- G. NEMA PB 1 - Panelboards; 2011.
- H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

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- I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- L. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- M. UL 67 - Panelboards; Current Edition, Including All Revisions.
- N. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- O. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- P. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- Q. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- R. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.
- S. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

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4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 4. Include documentation of listed series ratings upon request.
 5. Identify mounting conditions required for equipment seismic qualification.
- C. Manufacturer's equipment seismic qualification certification.
- D. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
- E. Field Quality Control Test Reports.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

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- H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- I. Maintenance Materials: Furnish the following for Owner's (Owner's) use in maintenance of project.
 - 1. Panelboard Keys: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of CEC.
- B. Conform to requirements of NFPA 70.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

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2.01 MANUFACTURERS

- A. ABB: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. Or approved equivalent subject to substitution process
- F. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Seismic Qualification: Provide panelboards and associated components suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- D. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Listed series ratings are not acceptable, except where pre-approved by the Owner and LP Consulting Engineers, Inc.
 - 3. Label equipment utilizing series ratings as required by NFPA 70 where permitted.

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- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 - 2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.
 - 3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
 - 4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
 - c. Provide removable end walls for NEMA Type 1 enclosures.
 - d. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.

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3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated. Provide door-in-door construction.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
 1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
 2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
 - a. Use zero sequence ground fault detection method unless otherwise indicated.
 - b. Provide test panel and field-adjustable ground fault pick-up and delay settings.
 - c. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control ground fault delay functions for system coordination purposes.
- L. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- M. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

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N. Provide the following features and accessories where indicated or where required to complete installation:

1. Feed-through lugs.
2. Sub-feed lugs.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Suitable for terminating aluminum or copper conductors. .
2. Main and Neutral Lug Type: Mechanical.
 - a. Provide an individual terminal or lug for each neutral wire.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Copper.
3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
4. Provide clear plastic circuit directory holder mounted on inside of door.

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- F. Provide column-width panelboards with accessory column-width cable trough and pullbox where indicated.
- G. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- H. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard ; provide insulated ground bus where scheduled.
- I. Minimum Integrated Short Circuit Rating: As indicated or as required by the short circuit study.
 - 1. 240 Volt Panelboards: 10,000 amperes rms symmetrical.
- J. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.
 - 1. Type SWD for lighting circuits.
 - 2. Type HACR for air conditioning equipment circuits.
 - 3. Class A ground fault interrupter circuit breakers where scheduled.
 - 4. Do not use tandem circuit breakers.
- K. Enclosure: NEMA PB 1, Type 1.
- L. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards..
- M. Cabinet Front: Flush cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.
- N. Special Features:
 - 1. Provide blocking clips or lock-off devices on circuit breakers as indicated on the drawings.
 - 2. Provide barriered space for mounting contactors and control devices with a hinged door and lock, where shown or required.
 - 3. Provide neutral bars with terminal for all active, spare, and inactive circuits.
 - 4. Provide feed-thru lugs or sub-feed lugs for 2 and 3 section panels.

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5. Equip bus bars for panelboard with main lugs, main fused switch, or main circuit breaker, capacity as required or as indicated.
6. Provide special features such as split bus, lighting contactors, extra-wide gutters as required or as indicated.
7. Provide panels with individual branch circuit power metering where noted on plans for connections to Facility Energy Management System. Provide Square D type NFMVP, NQMVP or approved equal.

2.04 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Provide required seismic controls in accordance with Section 26 05 48.
- G. Install panelboards plumb and when recessed, flush with wall finishes. Provide all backing for equipment support. Fasten all free-standing equipment to concrete slab. Mounting bolts on floor mounted panels shall extend into pads only and shall not be in direct contact with building structural members.

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- H. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- I. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- J. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- K. Provide grounding and bonding in accordance with Section 26 05 26.
 - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
 - 2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.
- L. Install all field-installed branch devices, components, and accessories.
- M. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- N. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- O. Set field-adjustable circuit breaker tripping function settings as indicated.
- P. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- Q. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.
- R. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- S. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- T. Provide filler plates to cover unused spaces in panelboards.
- U. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:

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1. Emergency and night lighting circuits.
 2. Fire detection and alarm circuits.
 3. Communications equipment circuits.
 4. Intrusion detection and access control system circuits.
 5. Video surveillance system circuits.
- V. Identify panelboards in accordance with Section 26 05 53.
- W. Provide computer-generated circuit directory card for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.
- X. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- Y. Provide engraved plastic nameplates under the provisions of Section 26 05 53.
- Z. Provide arc flash warning labels in accordance with NFPA 70.
- AA. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.
1. Minimum spare conduits: 6 empty 1 inch.
- BB. Ground and bond panelboard enclosure according to Section 26 05 26.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 40 00.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Fusible Switches: Perform inspections and tests listed in NETA ATS.
- D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 100 amperes.. Tests listed as optional are not required.
- E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not

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required.

- F. Test GFCI circuit breakers to verify proper operation.
- G. Test AFCI circuit breakers to verify proper operation.
- H. Test shunt trips to verify proper operation.
- I. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.
- J. Correct deficiencies and replace damaged or defective panelboards or associated components.
- K. Perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 24 16

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SECTION 26 28 13 - FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fuses.
- B. Spare fuse cabinet.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 24 16 - Panelboards: Fusible switches.
- D. Section 26 28 16.16 - Enclosed Switches: Fusible switches.

1.03 REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.
- D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.
- E. UL 248-8 - Low-Voltage Fuses - Part 8: Class J Fuses; Current Edition, Including All Revisions.
- F. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.
- G. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.
- H. UL 248-15 - Low-Voltage Fuses - Part 15: Class T Fuses; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

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A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
 - a. Fusible Enclosed Switches: See Section 26 28 16.16.
2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
3. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
- B. Maintenance Materials: Furnish the following for Owner's (Owner's) use in maintenance of project.
 1. Extra Fuses: Three set(s) of three for each type and size installed.
 2. Fuse Pullers: One set(s) compatible with each type and size installed.
 3. Spare Fuse Cabinet Keys: Two.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of CEC.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience and with service facilities within 100 miles of Project.
- D. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

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- A. Cooper Bussmann
- B. Ferraz Shawmut, Inc
- C. Littelfuse
- D. Gould
- E. Or approved equal.

2.02 APPLICATIONS

- A. General Purpose Branch Circuits: Class RK1, time-delay.
- B. Individual Motor Branch Circuits: Class RK1, time-delay.
- C. HVAC equipment: Provide fuses, size, type, and ratings in accordance with equipment nameplate data to be field verified by contractor.

2.03 FUSES

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.
 - 1. Class RK1, Time-Delay Fuses:
 - a. Products:
 - 1) Bussmann, "Low-Peak"; 250V KTN-RK and 600V LPS-RK.
 - 2) Littlefuse, "Little-Peak" 250V LLN-RK and 600V LLS-RK.
 - 3) Gould "AMPTRAP II" 250V A2D-R and 600V A6D-R.

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2. Class RK1, Fast-Acting, Non-Time-Delay Fuses:
 - a. Products:
 - 1) Bussmann "Limitron", 250V KTN-RK and 600V KTS-RK..
 - 2) Littlefuse 250V RLN-R and 600V RLS-R.
 - 3) Gould "AMPTRAP" 250V A2K-R and 600V A6K-R..
3. Class RK5, Time-Delay Fuses:
 - a. Products:
 - 1) Bussmann "Fusetron" 250V FRN-RK and 600V FRS-RK.
 - 2) Littlefuse "SLO-BLO" 250V FLN-R and 600V FLS-R.
 - 3) Gould "TRI-ONIC" 250V TR-R and 600V TRS-R.
4. Class RK5, Fast-Acting, Non-Time-Delay Fuses:
 - a. Products:
 - 1) Bussmann 300V "T-Tron" JJN, 600V "Limitron" JKS.
- H. Class J Fuses: Comply with UL 248-8.
 1. Class J, Time-Delay Fuses:
 - a. Products:
 - 1)
 2. Class J, Fast-Acting, Non-Time-Delay Fuses:
 - a. Products:
 - 1) Bussmann 300V JJN, 600V JKS.
- I. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- J. Provide the following accessories where indicated or where required to complete installation:
 1. Fuseholders: Compatible with indicated fuses.

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2. Fuse Reducers: For adapting indicated fuses to permit installation in switch designed for fuses with larger ampere ratings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B. Verify that mounting surfaces are ready to receive spare fuse cabinet.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.
- C. Install spare fuse cabinet in convenient location in main electrical room unless otherwise indicated on drawings.
- D. Identify spare fuse cabinet in accordance with Section 26 05 53.
- E. Provide identification nameplate for spare fuse cabinet in accordance with Section 26 05 53.

END OF SECTION 26 28 13

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SECTION 26 28 16.16 - ENCLOSED SWITCHES

PART 2 PRODUCTS

1.01 MANUFACTURERS

- A. ABB/GE: www.geindustrial.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. Cutler-Hammer.
- F. Or approved equal.
- G. Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

1.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Seismic Qualification: Provide enclosed safety switches suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.
- D. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- E. Horsepower Rating: Suitable for connected load.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Short Circuit Current Rating:

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1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
2. Minimum Ratings:
 - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
 - b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
 - c. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
- H. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- I. Provide with switch blade contact position that is visible when the cover is open.
- J. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- K. Conductor Terminations: Suitable for use with the conductors to be installed.
- L. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- M. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- N. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.

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- c. Wash down and corrosive Locations: Type 4X.
- 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- O. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- P. Heavy Duty Switches:
 - 1. Comply with NEMA KS 1.
 - 2. Conductor Terminations:
 - a. Provide mechanical lugs.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
 - a. Provide means for locking handle in the ON position where indicated.
- Q. Provide the following features and accessories where indicated or where required to complete installation:
 - 1. Hubs: As required for environment type; sized to accept conduits to be installed.
 - 2. Integral fuse pullers.
 - 3. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.
 - 4. Viewing Window: Positioned over switch blades for visual confirmation of contact position with door closed.
 - 5. Interlocked Receptacle: Integral pre-wired three phase, three wire, grounded type receptacle interlocked with switch mechanism to prevent insertion or removal of plug with switch in the ON position and to prevent switch from being placed in the ON position without matching plug inserted. Provide receptacle configuration as required to accept plug as indicated on the drawings.

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PART 3 EXECUTION

2.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

2.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Provide required seismic controls in accordance with Section 26 05 48.
- F. Install enclosed switches plumb.
- G. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- H. Provide grounding and bonding in accordance with Section 26 05 26.
- I. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Identify enclosed switches in accordance with Section 26 05 53.

2.03 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

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- C. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

2.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

2.05 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 28 16.16

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SECTION 28 46 00 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Transmitters for communication with supervising station.
- C. Circuits from protected premises to supervising station, including conduit.
- D. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.
- E. Maintenance of fire alarm system under contract for specified warranty period.
- F. The fire alarm system shall consist of all necessary hardware equipment and software programming to perform the following functions:
 - 1. Fire alarm detection operations.
 - 2. Control and monitoring of smoke control equipment and other equipment as indicated in the drawings and specifications.
 - 3. System shall tie into the existing Notifier NFS2-3030 DVC-EM and be fully integrated. New fire alarm appliances shall be programmed to the existing FACP.
- G. Thoroughly inspect the existing system and site conditions before bid. Advise the District's Representative of all conditions requiring immediate attention or might cause difficulties that are not addressed, or inferred to, in the contract drawings and specifications prior to new construction and the commencement of the guarantee period.
- H. Review the Drawings and Specifications for work and material provided by others that will affect work specified under this Section. Carefully coordinate with other trades, equipment suppliers, contractors, etc. as required to provide a high quality reliable installation with a minimum of construction delays. All work required to be re-accomplished due to lack of coordination shall be done at the Contractor's expense.

2.01 RELATED REQUIREMENTS

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- A. Section 07 84 00 - Firestopping: Materials and methods for work to be performed by this installer.
- B. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.
- C. Section 23 33 00 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

2.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage Power Circuits; 1991 (R1995).
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.
- E. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

2.03 AMERICANS WITH DISABILITIES ACT (ADA)

- A. All visual Notification appliances and manual pull stations shall comply with the requirements of the Americans with Disabilities Act or 2022 CBC, whichever is more stringent.

2.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
 - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
 - 3. Certification by that the system design will comply with Contract Documents.
 - 4. Proposed maintenance contract.

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- C. Drawings must be prepared using AutoCAD Release 2017.
1. Owner will provide floor plan drawings for 's use; verify all dimensions on Owner-provided drawings.
- D. Evidence of designer qualifications.
- E. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
1. Copy (if any) of list of data required by authority having jurisdiction.
 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
 4. System zone boundaries and interfaces to fire safety systems.
 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
 7. List of all devices on each signaling line circuit, with spare capacity indicated.
 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
 10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
 11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
 12. Certification by that the system design complies with Contract Documents.

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13. Do not show existing components to be removed.
- F. Evidence of installer qualifications.
- G. Evidence of instructor qualifications; training lesson plan outline.
- H. Evidence of maintenance contractor qualifications, if different from installer.
- I. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
 2. Submit documentation of satisfactory inspections and tests.
 3. Submit NFPA 72 "Inspection and Test Form," filled out.
- J. Operating and Maintenance Data: See Section 01 78 00 for additional requirements; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
 2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
 3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
 4. List of recommended spare parts, tools, and instruments for testing.
 5. Replacement parts list with current prices, and source of supply.
 6. Detailed troubleshooting guide and large scale input/output matrix.
 7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
 8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- K. Project Record Documents: See Section 01 78 00 for additional requirements:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.

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2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- L. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
 3. Certificate of Occupancy.
 4. Maintenance contract.
 5. Report on training results.
- M. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
 3. In addition to the items in quantities indicated in PART 2, furnish the following:
 - a. All tools, software, and documentation necessary to modify the fire alarm system using Owner's personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.
 - b. One copy, on CD-ROM, of all software not resident in read-only-memory.

2.05 QUALITY ASSURANCE

- A. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the

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relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to Owner upon completion.

- B. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, , or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction
- C. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
 - 1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
 - 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
 - 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
 - 4. Contract maintenance office located within 100 miles of project site.
 - 5. Certified in California as fire alarm installer.
- D. Maintenance Contractor Qualifications: Same entity as installer.
- E. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.
- F. WARRANTY
 - 1. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
 - 2. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
 - 3. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

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3.01 MANUFACTURERS (MATCH CAMPUS EXISTING SYSTEM)

- A. Fire Alarm Control Units - Basis of Design: Honeywell Security & Fire Solutions/Notifier ; NFS2-3030 : www.notifier.com. No known equal.
- B. Existing Notifier NFS2-3030D fire alarm control panel shall accommodate the new fire alarm appliances. This integration shall result in a fully functional and integrated network as described in the plans and specifications.
- C. Fire Alarm Control Units and Accessories:
 - 1. Honeywell Security & Fire Solutions/Notifier: www.notifier.com/#sle.
 - 2. Provide control units made by the same manufacturer.
- D. Initiating Devices and Notification Appliances:
 - 1. Honeywell Security & Fire Solutions/Notifier: www.notifier.com/#sle.

3.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide modifications and extensions to the existing automatic fire detection and alarm system:
 - 1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
 - 2. Protected Premises: Entire building shown on drawings.
 - 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. ADA Standards.
 - b. The requirements of the State Fire Marshal.
 - c. The requirements of the local authority having jurisdiction.
 - d. Applicable local codes.
 - e. Contract Documents (drawings and specifications).
 - f. NFPA 101.
 - g. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.

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4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
 5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
 6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
 7. Program notification zones as directed by Owner.
 8. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
 9. Fire Command Center: Location indicated on drawings.
 10. Fire Alarm Control Unit: Existing, located at building A .
 11. Combined Systems: Do not combine fire alarm system with other non-fire systems.
- B. Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: Via existing system.
 2. Remote Supervising Station: UL-listed central station under contract to facility.
 3. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.
- C. Circuits:
1. Initiating Device Circuits (IDC): Class B, Style A.
 2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
 3. Notification Appliance Circuits (NAC): Class B, Style W.
- D. Spare Capacity:
1. Initiating Device Circuits: Minimum 25 percent spare capacity.
 2. Notification Appliance Circuits: Minimum 25 percent spare capacity.

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3. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:

1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

3.03 EXISTING COMPONENTS

- A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.
- B. Clearly label components that are "Not In Service."
- C. Remove unused existing components and materials from site and dispose of properly.

3.04 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
 1. Sprinkler water flow.
- C. HVAC:
 1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

3.05 COMPONENTS

- A. General:

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1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Initiating Devices:
1. Addressable Systems:
 2. Addressable Manual Pull Stations: NGB-12LX.
 - a. Provide 1 extra.
 3. Smoke Detectors: Notifier FSP-951.
 4. Heat Detectors: Notifier FST-951H.
- D. Notification Appliances:
1. Weatherproof Speaker: System Sensor SPSRK.
 2. Strobes: System Sensor.
 3. Strobes/Speaker: System Sensor SPSCWL.
 4. Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz and operates horns with a Temporal Code Pattern operation. The circuit shall provide the capability to silence the audible signals, while the strobes continue to flash, over a single pair of wires. The capability to synchronize multiple notification appliance circuits shall be provided.
- E. The internal power supply & battery charger shall be capable of charging up 12.7 Ah batteries internally mounted or 18Ah batteries mounted in an external cabinet.
- F. Accessories: The contractor shall furnish the necessary accessories
- G. Circuit Conductors: Copper; provide 200 feet extra; color code and label.
- H. Locks and Keys: Deliver keys to Owner.
1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

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- I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
 - 1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
 - 2. Provide one for each control unit where operations are to be performed.
 - 3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
 - 4. Provide extra copy with operation and maintenance data submittal.
- J. Storage Cabinet for Spare Parts and Tools: Steel with baked enamel finish, size appropriate to quantity of parts and tools.
 - 1. Padlock eye and hasp for lock furnished by Owner.
 - 2. Locate as directed by Owner.

PART 3 EXECUTION

4.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, CEC 2022, and the contract documents.
- B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
 - 1. Factory trained and certified personnel.
 - 2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
 - 3. Personnel licensed or certified by state or local authority.
- C. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- D. Install all wiring in conduit, 3/4" minimum. No exception.
- E. Existing Fire Alarm Equipment shall be maintained, and new control equipment and devices shall be 100% compatible with the existing system.

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- F. Install instruction cards and labels.

4.02 CLEANING AND ADJUSTING

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.
- B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

4.03 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
 - 1. Record all system operations and malfunctions.
 - 2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
 - 3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.

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4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

4.04 OWNER PERSONNEL INSTRUCTION

- A. Provide the following instruction to designated Owner personnel:
 1. Hands-On Instruction: On-site, using operational system.
 2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
 3. Factory Instruction: At control unit manufacturer's training facility.
- B. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
 1. Initial Training: 1 session pre-closeout.
- C. Detailed Operation: Two-hour sessions for engineering staff; assume NICET level I qualifications or equivalent; combination of classroom and hands-on:
 1. Initial Training: 1 session pre-closeout.
- D. Maintenance Technicians: Detailed training for electrical technicians, on programming, maintaining, repairing, and modifying; factory training:
 1. Initial Training: One 3-day session, pre-closeout.
- E. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.
- F. Provide means of evaluation of trainees suitable to type of training given; report results to Owner.

4.05 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
 1. Be prepared to conduct any of the required tests.
 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.

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3. Have authorized technical representative of control unit manufacturer present during demonstration.
4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
5. Repeat demonstration until successful.

4.06 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.
- C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
 1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
 2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
 3. Record keeping required by NFPA 72 and authorities having jurisdiction.
- D. Provide trouble call-back service upon notification by Owner:
 1. Provide on-site response within 24 hours of notification.
 2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
 3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble,

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correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

G. Comply with Owner's requirements for access to facility and security.

END OF SECTION 28 46 00

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SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Chain-link fences.
 - 2. Swing gates.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Fence and gate posts, rails, and fittings.
 - b. Chain-link fabric, reinforcements, and attachments.
 - c. Gates and hardware.
- B. Shop Drawings: For each type of fence and gate assembly.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include accessories, hardware, gate operation, and operational clearances.
- C. Samples for Initial Selection: For each type of factory-applied finish.
- D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:
 - 1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.
- E. Design Data Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the professional engineer responsible for their preparation.

1.03 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.04 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

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1.05 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to comply with performance requirements.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - c. Faulty operation of gate operators and controls.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Hoover Fence Company.
 - 2. Master Halco, Inc.

2.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.
 - 1. Design Wind Load: As indicated on Drawings.
 - a. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified.

2.03 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
 - 1. Fabric Height: As indicated on Drawings.
 - 2. Steel Wire for Fabric: Wire diameter of 0.148 inch , unless indicated otherwise.
 - a. Mesh Size: 2 inches, unless indicated otherwise.
 - b. Zinc-Coated Fabric: ASTM A392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied after weaving.
 - c. Polymer-Coated Fabric: ASTM F668, Class 2b over zinc -coated steel wire.
 - 1) Color: Black, according to ASTM F934.
 - d. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.
 - 3. Selvage: Knuckled at both selvages.

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2.04 FENCE FRAMEWORK

- A. Posts and Rails: ASTM F1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F1043 or ASTM F1083 based on the following:
1. Fence Height: As indicated on Drawings.
 2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40 or Group IC, round steel pipe, electric-resistance-welded pipe.
 3. Horizontal Framework Members: ASTM F1043.
 4. Brace Rails: ASTM F1043.
 5. Metallic Coating for Steel Framework:
 - a. Type A: Not less than minimum 2.0-oz./sq. ft. average zinc coating according to ASTM A123/A123M or 4.0-oz./sq. ft. zinc coating according to ASTM A653/A653M.
 - b. Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
 - c. External, Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil- thick, zinc-pigmented coating.
 - d. Type C: Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. coating.
 - e. Coatings: Any coating above.
 6. Polymer coating over metallic coating.
 - a. Color: Match chain-link fabric , according to ASTM F934.

2.05 TENSION WIRE

- A. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire according to ASTM A817 or ASTM A824, with the following metallic coating:
1. Type II: Zinc coated (galvanized) by hot-dip or electrolytic process, with the following minimum coating weight:
 - a. Matching chain-link fabric coating weight.
- B. Polymer-Coated Steel Wire: 0.177-inch- diameter, tension wire according to ASTM F1664, Class 2b over zinc -coated steel wire.
1. Color: Match chain-link fabric , according to ASTM F934.

2.06 SWING GATES

- A. General: ASTM F900 for gate posts and gate types.
1. Gate Leaf Width: As indicated.
 2. Framework Member Sizes and Strength: Based on gate fabric height as indicated.

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- B. Pipe and Tubing:
 - 1. Zinc-Coated Steel: ASTM F1043 and ASTM F1083; protective coating and finish to match fence framework.
 - 2. Gate Posts: As indicated on Drawings.
 - 3. Gate Frames and Bracing: As indicated on Drawings.
- C. Frame Corner Construction: Welded.
- D. Hardware:
 - 1. Latch: Permitting operation from both sides of gate[**with provision for padlocking accessible from both sides of gate**].

2.07 FITTINGS

- A. Provide fittings according to ASTM F626.
- B. Finish:
 - 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.
 - a. Polymer coating over metallic coating.

PART 3 - EXECUTION

3.01 CHAIN-LINK FENCE INSTALLATION

- A. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.
- B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
- C. Chain-Link Fabric: Apply fabric to enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- D. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches o.c.

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- E. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.
 - 1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
- F. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

3.02 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

3.03 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

END OF SECTION