

P R O J E C T M A N U A L

BRIGHTON HIGH SCHOOL TEEN CENTER

2220 BENGAL BLVD
COTTONWOOD HEIGHTS, UT 84121

FOR
CANYONS SCHOOL DISTRICT

DIVISION 00 through DIVISION 28 + APPENDIX
CONSTRUCTION DOCUMENTS

MHTN PROJECT NO. 2024516
3 MAR 2025



vision made **real**

000107 - SEALS PAGE

DESIGN PROFESSIONALS OF RECORD

ARCHITECT	MECHANICAL ENGINEER	ELECTRICAL ENGINEER

All professional seals (stamps) to be signed and dated; Architect Licensing Act Rules R156-3a, Utah Administrative Code, paragraph 601 and Professional Engineers Licensing Act Rules R156-22, Utah Administrative Code, paragraph 601.

TABLE OF CONTENTS

Division	Section Title
000107	Seals Page
DIVISION 00 - CONTRACT FORMS AND CONDITIONS	
007200	General Conditions of the Contract for Construction, AIA A201-2017
007300	Supplementary Conditions to AIA A201-2017
DIVISION 01 - GENERAL REQUIREMENTS	
011000	Summary
012000	Price and Payment Procedures
012500	Substitution Procedures
013000	Administrative Requirements
013216	Construction Progress Schedule
014000	Quality Requirements
014100	Regulatory Requirements
015000	Temporary Facilities and Controls
015100	Temporary Utilities
016000	Product Requirements
017000	Execution and Closeout Requirements
017800	Closeout Submittals
DIVISION 02 - EXISTING CONDITIONS	
024100	Demolition
DIVISION 03 - CONCRETE	
033000	Cast-in-Place Concrete
DIVISION 05 - METALS	
DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES	
061000	Rough Carpentry
064100	Architectural Wood Casework
064219	Plastic-Laminate-Faced Wood Paneling
DIVISION 07 - THERMAL AND MOISTURE PROTECTION	
079200	Joint Sealants
DIVISION 08 - OPENINGS	
081213	Hollow Metal Frames
081416	Flush Wood Doors
084313	Aluminum-Framed Storefronts
087100	Door Hardware
088000	Glazing
DIVISION 09 - FINISHES	
090561	Common Work Results for Flooring Preparation
092116	Gypsum Board Assemblies
093000	Tiling
095100	Acoustical Ceilings

095426	Suspended Wood Ceilings
096500	Resilient Flooring
096813	Tile Carpeting
097200	Wall Coverings
099000	Paintings and Coatings

DIVISION 10 – SPECIALTIES

102600	Wall and Door Protection
102800	Toilet, Bath, and Laundry Accessories
104400	Fire Protection Specialties

DIVISION 12 - FURNISHINGS

123600	Countertops
--------	-------------

DIVISION 21 - FIRE SUPPRESSION

210000	Fire Protection
--------	-----------------

DIVISION 22 – PLUMBING

220000	Plumbing
220700	Insulation

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

230000	Heating-Cooling
230100	General Provisions
230501	Testing
230593	Balancing
230900	Basic Materials and Methods
233000	Air Distribution

DIVISION 25 – INTEGRATED AUTOMATION

251000	Automatic Temperature Control
--------	-------------------------------

DIVISION 26 - ELECTRICAL

260500	Electrical General Provisions
260502	Electrical Submittals and O & M Manuals
260507	Electrical Connections for Equipment
260519	Conductors and Cables (600V and Below)
260526	Grounding
260529	Supporting Devices
260532	Conduit Raceway
260533	Electrical Boxes and Fittings
260553	Electrical Identification
260943	Lighting Control Equipment
262726	Wiring Devices
262815	Overcurrent Protective Devices
262816	Motor and Circuit Disconnects
264119	Demolition
265100	Interior and Exterior Building Lighting

DIVISION 27 - COMMUNICATIONS

271500	Telephone & Data Systems CSD - Cabling Standard Final 8-31-18
275123	Intercommunication Systems

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

280501	Common Requirements for Security Systems
282205	Access Control System
282300	IP Video Surveillance System
283111	Fire Alarm and Detection System

APPENDIX

Utah State Tax Commission Exemption Certificate Form TC-721g
License and Indemnification Agreement

END OF TABLE OF CONTENTS

SECTION 007200 - GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

- 1.01 AIA A201 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, 2017 EDITION, ARE INCLUDED BY REFERENCE.

SUPPLEMENTARY CONDITIONS

- 2.01 REFER TO DOCUMENT 007300 - SUPPLEMENTARY CONDITIONS FOR AMENDMENTS TO THESE GENERAL CONDITIONS.

END OF SECTION

007300 - SUPPLEMENTARY CONDITIONS

The following supplements modify AIA Document A201–2017, General Conditions of the Contract for Construction. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 1 GENERAL PROVISIONS

§ 1.1.1 The Contract Documents

Delete Section 1.1.1 and substitute the following:

§ 1.1.1 The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, the Contractor's bid or proposal, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, or portions of Addenda relating to bidding or proposal requirements. The Contract also includes all final bid documents accepted by the School District. And the Bid document requirements.

§ 1.1.8 Initial Decision Maker

Delete Section 1.1.8 and substitute the following.

The Architect will serve as the Initial Decision Maker, and as such, is the person identified to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

Add Sections 1.2.1.2 through 1.2.1.4 to Section 1.2.1:

§ 1.2.1.2 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

- .1 Modifications.
- .2 The Agreement.
- .3 Addenda, with those of later date having precedence over those of earlier date.
- .4 The Supplementary Conditions.
- .5 The General Conditions of the Contract for Construction.
- .6 Division 1 of the Specifications.
- .7 Drawings and Divisions 2–49 of the Specifications.
- .8 Other documents specifically enumerated in the Agreement as part of the Contract Documents.

In the case of conflicts or discrepancies between Drawings and Divisions 2–49 of the Specifications, or within or among the Contract Documents and not clarified by Addendum, the Architect will determine which takes precedence in accordance with Sections 4.2.11, 4.2.12, and 4.2.13.

§ 1.2.1.3 Large scale drawings shall have precedence over small scale drawings in the same area or conditions and should any discrepancy occur between such large and small drawings the same shall be referred to the Architect for decision or clarification. Minor modifications of detailed drawings may be made in larger or full-size drawings to clarify detail and to provide proper connection or construction at points not specifically detailed. Where a portion of the drawings or details is shown in outline, the portion shown in outline shall be constructed the same as like portions of work. If during the course of the contract, conflicts are found between the various parts of the drawings or between drawings and

specifications, the Architect will interpret the drawings and/or specifications so as to secure the most substantial and complete performance of the work.

§ 1.2.1.4 Certain materials and equipment are specified by manufacturer or trade name to establish standards of quality and performance and not for the purpose of limiting competition. Products of other manufacturers may be substituted, if, in the opinion of the Owner and the Architect, they are equal to those specified in quality, performance, design and suitability for intended use. Where two or more items are mentioned, the selection among those specified is the Contractor's option. Bids based on material and equipment other than those specified shall include a statement of substitutions stating difference in cost, if any, for each proposed substitution. Substitutions accepted prior to award of the Contract will be covered by modification to the original Contract Documents. Prior to consideration of any substitution, the Architect may require submission of samples, descriptive, technical and catalog data and reports of tests.

Add Section 1.2.4 to Section 1.2.

§ 1.2.4 Notes and call-outs are to be representative of the complete scope of the project documents. Callouts made in one location apply to all similar conditions.

§ 1.7 Digital Data Use and Transmission

Replace the text under Section 1.7 with the following:

Release of Electronic Media Drawings and Files: an agreement entitled "License and Indemnification Agreement" must be signed and returned to the Architect prior to release of any Documents. A copy of the release is included in Division 1 Sections and may be obtained from the Architect.

ARTICLE 2 OWNER

§ 2.1 General

Replace the text under Section 2.1.1 with the following:

Because no entity may file liens against the Owner as a governmental entity, nothing herein shall be construed to grant a right to assert mechanic's liens against property of the Owner.

Delete Section 2.1.2.

§ 2.2 Evidence of the Owner's financial Arrangements

Delete Section 2.2.1.

§ 2.3 Information and Services Required of the Owner

Delete Section 2.3.6 and substitute the following:

§ 2.3.6 The Owner shall furnish the Contract Documents to the Contractor in digital format. If the Contractor requires paper documents, the Contractor shall be responsible for the costs of producing such paper documents.

ARTICLE 3 CONTRACTOR

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

Add Section 3.2.5 to Section 3.2:

§ 3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

§ 3.3 Supervision and Construction Procedures

Replace the text under Section 3.3.3 with the following:

The Contractor shall be responsible for inspection of the work already performed to determine that such portions of work are in proper condition to receive subsequent work and to ensure that it complies with Contract Documents and relevant codes and authorities so that portions are in proper condition to receive subsequent work.

§ 3.4 Labor and Materials

Add Section 3.4.2.1 to Section 3.4.2:

§ 3.4.2.1 After the Contract has been executed, the Owner and Architect may consider requests for the substitution of products in place of those specified. The Owner and Architect may, but are not obligated to, consider only those substitution requests that are in full conformance with the conditions set forth in the General Requirements (Division 1 of the Specifications). By making requests for substitutions, the Contractor:

- .1 represents that it has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to the product specified;
- .2 represents that it will provide the same warranty for the substitution as it would have provided for the product specified;
- .3 certifies that the cost data presented is complete and includes all related costs for the substituted product and for Work that must be performed or changed as a result of the substitution, except for the Architect's redesign costs, and waives all claims for additional costs related to the substitution that subsequently become apparent;
- .4 agrees that it shall, if the substitution is approved, coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

Add Section 3.4.2.2 to Section 3.4.2:

§ 3.4.2.2 The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for reviewing the Contractor's proposed substitutions and making agreed-upon changes in the Drawings and Specifications resulting from such substitutions.

Add Section 3.4.4 to Section 3.4:

§ 3.4.4 The Contractor shall cooperate with the Architect in forwarding the interests of the Owner; he shall furnish efficient and skilled business administration and supervision during crucial periods along with an adequate supply of workers and materials, and shall complete the work in a workmanlike and expeditious manner, to the satisfaction of the Architect and Owner.

Add Section 3.4.5 to Section 3.4:

§ 3.4.5 The Contractor shall be responsible for storing, maintaining and preserving in a safe and professional manner the materials that are delivered to the site prior to time for installation.

§ 3.6 Taxes

Replace the text under Section 3.6 with the following:

Purchases of construction materials by the Contractor is not subject to Utah State Sales Tax. Use of Tax-Exempt form TC-721g and authorization for such use shall be at the direction of the School District.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

Delete Section 3.7.1 and substitute the following:

§ 3.7.1 Unless otherwise notified in writing, the Contractor shall not be required to obtain Building Permits or other permits from governmental authorities. The Owner shall provide its own inspectors to comply with inspection requirements of governmental authorities. However, the fact that the Owner provides its own

inspectors for such purposes does not release the Contractor from the obligation to conduct inspections of the Work to ensure that it complies with Contract Documents, or to otherwise comply with all applicable laws, statutes, ordinances, building codes, rules and regulations.

Add Sections 3.7.1.1 and 3.7.1.2 to Section 3.7.1:

§ 3.7.1.1 Fees for impact fees and permits for off-site work and roadways are the responsibility of the Contractor. On-site permits are the responsibility of the School District.

§ 3.7.1.2 Where inspections required by the Contract Documents and indicated to be by the Owner, require re-inspection, following the second inspection to comply with requirements, the Contractor will be charged **\$200.00 per each additional inspection** required until approval for the Architect and each consultant for each trade not complete.

§ 3.9 Superintendent

Add Section 3.9.4 to Section 3.9:

§ 3.9.4 The Superintendent and Project Coordinator are subject to the approval of the Owner. Should the Owner request removal of either one during the course of the Work, replacements, acceptable to the Owner shall be provided to permit the Project to proceed without delay.

§ 3.10 Contractor's Construction and Submittal Schedules

Add Section 3.10.2.1 to Section 3.10.2:

§ 3.10.2.1 Submittals as defined in Section 3.12, shall be submitted to the Architect for review on or before 30 calendar days from the Date of Agreement in the Owner/Contractor Agreement. If the date of commencement of the Work is adjusted to a later date in the Agreement, the submittal deadline will be adjusted accordingly. Submittals submitted after the 30 days shall be subject to a **\$500 per day penalty**.

§ 3.12 Shop Drawings, Product Data and Samples

Add Section 3.12.11 to Section 3.12:

§ 3.12.11 The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and one (1) resubmittal. The Contractor shall reimburse the Owner for amounts paid to the Architect for evaluation of additional resubmittals.

§ 3.18 Indemnification

Add the following to the end of Section 3.18.1:

The Contractor's duty to indemnify and hold harmless shall extend to contract claims against the Owner by any Subcontractor or third party arising from errors, negligence or omissions of the Contractor or Contractor's alleged failure to pay amounts due and owing.

ARTICLE 4 ARCHITECT

§ 4.2.2

Add Section 4.2.2.1 to Section 4.2.2:

§ 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work.

§ 4.2.4 Communications

Delete Section 4.2.4 and substitute the following:

§ 4.2.4 The Owner and Contractor shall communicate with each other through the Architect about matters arising out of or relating to the Project. Communications by and with the Architect's consultants shall be

through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7

Add Section 4.2.7.1 to Section 4.2.7:

§ 4.2.7.1 In no case will the Architect's review period on any submittal be less than ten (10) days after receipt of the submittal from the Contractor.

§ 4.2.14

Add Section 4.2.14.1 to Section 4.2.14:

§ 4.2.14.1 Contractor's requests for information shall be prepared and submitted in accordance with Division 1 "General Requirements" sections on the form(s) indicated in Section 013100 "Project Management and Coordination." The Architect will return without action requests for information that do not conform to requirements of the Contract Documents.

ARTICLE 5 SUBCONTRACTORS

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

Revise the first two lines of Section 5.2.1 to read:

The Contractor, no later than two days after award of the Contract, shall furnish in writing to the Owner through the Architect the names of the persons or entities....

Add Section 5.2.5 to Section 5.2:

§ 5.2.5 As part of the Proposal, the Contractor shall furnish in writing to the Owner through the Architect the names of persons or entities proposed as manufacturers or fabricators for certain products, equipment and systems identified in the General Requirements (Division 1 of the Specifications) and where applicable the name of the installing Subcontractor. The Architect may reply within 5 days to the Contractor in writing stating (1) whether the Owner or Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time to review. Failure of the Owner or Architect to reply within a 14-day period shall constitute notice of no reasonable objection.

§ 5.4 Contingent Assignment of Subcontracts

Delete Section 5.4 in its entirety.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

Delete all references to waiver of subrogation in Section 6.1.1.

§ 6.2 Mutual Responsibility

Delete the second sentence of Section 6.2.3.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

Add Section 7.1.4 and Section 7.1.5 to Section 7.1:

§ 7.1.4 The combined overhead and profit included in the total cost to the Owner for a change in the Work shall be based on the following schedule:

- .1 Total mark-up presented to the Owner shall not exceed 10 percent of the cost. This percentage

shall include mark-up for Sub-Contractors or Sub-sub contractors.

- .2 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.4.

§ 7.1.5 In order to facilitate checking of proposals for increases or decreases to the contract sum, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over \$5,000.00 be approved without such itemization.

§ 7.2 Change Orders

Delete Section 7.2.1 and substitute the following, including Section 7.2.2:

§ 7.2.1 A Change Order is a written instrument signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Except as otherwise provided in the Contract Documents, the Contractor shall prepare the Change Order form, which may include supporting materials prepared by the Architect, for review and approval by the Owner and Architect.

§ 7.3 Construction Change Directives

Delete Section 7.3.4.5 and substitute the following:

- .5 Additional costs of supervision and field office personnel, and processing of documentation of the change is considered to be part of general conditions and is not attributable to the change for general construction work or work performed under allowance amounts.

ARTICLE 8 –TIME

Add the following sentence to Section 8.1.4:

The term “working day” shall mean any calendar day except Saturday, Sunday and legal holidays at the Project Site.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.3 Applications for Payment

§ 9.3.1

Add the following sentence to Section 9.3.1:

The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G7021992, Application and Certificate for Payment, supported by a current authorized edition of AIA Document G703–1992, Continuation Sheet.

Add Section 9.3.1.3 to Section 9.3.1:

9.3.1.3 Payments made shall be 95 percent of scheduled values requested by each application for payment. Retainage shall be 5 percent and shall be withheld until final application for payment upon completion of the work. Retainage shall be held in an interest-bearing account and distributed upon disbursement on a pro rata basis among all sub-contractors in accordance with Utah Legislation HB 382.

Add Section 9.3.2.1 to Section 9.3.2:

§ 9.3.2.1 Progress payments for stored materials in a bonded warehouse will be paid in accordance with paragraph 9.3.1.3.

§ 9.5 Decisions to Withhold Certification

Add Section 9.5.1.8 to Section 9.5.1:

- .8 Nothing in this Agreement shall be construed to create a third party beneficiary contract, agency or any other relationship between Owner and any subcontractor or sub-contractor.

§ 9.7 FAILURE OF PAYMENT

Revise Section 9.7 to read fifteen (15) days wherever it refers to seven days.

§ 9.8 Substantial Completion

Delete Section 9.8.1 and substitute the following:

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The following items, completed in their entirety, shall qualify the Work for Substantial Completion:

- .1 Completion of all scheduled finishes: flooring, ceilings, interior architectural woodwork, (finish wall, ceiling and floor coatings), acoustical treatments, partitions and accessories.
- .2 Completion of all doors and door hardware, functioning as scheduled.
- .3 Completion of all storefront systems.
- .4 Completion of all door access controls and door control devices.
- .5 Completion of all A/V, data and phones systems.
- .6 Completion of all light fixtures and day lighting control systems.
- .7 Completion of all fire and smoke alarm systems.
- .8 Completion of all automatic sprinkler system.
- .9 Completion of complete mechanical system, mechanical controls system online & completed testing and balancing report.
- .10 Completion of all mechanical and plumbing fixtures, connected and functioning.

§ 9.8.3.1

Add Section 9.8.3.1 to Section 9.8.3:

§ 9.8.3.1 The Architect will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections.

§ 9.8.6

Add Section 9.8.6 to Section 9.8:

§ 9.8.6 The certificate issued by the Contractor shall warrant to the Owner that the work has been performed according to and complies with plans and specifications, that all work is performed in a good and workmanlike manner and that there are no undisclosed latent dangers in the construction.

§ 9.9 Partial Occupancy or Use

Delete Section 9.9.1 and substitute the following:

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by the Owner and approved as to safety by Owner's inspectors. Such partial occupancy or use may commence whether or not the portion is substantially completed. In the event of such partial use or occupancy, the Owner and Contractor shall specify in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and the Owner has designated in writings the period for correction of the Work and commencement of warranties required by the Contract Documents, so long as the original schedule is not shortened.

§ 9.9.1.1 When the Contractor considers a portion of the Work substantially complete, the Contractor shall prepare and submit a list to the Architect as provided in subparagraph 9.8.2. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.10 Final Completion and Final Payment

§ 9.10.1.1

Add Section 9.10.1.1 to Section 9.10.1:

§ 9.10.1.1 The Architect will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections.

§ 9.10.2.1

Add Section 9.10.2.1 to Section 9.10.2:

§ 9.10.2.1 The Certificate of Final Completion provided by the Contractor to the Owner constitutes a warranty to the Owner that the Work has been performed according to and complies with the Contract Documents, that all Work is performed in a good and workmanlike manner and that there are no undisclosed latent dangers in the construction.

§ 9.10.4

Add Sections 9.10.4.5, 9.10.4.6 and 9.10.4.7 to Section 9.10.4 (delete "or" in Section 9.10.4.3 and replace the period in Section 9.10.4.4 with a colon):

- .4 any Owner liability arising from defects or dangers known to Architect or Contractor that were not disclosed in writing to Owner;
- .5 any liquidated damages and penalties resulting from failure to timely complete the Work; or
- .6 any claims for fraud or fraudulent concealment.

§ 9.11

Add Section 9.11 to Article 9:

§ 9.11 Damages

§ 9.11 1 The Contractor and the Contractor's surety shall be liable for and shall pay the Owner the sums hereinafter stipulated as liquidated damages, and not as a penalty, for each calendar day of delay after the date established for Substantial Completion until the work is substantially complete, including all punch list items: **One Thousand dollars (\$1,000.00) per day.**

The owner reserves the right to assess actual damages or continue liquidated damages.

ARTICLE 10 PROTECTION OF PERSONS AND PREPerty

§ 10.2 Safety of Persons and Property

Add Section 10.2.1.4 to Section 10.2.1:

- .4 Third parties who are invited onto the site or who may otherwise reasonably be expected to access the site.

Add Section 10.2.2.1 to Section 10.2.2:

§ 10.2.2.1 Nothing herein shall be construed to subject the Owner to the jurisdiction of local or state authorities except to the extent required by law.

Add Section 10.2.6.1 to Section 10.2.6:

§ 10.2.6.1 The contractor shall institute a safety program at the start of construction to minimize accidents, until Final completion of the Project and conform to the latest requirements of the State Occupational and Safety Health Act.

§ 10.2.8 Injury or Damage to Person or Property

Add the following paragraph to Section 10.2.8:

The Contractor shall provide the Architect with a copy of all reports of accidents and claims arising out of or in connection with the performance of the work. He shall immediately notify the Architect of accidental death, major injury to persons, and extensive damage to the work. If any claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Architect, giving full details of the claim.

Add Sections 10.2.9 through 10.2.13 to Section 10.2:

§ 10.2.9 The Contractor shall keep areas affected by the work or adjacent to the site free from snow, ice, rubbish, excavation, encumbrances or any obstacles resulting from the construction operations, and in safe condition to the reasonable satisfaction of the authorities having jurisdiction.

§ 10.2.10 The Contractor shall at all times provide protection against weather, rain, winds, storms, frost or heat, so as to maintain all work, materials, apparatus and fixtures, free from injury or damage. At the end of the day's work, all new work reasonably likely to be damaged shall be covered.

§ 10.2.11 Adequate precautions shall be taken against fire throughout all the Contractor's operations. The amount of flammable material shall be reduced to a minimum consistent with the proper handling and storing of materials. Except as otherwise provided herein, the Contractor shall not permit fires to be built or open salamanders to be used in any part of the work.

§ 10.2.11 The Contractor shall provide at the site, and make available to all workers, medical supplies and equipment necessary to supply first aid service to all persons who may be injured in connection with the work.

§ 10.2.12 The Contractor shall provide the Architect with a copy of all reports of accidents and claims arising out of or in connection with the performance of the work. He or she shall immediately notify the Architect of accidental death, major injury to persons, and extensive damage to the work. If any claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Architect, providing full details of the claim.

§ 10.3 Hazardous Materials

Add the following to the end of Section 10.3.2:

"...provided that the presence of hazardous materials was not foreseeable to Contractor at the time of entering into this Agreement."

Delete Section 10.3.3.

ARTICLE 11 - INSURANCE AND BONDS

§ 11.1.2

Add Sections 11.1.2.1, 11.1.2.2 and 11.1.2.3 to Section 11.1.2:

§ 11.1.2.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100 percent of the Contract Sum.

§ 11.1.2.2 The contractor shall deliver the required bonds to the Owner not later than three days following the date the Agreement is entered into, or if the work is to be commenced prior thereto in response to the letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory

to the Owner that such bonds will be furnished.

§ 11.1.2.3 The contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

§ 11.2 Owner's Insurance

Delete Section 11.2.1 and substitute the following:

§ 11.2.1 The Owner shall provide insurance available to it from Utah State Risk Management to cover the Site.

Delete Sections 11.2.2 and 11.2.3.:

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.2 Correction of Work

Add the following paragraph to Section 12.2.2.1:

Nothing herein shall be construed to waive claims Owner has against Contractor for failure to build according to plan or in accordance with authorities having jurisdiction. All work performed during the one-year period shall be performed at Contractor's expense.

§ 12.2.2

Add Section 12.2.2.4 to Section 12.2.2:

§ 12.2.2.4 Upon request by the Owner and prior to the expiration of one year from the date of Substantial Completion, the Architect will conduct, and the Contractor shall attend, a meeting with the Owner to review the facility operations and performance.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.2 Successors and Assigns

Delete the second sentence in Section 13.2.2.

Add Section 13.6 to Article 13:

§ 13.6 Non-Discrimination and Affirmative Action.

§ 13.6.1 The Contractor shall maintain policies of employment as follows:

- .1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but are not limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.
- .2 The Contractor and Contractor's Subcontractors shall, in all solicitations or advertisement for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

§ 13.7 Confidential Information

Add Section 13.7:

§ 13.7 If the Owner or Contractor receives information specifically designated by the other party as "confidential" or "business proprietary," the receiving party shall keep such information strictly confidential

and shall not disclose it to any other person except to (1) those who need to know the content of such information in order to perform services or construction solely and exclusively for the Project, including its employees, or (2) its consultants and contractors whose contracts include similar restrictions on the use of confidential information. However, the party receiving "confidential" or "business proprietary" information may disclose such information, after seven (7) days' Notice to the party providing the confidential or business proprietary information, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by arbitrator(s) order. Notice shall be provided, and deemed to have been duly served, in accordance with § 1.6.2 of A201-2017.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

Delete Section 14.1.3 and replace with the following:

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for work executed, as well as reasonable costs incurred by reason of such termination.

§ 14.3 Suspension by the Owner for Convenience

Delete Section 14.3.1 and replace with the following:

§ 14.3.1 The Owner may terminate for convenience as long as the Contractor is paid in full for all work performed and costs incurred through the date of termination.

Add Section 14.5 to Article 14:

§ 14.5 Nothing herein shall be construed to subject the Owner to the jurisdiction of local or state authorities except to the extent required by law.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1.5 Claims for Additional Cost

Add the following to Section 15.1.5:

However, an addition to the Contract Sum shall be permitted only in the event of a material addition not contemplated in the Contract Documents.

§ 15.1.6 Claims for Additional Time

Modify the language in Section 15.1.6.2 to read:

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, the Claim shall be documented by data substantiating that the weather conditions upon which the Claim is based (1) were abnormal when compared to the previous five-year period, during the same time frame and at the location of the Work, (2) could not have been reasonably anticipated, and (3) had an adverse effect on the date of substantial completion of the Work.

Add Sections 15.1.6.3 and 15.1.6.4 to Section 15.1.6:

§ 15.1.6.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work, and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

§ 15.1.6.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of

the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

§ 15.1.7 Waiver of Claims for Consequential Damages

Add the following sentence to Section 15.1.7:

If, before expiration of 30 days from the date of execution for this Agreement, the Owner obtains by separate agreement and furnishes to the Contractor a similar mutual waiver of all claims from the Architect against the Contractor for consequential damages which the Architect may incur as a result of any act or omission of the Owner or Contractor, then the waiver of consequential damages by the Owner and Contractor contained in this Section 15.1.7 shall be applicable to claims by the Contractor against the Architect.

Delete Section 15.1.7.1.

Delete the following from Section 15.1.6.2:

...except anticipated profit arising directly from the Work.

Modify the last sentence in Section 15.2.5 to read:

The initial decision shall be final and binding on their parties but subject to the rights of the parties to assert their claims in a court of law or by mediation.

§ 15.3 Meet and Confer as Condition Precedent to Mediation

Before Section 15.3, Mediation, add the below new Section 15.3 and renumber succeeding paragraphs as necessary:

§ 15.3 Meet and Confer

§ 15.3.1 Any claim, dispute or other matter in question arising out of or related to this Agreement shall be subject to a meet and confer session as a condition precedent to mediation.

§ 15.3.2 The meet and confer session shall be attended by members of the Owner and Contractor's senior management, who shall have full authority to bind their respective party with respect to the Claim, dispute or other matter in question. The meet and confer session shall take place within fourteen (14) days after a request by either party, unless the parties mutually agree otherwise.

§ 15.3.3 If the parties reach a mutually acceptable resolution, then they shall prepare appropriate documentation memorializing the resolution. If the parties cannot reach a mutually acceptable resolution, they shall proceed to mediation in accordance with Section 15.4.

§ 15.3 Mediation

Amend to state "may" wherever the word "shall" appears in this article.

§ 15.4 Arbitration

Delete paragraph § 15.4 and all of its subparts in their entirety.

Add the following article:

ARTICLE 16 ADDITIONAL RESPONSIBILITIES

§ 16.1 Signs

§ 16.1.1 Temporary Signs shall not be permitted without review of the Architect.

SECTION 011000 - SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Brighton High School Teen Center.
- B. Owner's Name: Canyons School District.
- C. Architect's Name: MHTN Architects.
- D. The Project consists of the renovation of existing space into a Teen Center.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price.

1.03 DESCRIPTION OF ALTERATIONS WORK

- A. Scope of demolition and removal work is indicated on drawings and specified in Section 024100.
- B. Scope of alterations work is indicated on drawings.

1.04 WORK BY OWNER

- A. Owner will supply and install the following:
- B. Owner will supply the following for installation by Contractor:
 - 1. Toilet and Bath Accessories, including: Paper towel dispensers, Toilet paper dispensers, Seat cover dispensers, and Soap dispensers.

1.05 OWNER OCCUPANCY

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
 - 1. Locate and conduct construction activities in ways that will limit disturbance to site.
- B. Arrange use of site and premises to allow:
 - 1. Owner occupancy.
 - 2. Work by Owner.
 - 3. Use of site and premises by the public.

- C. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- D. Existing building spaces may not be used for storage.
- E. Time Restrictions:
 - 1. Limit conduct of interior work to the hours of 7:00 am to 6:00 pm during summer recess and to hours before and after school when it is in session.
- F. Utility Outages and Shutdown:
 - 1. Limit disruption of utility services to hours the building is unoccupied.
 - 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 72 hours notice to Owner and authorities having jurisdiction.
 - 3. Prevent accidental disruption of utility services to other facilities.

1.07 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012000 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.

1.02 SCHEDULE OF VALUES

- A. Forms filled out by hand will not be accepted.
- B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- D. Include in each line item, the amount of Allowances specified in this section.
- E. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- H. Submit one electronic and three hard-copies of each Application for Payment.

1.04 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.

1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within ten days.
- D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation.
- E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
- F. Substantiation of Costs: Provide full information required for evaluation.
1. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- 1.05 APPLICATION FOR FINAL PAYMENT
- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
1. All closeout procedures specified in Section 017000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment 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, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Time Restrictions:
 - 1. Owner will consider requests for substitutions only if submitted at least 7 days prior to the date for receipt of bids.
- B. Submittal Form (before award of contract):
 - 1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 - 1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request (After Bidding/Negotiating). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Architect will consider requests for substitutions only within 15 days after date of Agreement.
- C. Submit request for Substitution for Cause immediately upon discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- D. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
 - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
 - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
 - 3. Bear the costs engendered by proposed substitution of:
 - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
- E. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
 - 1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record.

END OF SECTION

SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Electronic document submittal service.
- C. Preconstruction meeting.
- D. Progress meetings.
- E. Construction progress schedule.
- F. Contractor's daily reports.
- G. Progress photographs.
- H. Coordination drawings.
- I. Submittals for review, information, and project closeout.
- J. Number of copies of submittals.
- K. Requests for Interpretation (RFI) procedures.
- L. Submittal procedures.

1.02 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
 - 1. Requests for Interpretation (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 - 2. Contractor and Architect are required to use this service.
 - 3. It is Contractor's responsibility to submit documents in allowable format.
 - 4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
 - 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 - 6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
 - 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

- A. Schedule meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Designation of personnel representing the parties to Contract and Architect.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.

- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum weekly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Contractor's superintendent.
 - 5. Major subcontractors.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems that impede, or will impede, planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of RFIs log and status of responses.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Maintenance of quality and work standards.
 - 11. Effect of proposed changes on progress schedule and coordination.
 - 12. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.05 DAILY CONSTRUCTION REPORTS

- A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.
- B. In addition to transmitting electronically a copy to Owner and Architect, submit two printed copies at weekly intervals.
 - 1. Submit in format acceptable to Owner.
- C. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 - 1. Date.
 - 2. High and low temperatures, and general weather conditions.
 - 3. Approximate count of personnel at Project site.
 - 4. Safety, environmental, or industrial relations incidents.
 - 5. Meetings and significant decisions.
 - 6. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 - 7. Testing and/or inspections performed.
 - 8. Signature of Contractor's authorized representative.

3.06 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
- E. Take photographs as evidence of existing project conditions as follows:
 - 1. Interior views: As many as are required to document work in progress in each room or area.
 - 2. Exterior views: As many as are required to document work in progress.
- F. Views:
 - 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 - 2. Consult with Architect for instructions on views required.
 - 3. Provide factual presentation.
 - 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- G. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via email.
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.07 COORDINATION DRAWINGS

- A. Provide information where installation is not completely indicated on Shop Drawings, where space is limited, or where coordination is required for products and materials fabricated or installed by more than one entity.
- B. Review drawings prior to submission to Architect.

3.08 REQUESTS FOR INFORMATION (RFI)

- A. Definition: A request seeking one of the following:
 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 2. Prepare in a format and with content acceptable to Owner.
 - a. Use CSI/CSC Form 13.2A - Request for Interpretation or Contractor's form containing the same information.
 3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 016000 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
 3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response.
 4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
 - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

- D. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- E. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
 - 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 - 2. Note dates of when each request is made, and when a response is received.
 - 3. Highlight items requiring priority or expedited response.
 - 4. Highlight items for which a timely response has not been received to date.
- F. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
 - 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- G. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
 - 1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
 - 2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 - 3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
 - 4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.09 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
 - 1. Format schedule to allow tracking of status of submittals throughout duration of construction.
 - 2. **Submittals are subject to a deadline for transmission the Architect for review. Refer to the Supplementary Conditions.**

3.10 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout

Submittals.

3.11 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a single transmittal for related items.
 - 2. Transmit using approved form.
 - a. Use Contractor's form, subject to prior approval by Architect.
 - 3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 - 4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - 5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of

information is in accordance with the requirements of the work and Contract Documents.

- a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 6. Deliver each submittal in electronic format via Bluebeam Studio Projects unless another method of transmission has been agreed to by Owner and Architect.
 7. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 10 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
 - c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
 8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 9. Provide space for Contractor and Architect review stamps.
 10. When revised for resubmission, identify all changes made since previous submission.
 11. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 12. Submittals not requested will not be recognized or processed.
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Do not reproduce Contract Documents to create shop drawings.
 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
1. Transmit related items together as single package.
 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
- 3.15 SUBMITTAL REVIEW
- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Architect's actions on items submitted for review:
1. Final Unrestricted Release: Where the submittal is marked "No Exception Taken," the Work covered by the submittal may proceed, provided it complies with the Contract Documents. Final acceptance will depend on that compliance.

2. Final-but-Restricted Release: Where the submittal is marked "Make Corrections Noted," the Work covered by the submittal may proceed, provided it complies both with Architect's notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.
 3. Resubmit: Where the submittal is marked "Exception Taken - Resubmit" do not proceed with the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity for the product submitted. Revise or prepare a new submittal according to Architect's notations and corrections.
- E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 013216 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- D. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
- E. Indicate delivery dates for owner-furnished products.
- F. Coordinate content with schedule of values specified in Section 012000 - Price and Payment Procedures.
- G. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

3.04 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.

3.05 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Contractor's design-related professional design services.
- F. Control of installation.
- G. Mock-ups.
- H. Tolerances.
- I. Manufacturers' field services.
- J. Defect Assessment.

1.02 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
 - 1. Design Services Types Required:
 - a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
 - b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
- C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.03 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.

- C. Scope of Contractor's Professional Design Services: Provide for, but not limited to, the following items of work:
 - 1. Concrete Mix Design: As described in Section 033000 - Cast-in-Place Concrete. No specific designer qualifications are required.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
 - 1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
 - a. Full name.
 - b. Professional licensure information.
 - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
 - 1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
 - 2. Include required product data and shop drawings.
 - 3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 - 4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
- E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in

which the Project is located.

- C. Contractor's Quality Control (CQC) Plan:
 - 1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
 - a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
 - b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
 - c. Owner will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.

1.06 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Owner will employ and pay for services of an independent testing agency to perform specified testing.
- B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- D. Contractor Employed Agency:
 - 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
 - 2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 - 3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
 - 4. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- 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 Architect 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.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.
- D. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- G. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- H. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Owner, it is not practical to remove and replace the work, Owner will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 014100 - REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY OF REFERENCE STANDARDS

- A. Regulatory requirements applicable to this project are the following:
- B. 28 CFR 35 - Nondiscrimination on the Basis of Disability in State and Local Government Services; Final Rule; Department of Justice; current edition.
- C. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice; current edition.
- D. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- E. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- F. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
- G. State of Utah amendments to some or all of the following.
- H. ICC A117.1-2009 - Accessible and Usable Buildings and Facilities; 2009.
- I. ICC (IFC) - International Fire Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. ICC (IEBC) - International Existing Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. ICC (IMC) - International Mechanical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. ICC (IECC) - International Energy Conservation Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary telecommunications services.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Security requirements.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.
- G. Field offices.

1.02 TEMPORARY UTILITIES - SEE SECTION 015100

1.03 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is not permitted.
- C. New permanent facilities may not be used during construction operations.
- D. Maintain daily in clean and sanitary condition.
- E. At end of construction, return facilities to same or better condition as originally found.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

- A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.07 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 INTERIOR ENCLOSURES

- A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:
- C. Paint surfaces exposed to view from Owner-occupied areas.

1.09 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.10 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
 - 1. Use of Owner's existing parking areas may be available. Coordinate with Owner.

1.11 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 FIELD OFFICES

- A. Use room(s) designated by Owner.
- B. Provide furniture including table and chairs, desk, drawing display table and other office furniture as needed for field personnel.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 015100 - TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.02 TEMPORARY ELECTRICITY

- A. Cost: By Owner.
- B. Connect to Owner's existing power service.
 - 1. Do not disrupt Owner's need for continuous service.
 - 2. Exercise measures to conserve energy.
- C. Provide temporary electric feeder from existing building electrical service at location as directed.
- D. Complement existing power service capacity and characteristics as required.
- E. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.
- F. Provide main service disconnect and over-current protection at convenient location and meter.
- G. Permanent convenience receptacles may be utilized during construction.
- H. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.03 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Maintain lighting and provide routine repairs.
- D. Permanent building lighting may be utilized during construction.

1.04 TEMPORARY HEATING

- A. Cost of Energy: By Owner.
- B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
- D. Owner's existing heat plant may be used.

1. Exercise measures to conserve energy.

- E. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.05 TEMPORARY COOLING

- A. Cost of Energy: By Owner.
- B. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
- C. Owner's existing cooling plant may be used.
1. Exercise measures to conserve energy.
- D. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.06 TEMPORARY VENTILATION

- A. Existing ventilation equipment may not be used.
- B. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.07 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Re-use of existing products.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Procedures for Owner-supplied products.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 SUBMITTALS

- A. 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.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Containing lead, cadmium, or asbestos.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified as Basis of Design: Where a "basis of design" product is indicated, the manufacturer's published properties and characteristics of that product establish the criteria by which other proposed products may be deemed comparable by the Architect.
 - 1. Where other manufacturer's are listed, provide a comparable product request prior to bidding. If no comparable manufacturer's are listed, comply with substitution procedures.
- C. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- D. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 012500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
 - 1. Review Owner reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install and finish products.
 - 4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Cutting and patching.
- C. Cleaning and protection.
- D. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- E. General requirements for maintenance service.

1.02 QUALIFICATIONS

1.03 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
 - 2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
 - 2. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am.

1.04 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.04 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.
- I. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.05 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.06 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.07 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.08 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.09 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.10 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 017800 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

1.02 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 3. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Addenda.
 - 3. Change Orders and other modifications to the Contract.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.

- E. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.
- F. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- G. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- H. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- I. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 024100 - DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Site Plan: Indicate:
 - 1. Vegetation to be protected.
 - 2. Areas for temporary construction and field offices.
- C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
 - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
 - 2. Demolition firm qualifications.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.03 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 - 1. Minimum of five years of documented experience.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 DEMOLITION

- A. Remove items indicated, for salvage, relocation, and recycling.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with requirements in Section 017000.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 3. Provide, erect, and maintain temporary barriers and security devices.
 - 4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.

5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 6. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 7. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
 2. Prevent movement or settlement of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.
- F. Hazardous Materials:
1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

3.03 EXISTING UTILITIES

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

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
1. Verify construction and utility arrangements are as indicated.
 2. Report discrepancies to Architect before disturbing existing installation.
 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Remove existing work as indicated and required to accomplish new work.

1. Remove items indicated on drawings.
 - C. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
 1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 3. Verify that abandoned services serve only abandoned facilities before removal.
 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
 - D. Protect existing work to remain.
 1. Prevent movement of structure. Provide shoring and bracing as required.
 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
 4. Patch to match new work.
- 3.05 DEBRIS AND WASTE REMOVAL
- A. Remove debris, junk, and trash from site.
 - B. Leave site in clean condition, ready for subsequent work.
 - C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Elevated concrete slabs.
- C. Floors and slabs on grade.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Concrete curing.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
- D. Samples: Submit samples of underslab vapor retarder to be used.
- E. Test Reports: Submit report for each test or series of tests specified.
- F. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.03 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I/II Portland type, gray.
 - 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 - 1. Acquire aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class C or F.

- D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.02 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- E. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- F. Accelerating Admixture: ASTM C494/C494M Type C.
- G. Retarding Admixture: ASTM C494/C494M Type B.
- H. Water Reducing Admixture: ASTM C494/C494M Type A.

2.03 GRANULAR FILL

- A. Well graded granular material, 3 inch maximum size with less than 12 percent passing a No. 200 sieve, and non-plastic fines having a Plasticity Index of less than 15. Compacted to 98 percent of the maximum laboratory density as determined by ASTM D1557.

2.04 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
 - 1. Sheet Material: ASTM E1745, Class A, except with 0.01 perms maximum water-vapor permeance; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
 - 2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 - 3. Products:
 - a. Henry Company; Moistop Ultra 15: www.henry.com/#sle.
 - b. Stego Industries, LLC; Stego Wrap Vapor Barrier (15 mil): www.stegoindustries.com/#sle.
 - c. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.05 BONDING AND JOINTING PRODUCTS

- A. Epoxy Bonding System:
 - 1. Complying with ASTM C881/C881M and of Type required for specific application.
- B. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.
 - 1. Material: ASTM D1751, cellulose fiber.

2.06 CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
 - 1. Products:
 - a. Euclid Chemical Company ; EUCOBAR: www.euclidchemical.com/#sle.
 - b. SpecChem, LLC; SpecFilm Concentrate or SpecFilm: www.specchemllc.com/#sle.
 - c. W. R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- B. Curing Compound, Non-Dissipating: Liquid, membrane-forming, clear, nonyellowing acrylic; complying with ASTM C309, Type 1, Class B. Certified by manufacturer to not interfere with floor covering bonding to concrete.
 - 1. Vehicle: Water-based.
 - 2. Products:
 - a. LATICRETE International, Inc; Dress & Seal WB: www.laticrete.com/#sle.
 - b. SpecChem, LLC; Cure and Seal WB: www.specchemllc.com/#sle.
 - c. W. R. Meadows, Inc; VOCOMP-20: www.wrmeadows.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- C. Moisture-Retaining Sheet: ASTM C171.
 - 1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.

2.07 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- D. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch.
 - 2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight, unless indicated otherwise in General Structural Notes.
 - 3. Water-Cement Ratio: Maximum 45 percent by weight.
 - 4. Maximum Slump: 4 inches.
 - 5. Maximum Aggregate Size: 1 inch.

2.08 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Verify that forms are clean and free of rust before applying release agent.
- B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
- D. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- E. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 - 1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.
- B. Place concrete for floor slabs in accordance with ACI PRC-302.1.
- C. Match existing slab-on-grade profile:
 - 1. 4 inch thick slab.
 - 2. Vapor barrier.
 - 3. Thickness of granular fill as required for trenches, 4 inch minimum, compacted.
- D. Notify Architect not less than 24 hours prior to commencement of placement operations.
- E. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- F. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.04 SLAB JOINTING

- A. Align joints with existing joints.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
- E. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
 1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15.
 2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15.
 3. Under Carpeting: F(F) of 25; F(L) of 20.
 4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25.
- B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
- D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.06 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
 1. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
- D. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
 1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI PRC-302.1; thick floor coverings include quarry tile and ceramic tile with full bed setting system.
 2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
 3. Decorative Exposed Surfaces: Trowel as described in ACI PRC-302.1; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, surfaces to receive liquid hardeners, surfaces to be polished, and all other exposed slab surfaces.
- E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:50 nominal.

3.07 CURINRING AND PROTECTION

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than seven days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
 - 2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
 - 3. Final Curing: Begin after initial curing but before surface is dry.
 - a. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.08 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.

3.09 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.10 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 061000 - ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preservative treated wood materials.
- B. Concealed wood blocking, nailers, and supports.

1.02 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Douglas Fir-Larch, unless otherwise indicated.
 - 2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- F. Provide the following specific nonstructural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Grab bars.
 - 3. Towel and bath accessories.
 - 4. Wall-mounted door stops.

3.04 CLEANING

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

END OF SECTION

SECTION 064100 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Hardware.
- C. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

- A. Section 123600 - Countertops.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
 - 2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
 - 2. Single Source Responsibility: Provide and install this work from single fabricator.

1.06 MOCK-UPS

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.
- B. Locate where directed.

- C. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 FABRICATORS

- A. Provide architectural woodwork by one of the following:.
 1. Artistic Mill.
 2. Granite Mill and Fixture Company.
 3. Huetter Mill and Cabinet Company.
 4. Johnson Brothers, Inc.
 5. MapleLeaf Cabinets.
 6. Swainston Mill, Preston ID.
 7. TMI Systems.
- B. Substitutions: See Section 016000 - Product Requirements.

2.02 CABINETS

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Cabinets:
 1. Finish - Exposed Exterior Surfaces: Decorative laminate.
 2. Finish - Exposed Interior Surfaces: Decorative laminate.
 3. Finish - Semi-Exposed Surfaces: TFL Panels.
 4. Finish - Concealed Surfaces: Manufacturer's option.
 5. Door and Drawer Front Edge Profiles: Square, with PVC edge banding.
 6. Casework Construction Type: Type A - Frameless.
 7. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
 8. Cabinet Design Series: As indicated on drawings.
 9. Adjustable Shelf Loading: 50 psf.
 10. Drawer Construction Technique: Dovetail joints.

2.03 PANEL CORE MATERIALS

- A. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
 1. Grade: 140; moisture resistance: MR30.
 2. Panel Thickness - Case Body, Exposed Back, Door and Drawer Fronts: 1 inch.
 3. Panel Thickness - Shelves: 1 inch at 36 inches and less; 1-1/4 inch over 36 inches.
 4. Products:
 - a. Roseburg Forest Products; Medite II: www.roseburg.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

- B. Basic Hardboard: Panel manufactured from inter-felted lignocellulosic fibers consolidated under heat and pressure; comply with ANSI A135.4.
1. Class: Tempered.
 2. Surface: Smooth one side (S1S).
 3. Nominal Thickness: 1/4 inch.

2.04 THERMALLY FUSED LAMINATE PANELS

- A. Thermally Fused Laminate (TFL): Melamine- or polyester-resin-saturated decorative papers; for fusion to composite wood substrates under heat and pressure.
1. Test in accordance with NEMA LD 3 Section 3.
 2. Panel Core Substrate: Medium Density Fiberboard (MDF).
 3. Color: As selected from manufacturer's standard range of colors.

2.05 LAMINATE MATERIALS

- A. Manufacturers:
1. Arborite: www.arborite.com/#sle.
 2. Formica Corporation: www.formica.com/#sle.
 3. Panolam Industries International, Inc: www.panolam.com/#sle.
 4. Wilsonart LLC: www.wilsonart.com/#sle.
 5. Substitutions: See Section 016000 - Product Requirements.
- B. Provide specific types as follows:
1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, colors as indicated.
 2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, colors as indicated.
 3. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.06 COUNTERTOPS

- A. Countertops: See Section 123600.

2.07 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
1. Thickness: 3 mm.
 2. Color: As selected by Architect from manufacturer's standard range.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

2.08 HARDWARE

- A. Adjustable Shelf Supports at Casework: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing

adjustments.

1. Product: Knappe & Vogt, 346.
 2. Substitutions: See Section 016000 - Product Requirements.
- B. Adjustable Shelf Supports at Wall Mounted Shelving: Heavy duty double slot system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch spacing adjustments.
1. Products:
 - a. Shelf Brackets: Knappe & Vogt; 185 double slot.
 - b. Shelf Standards: Knappe & Vogt; 185.
 2. Substitutions: See Section 016000 - Product Requirements.
- C. Countertop Brackets: Fixed, concealed vertical leg, side-of-stud mounting.
1. Materials: Steel L- and T-shapes.
 - a. Finish: Manufacturer's standard, factory-applied, powder coat.
 - b. Color: Black.
 - c. Support Member Depth: 2 inches.
 - d. Support Member Width: 2 inches.
 - e. Support Member Length: 21 inches.
 2. Products:
 - a. A&M Hardware, Inc; Extended Concealed Brackets: www.aandmhardware.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- D. Drawer and Door Pulls: .
- E. Basis-of Design: Top Knobs; Europa Tab Pull: www.topknobs.com/collections/#sle.
1. Size: 5 inch.
 2. Finish: Brushed satin nickel.
- F. Drawer and Door Locks: 5-pin tumbler, complying with ANSI/BHMA A156.11, Grade 1
1. Keyed cylinder, two keys per lock, master keyed according to Owner's key schedule.
 2. Olympus Lock, Inc. or comparable.
 - a. Finish: Satin Chrome: 26D.
 - b. Drawer Locks: 200W.
 - c. Door Locks: 100DR.
 3. Substitutions: See Section 016000 - Product Requirements.
- G. Drawer Slides:
1. Type: Full extension.
 2. Static Load Capacity: Heavy Duty grade.
 3. Manufacturers:
 - a. Accuride International, Inc; Heavy-Duty Drawer Slides: www accuride.com/#sle.
 - b. Blum, Inc; MOVENTO: www.blum.com/#sle.
 - c. Hettich America, LP; Quadro: www.hettich.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- H. Hinges: European style concealed self-closing type, steel with nickel-plated finish.
1. Manufacturers:
 - a. Blum, Inc; CLIP top BLUMOTION: www.blum.com/#sle; 155 degree opening.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.09 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 - 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 - 2. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.
- F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 064219 - PLASTIC-LAMINATE-FACED WOOD PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Plastic-laminate-faced wood paneling.

1.02 RELATED REQUIREMENTS:

- A. Section 061000 - Rough Carpentry: Wood furring, blocking, shims, and hanging strips required for installing paneling that is concealed within other construction before paneling installation.

1.03 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

1.04 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.05 SUBMITTALS

- A. See Section 013000-Administrative Requirements.
- B. Product Data: For each type of product.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- C. Shop Drawings: For plastic-laminate-faced wood paneling.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show details full size.
 - 3. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
- D. Samples for Initial Selection:
 - 1. For each type of plastic laminate.
 - 2. For each type of trim and finish.
- E. Qualification Data: For fabricator.
- F. Product Certificates: For each type of product.
- G. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that might damage paneling have been completed in installation areas. Store paneling in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.07 FIELD CONDITIONS

- A. Environmental Limitations with Humidity control: Maintain temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent 72 hours prior to installaion and during the remainder of the construction period.
- B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed/concealed by construction and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 PRODUCTS

2.01 PANELING FABRICATORS

- A. Fabricators: Subject to compliance with requirements, provide products by one of the following:
 - 1. The fabricators listed in Section 064100 - Architectural Wood Casework.

2.02 PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-faced wood paneling (decorative laminate surfacing) indicated for construction, finishes, installation, and other requirements.

2.03 PLASTIC-LAMINATE-FACED WOOD PANELING

- A. Grade: Premium.
- B. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3 and the following requirements:
 - 1. Basis-of-Design Product: As indicated on drawings, or comparable product from one of the following:
 - a. Abet Laminati Inc.
 - b. Arborite.
 - c. Formica Corporation.
 - d. Lamin-Art, Inc.
 - e. Wilsonart LLC.
 - 2. Faces: Grade HGS.
 - 3. Backs: Grade BKV.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed surfaces complying with the following requirements:
 - 1. As indicated by Finish Schedule and manufacturer's designations.
- D. Panel Core: Fire-retardant MDF.
 - 1. Thickness: 3/4 inch.

- E. Exposed Panel Edges: Aluminum edge trim and reveals.
- F. Fire-Retardant-Treated Paneling: Panels shall consist of fire-retardant plastic laminate and medium-density fiberboard (MDF). Panels shall have a flame-spread index of 75 or less and a smoke-developed index of 450 or less per ASTM E84, and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. Assemble panels by gluing and concealed fastening, unless otherwise shown.

2.04 MATERIALS

- A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- B. Wood Moisture Content: 5 to 10 percent.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
 - 1. MDF: ANSI A208.2, Grade 130.
- E. Aluminum Trim: 6063T5 extruded aluminum profiles as indicated in Drawings.
 - 1. Basis of Design Product: Monarch Metal Inc. or comparable product.
 - 2. Edge and Reveal Trim: Profiles as indicated in the Finish Schedule Legend.
 - 3. Finish: Manufacturer's powder coat.
 - a. Colors: As indicated in Finish Schedule Legend.

2.05 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
 - 1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant Fiberboard: MDF panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E84.
 - 1. 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:
 - a. Roseburg.

2.06 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.
- C. Installation Adhesive: Product recommended by panel fabricator for each substrate for secure anchorage.
 - 1. Verify adhesives have a VOC content of 70 g/L or less.

2.07 FABRICATION

- A. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times paneling fabrication will be complete.
- B. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 EXECUTION

3.01 PREPARATION

- A. Before installation, condition paneling to humidity conditions in installation areas.
- B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.02 INSTALLATION

- A. Grade: Install paneling to comply with quality standard grade of paneling to be installed.
- B. Install paneling level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
 - 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch .
- C. Anchor paneling to supporting substrate with concealed panel-hanger clips . Do not use face fastening.
- D. Install metal trim per manufacturer's written instructions.

3.03 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling and trim, where possible, to eliminate defects. Where not possible to repair, replace paneling and trim. Adjust for uniform appearance.
- B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Joint backings and accessories.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Backing material recommended by sealant manufacturer.
 - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 5. Substrates the product should not be used on.
 - 6. Substrates for which use of primer is required.
 - 7. Sample product warranty.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Executed warranty.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.

2. Compatibility Testing: In accordance with ASTM C1087.
3. Allow sufficient time for testing to avoid delaying the work.
4. Deliver sufficient samples to manufacturer for testing.
5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

1.04 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

- A. Scope:
 1. Interior Joints:
 - a. Seal open joints except specific open joints indicated on drawings as not sealed.
 - b. Seal the following joints:
 - 1) Joints between door frames and window frames and adjacent construction.
 - 2) In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.
- B. Interior Joints: Use nonstaining nonsag silicone sealant, unless otherwise indicated.
 1. Wall Joints with Door and Window Frames, and Casework: Acrylic emulsion latex sealant.
 2. Joints between Tile in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
 3. Aluminum Thresholds and Sill Plates: Butyl sealant.
- C. Interior Wet Areas: restrooms, kitchens, and other areas with sinks or clothes washers; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.

2.02 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 016116.

2.03 NONSAG JOINT SEALANTS

- A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
 2. Color: To be selected by Architect from manufacturer's standard range.
 3. Products:
 - a. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.

- b. Pecora Corporation; Pecora 890 NST (Non-Staining Technology):
www.pecora.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; Spectrem 1:
www.tremcosealants.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 - 1. Color: White.
 - 2. Products:
 - a. Dow Corning Corporation; 786-M White.
 - b. Pecora Corporation; Pecora 898 NST (Non-Staining Technology):
www.pecora.com/#sle.
 - c. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.
- C. Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.
 - 1. Hardness Range: 10 to 30, Shore A, when tested in accordance with ASTM C661.
 - 2. Color: To be selected by Architect from manufacturer's standard range.
 - 3. Service Temperature Range: Minus 13 to 180 degrees F.
 - 4. Products:
 - a. Pecora Corporation; Pecora BC-158 Butyl Rubber Sealant: www.pecora.com/#sle.
 - b. Sherwin-Williams Company; Storm Blaster All Season Sealant: www.sherwin-williams.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

2.04 ACCESSORIES

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
- B. Sealant Backing Rod, Closed-Cell Type:
 - 1. Cylindrical flexible sealant backings complying with ASTM C1330 Type C.
 - 2. Size: 25 to 50 percent larger in diameter than joint width.
- C. Sealant Backing Rod, Bi-Cellular Type:
 - 1. Cylindrical flexible sealant backings complying with ASTM C1330 Type B.
 - 2. Size: 25 to 50 percent larger in diameter than joint width.
- D. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

SECTION 081213 - HOLLOW METAL FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal frames for non-hollow metal doors.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D. Samples: Submit one sample of frame metal, 2 by 2 inches, showing factory finishes, colors, and surface textures.
- E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- F. Manufacturer's qualification statement.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Frames with Integral Casings:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 3. Premier Steel Doors and Frames: www.trustpremier.com/#sle.
 - 4. Steelcraft, an Allegion brand: www.allegion.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Door Frame Type: Provide hollow metal door frames with integral casings.
 - 1. Interior Doors: Use frames with integral casings.
- B. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
- C. Accessibility: Comply with ICC A117.1 and ADA Standards.
- D. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

2.03 HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS

- A. Frame Finish: Factory finished.
- B. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.

2.04 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.05 ACCESSORIES

- A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- B. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

- A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.

- B. Coordinate frame anchor placement with wall construction.
- C. Install door hardware as specified in Section 087100.

3.03 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

3.04 SCHEDULE

- A. Refer to Door Schedule on the drawings.

END OF SECTION

SECTION 081416 - FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush and flush glazed configuration; non-rated.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- D. Samples: Submit two samples of door veneer, 8 by 10 inches in size illustrating wood grain, stain color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.
- F. Warranty, executed in Owner's name.

1.03 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. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
 - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Masonite Architectural: www.architectural.masonite.com/#sle.
 - 2. VT Industries, Inc: www.vtindustries.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 DOORS

- A. Doors: See drawings for locations and additional requirements.
 - 1. Quality Standard: Premium Grade, Extra Heavy Duty performance, in accordance with WDMA I.S. 1A.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Wood veneer facing with factory transparent finish.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

2.04 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: Select white maple to match existing, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, center balance match of spliced veneer leaves assembled on door or panel face.
 - 1. Vertical Edges: Same species as face veneer, Architectural Woodwork Standards edge type D.

2.05 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
 - 1. Provide solid blocks at lock edge, top of door for closer, and bottom of door for protection plates for hardware reinforcement.
- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- F. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 10, UV Curable, Water-based.
 - b. Stain: As selected by Architect to match existing.
 - c. Sheen: Semigloss.
- B. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
 - 1. Transparent:
 - a. System - TR-6, Catalyzed Polyurethane.
 - b. Stain: As selected by Architect.
 - c. Sheen: Satin.
- C. Factory finish doors in accordance with approved sample.
- D. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

- A. Hollow Metal Door Frames: See Section 081213.
- B. Door Window Frames: Door window frames with glazing securely fastened within door opening.
- C. Glazing: See Section 088000.
- D. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
- E. Door Hardware: See Section 087100.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

SECTION 084313 - ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors.
- C. Weatherstripping.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
 - 1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- D. Samples: Submit two samples in manufacturer's standard sizes illustrating finished aluminum surfaces.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Specimen warranty.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least ten years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.06 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a two year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitation: Provide aluminum-framed storefronts and entrance doors, including accessories, from the same manufacturer.

2.02 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING

- A. Center-Set Style:
 - 1. Basis of Design: Kawneer North America; 451; www.kawneer.com/#sle.
 - 2. Vertical Mullion Dimensions: 1-3/4 inches wide by 4-1/2 inches deep.

2.03 BASIS OF DESIGN -- SWINGING DOORS

- A. Wide Stile, Monolithic Glazing:
 - 1. Basis of Design: Kawneer North America; 500 Heavy Wall; www.kawneer.com/#sle.
 - 2. Thickness: 2 inches.
- B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 - 1. Arcadia, Inc: www.arcadiainc.com/#sle.
 - 2. Coral Architectural Products, a division of Coral Industries, Inc: www.coralap.com/#sle.
- C. Substitutions: See Section 016000 - Product Requirements.
 - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.04 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Finish: Class I natural anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - 2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.

3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
4. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
5. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

2.05 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
 1. Framing members for interior applications need not be thermally broken.
 2. Glazing Stops: Applied.
- B. Glazing: See Section 088000.

2.06 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.
- C. Fasteners: Stainless steel.
- D. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.
- E. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.
- F. Sealant for Setting Thresholds: Non-curing butyl type.
- G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- H. Glazing Accessories: See Section 088000.

2.07 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.08 HARDWARE

- A. For each door, include weatherstripping and sill sweep strip.
- B. Other Door Hardware: See Section 087100.
- C. Weatherstripping: Semi-rigid polypropylene, continuous and replaceable; provide on all doors.
- D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

- A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.
- B. See Section 014000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- C. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Mechanical and electrified door hardware
 - 2. Electronic access control system components
- B. Section excludes:
 - 1. Windows
 - 2. Cabinets (casework), including locks in cabinets
 - 3. Signage
 - 4. Toilet accessories
 - 5. Overhead doors

1.02 SUBMITTALS

- A. See Section 013000-Administrative Requirements.
 - 1. Prior to forwarding submittal:
 - a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
 - b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
- B. Action Submittals:
 - 1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
 - 2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.
 - 3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
 - 4. Door Hardware Schedule:
 - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.

- b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
 - c. Indicate complete designations of each item required for each opening, include:
 - 1) Door Index: door number, heading number, and Architect's hardware set number.
 - 2) Quantity, type, style, function, size, and finish of each hardware item.
 - 3) Name and manufacturer of each item.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each hardware set cross-referenced to indications on Drawings.
 - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for hardware.
 - 8) Door and frame sizes and materials.
 - 9) Degree of door swing and handing.
 - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
 - 5. Key Schedule:
 - a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
 - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
 - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
 - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
 - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
- C. Informational Submittals:
 - 1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
 - 2. Provide Product Data:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - b. Include warranties for specified door hardware.
- D. Closeout Submittals:
 - 1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Final approved hardware schedule edited to reflect conditions as installed.
 - d. Final keying schedule
 - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
 - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
- E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
 - a. Required egress door assemblies, in compliance with NFPA 101.

1.03 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
 - a. For door hardware: DHI certified AHC or DHC.
 - b. Can provide installation and technical data to Architect and other related subcontractors.
 - c. Can inspect and verify components are in working order upon completion of installation.
 - d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
 - a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
 - b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
2. Smoke and Draft Control Door Assemblies:
 - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
 - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
3. Electrified Door Hardware
 - a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
4. Accessibility Requirements:
 - a. Comply with governing accessibility regulations, including all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference

- a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2) Preliminary key system schematic diagram.
 - 3) Requirements for key control system.
 - 4) Requirements for access control.
 - 5) Address for delivery of keys.
2. Pre-installation Conference
 - a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Inspect and discuss preparatory work performed by other trades.
 - c. Inspect and discuss electrical roughing-in for electrified door hardware.
 - d. Review sequence of operation for each type of electrified door hardware.
 - e. Review required testing, inspecting, and certifying procedures.
 - f. Review questions or concerns related to proper installation and adjustment of door hardware.
3. Electrified Hardware Coordination Conference:
 - a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.05 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.06 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
 - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
 - 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
 - a. Mechanical Warranty
 - 1) Exit Devices
 - a) Von Duprin: 3 years
 - 2) Closers
 - a) LCN 4000 Series: 30 years

1.07 MAINTENANCE

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
 - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

- A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with Division 8 door sections to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- C. Cable and Connectors:
1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
 2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
 3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

- A. Manufacturers and Products:
1. Scheduled Manufacturer and Product:
 - a. Ives 5BB series
 2. Acceptable Manufacturers and Products:
 - a. No Substitute
- B. Requirements:
1. Provide hinges conforming to ANSI/BHMA A156.1.
 2. Provide five knuckle, ball bearing hinges.
 3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
 - a. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
 4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
 - a. Interior: Heavy weight, steel, 5 inches (127 mm) high
 5. 2 inches or thicker doors:
 - a. Interior: Heavy weight, steel, 5 inches (127 mm) high
 6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
 7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
 8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
 9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 CONTINUOUS HINGES

- A. Manufacturers:
 - 1. Scheduled Manufacturer:
 - a. Ives
 - 2. Acceptable Manufacturers:
 - a. No Substitute
- B. Requirements:
 - 1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
 - 2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
 - 3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
 - 4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
 - 5. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
 - 6. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 EXIT DEVICES

- A. Manufacturers and Products:
 - 1. Scheduled Manufacturer and Product:
 - a. Von Duprin 98/35A series
 - 2. Acceptable Manufacturers and Products:
 - a. No Substitute
- B. Requirements:
 - 1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
 - 2. Cylinders: Refer to "KEYING" article, herein.
 - 3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
 - 4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
 - 5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
 - 6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
 - 7. Provide flush end caps for exit devices.
 - 8. Provide exit devices with manufacturer's approved strikes.
 - 9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
 - 10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
 - 11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
 - 12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed

- cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
 14. Provide electrified options as scheduled.
 15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
 16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
 17. Special Options:
 - a. SI
 - 1) Provide dogging indicators for visible indication of dogging status.
 - b. XP
 - 1) Rim Exit Devices: provide devices with non-tapered smart latchbolt with 90° latchbolt to strike engagement under stress and Static Load Resistance of 2000 pounds.
 - c. QM
 - 1) Rim Exit Devices: provide devices with damper-controlled re-latching to reduce operational noise. Where lever trim is specified, provide damper controlled lever return.
 - d. CX
 - 1) Provide delayed egress devices, where scheduled, that are UL 294 listed, meet National Fire Protection Association (NFPA) and International Building Code (IBC) governing delayed egress, and/or other local and national fire codes acceptable to authority having jurisdiction as required.
 - a) Provide non-handed and field sizable device with 3/4 (19mm) throw deadlocking latch bolt. Device incorporates an internal RX switch that detects attempt to exit from applying less than 15lbs to the push pad, which causes this switch to start an irreversible alarm cycle. Key switch in device is capable of arming, disarming, or resetting the device; and indicator lamp determines status of the device.
 - b) Provide devices capable of standard 15 second release delay and indefinite release delay as required by code, when tied into fire alarm system will release immediately when an alarm condition exists.
 - c) Provide devices with all control inputs – door position input, external inhibit input, fire alarm input; auxiliary locking; nuisance alarm and internal horn; and, remote signaling output self-contained in the device assembly.
 - e. CVC
 - 1) Provide cable-actuated concealed vertical latch system in two-point for non-rated or fire rated wood doors up to a 90 minute rating and less bottom latch (LBL) configuration for non-rated or fire rated wood doors up to 20 minute rating. Vertical rods not permitted.
 - a) Cable: Stainless steel with abrasive resistant coating. Conduit and core wire ends snap into latch and center slides without use of tools.
 - b) Wood Door Prep: Maximum 1 inch x 1.1875 inch x 3.875 inches top latch pocket and 1 inch x 1.1875 inch x 5 inches bottom latch pocket which does not require the use of a metal wrap or edge for non-rated or fire rated wood doors up to a 45 minute rating.
 - c) Latchbolts and Blocking Cams: Manufactured from sintered metal low carbon copper- infiltrated steel, with molybdenum disulfide low friction coating.
 - d) Top Latchbolt: Minimum 0.38 inch (10 mm) and greater than 90-degree engagement with strike to prevent door and frame separation under high static load.

- e) Bottom Latchbolt: Minimum of 0.44-inch (11 mm) engagement with strike.
- f) Product Cycle Life: 1,000,000 cycles.
- g) Latch Operation: Top and bottom latch operate independently of each other. Top latch fully engages top strike even when bottom latch is compromised. Separate trigger mechanisms not permitted.
- h) Latch release does not require separate trigger mechanism.
- i) Cable and latching system characteristics:
 - 1 Installed independently of exit device installation, and capable of functioning on door prior to device and trim installation.
 - 2 Connected to exit device at single point in steel and aluminum doors, and two points for top and bottom latches in wood doors.
 - 3 Bottom latch height adjusted, from single point for steel and aluminum doors and two points for wood doors, after system is installed and connected to exit device, while door is hanging
 - 4 Bottom latch position altered up and down minimum of 2 inches (51 mm) in steel and aluminum doors without additional adjustment. Bottom latch deadlocks in every adjustment position in wood doors.
 - 5 Top and bottom latches in steel and aluminum doors and top latch in wood doors may be removed while door is hanging.

2.06 CYLINDERS

- A. Manufacturers: VERIFY WITH OWNER
 - 1. Scheduled Manufacturer and Product:
 - a. SCHLAGE
 - 2. Acceptable Manufacturers and Products:
 - a. No Substitute
- B. Requirements:
 - 1. Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

2.07 KEYING

- A. Scheduled System: VERIFY WITH OWNER
 - 1. New factory registered system:
 - a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
 - 2. Existing factory registered system:
 - a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
 - 3. Existing non-factory registered system:
 - a. Provide cylinders/cores keyed into Owner's existing keying system managed by Owner's locksmith, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference. Contact:
 - 1) Firm Name:
 - 2) Contact Person:
 - 3) Telephone:

B. Requirements:

1. Construction Keying:
 - a. Temporary Construction Cylinder Keying.
 - 1) Provide construction cores that permit voiding construction keys without cylinder removal, furnished in accordance with the following requirements.
 - a) Split Key or Lost Ball Construction Keying System.
 - b) 3 construction control keys, and extractor tools or keys as required to void construction keying.
 - c) 12 construction change (day) keys.
 - 2) Owner or Owner's Representative will void operation of temporary construction keys.
 - b. Replaceable Construction Cores.
 - 1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - a) 3 construction control keys
 - b) 12 construction change (day) keys.
 - 2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.
2. Permanent Keying:
 - a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
 - 1) Master Keying system as directed by the Owner.
 - b. Forward biting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
 - c. Provide keys with the following features:
 - 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
 - 2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
 - 3) Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.
 - d. Identification:
 - 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
 - 2) Identification stamping provisions must be approved by the Architect and Owner.
 - 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
 - 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
 - 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
 - e. Quantity: In addition to existing control and master keys, furnish the following quantities.
 - 1) Permanent Control Keys: 3.
 - 2) Master Keys: 6.
 - 3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
 - 4) Key Blanks: Quantity as determined in the keying meeting.

2.08 KEY CONTROL SYSTEM

- A. Add keys to existing key cabinet.

2.09 DOOR CLOSERS

- A. Manufacturers and Products:
 - 1. Scheduled Manufacturer and Product:
 - a. LCN 4040XP series
 - 2. Acceptable Manufacturers and Products:
 - a. No Substitute
- B. Requirements:
 - 1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
 - 2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
 - 3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
 - 4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
 - 5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
 - 6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
 - 7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
 - 8. Pressure Relief Valve (PRV) Technology: Not permitted.
 - 9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
 - 10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.10 PROTECTION PLATES

- A. Manufacturers:
 - 1. Scheduled Manufacturer:
 - a. Ives
 - 2. Acceptable Manufacturers:
 - a. Trimco
 - b. Rockwood
- B. Requirements:
 - 1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
 - 2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on

- pairs without a mullion or edge guards.
- 3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.11 DOOR STOPS AND HOLDERS

- A. Manufacturers:
 - 1. Scheduled Manufacturer:
 - a. Ives
 - 2. Acceptable Manufacturers:
 - a. Trimco
 - b. Rockwood
- B. Provide door stops at each door leaf:
 - 1. Provide wall stops wherever possible. Provide concave type where lockset has a push button or thumbturn.
 - 2. Where a wall stop cannot be used, provide universal floor stops.
 - 3. Where wall or floor stop cannot be used, provide overhead stop.
 - 4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.12 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

- A. Manufacturers:
 - 1. Scheduled Manufacturer:
 - a. Zero International
 - 2. Acceptable Manufacturers:
 - a. National Guard
 - b. Pemko
- B. Requirements:
 - 1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
 - 2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 - 3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
 - 4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.13 SILENCERS

- A. Manufacturers:
 - 1. Scheduled Manufacturer:
 - a. Ives
 - 2. Acceptable Manufacturers:
 - a. Rockwood
 - b. Trimco
- B. Requirements:
 - 1. Provide "push-in" type silencers for hollow metal or wood frames.
 - 2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
 - 3. Omit where gasketing is specified.

2.14 DOOR POSITION SWITCHES

- A. Manufacturers:
 - 1. Scheduled Manufacturer:
 - a. Schlage
 - 2. Acceptable Manufacturers:
 - a. GE-Interlogix
 - b. Sargent
- B. Requirements:
 - 1. Provide recessed or surface mounted type door position switches as specified.
 - 2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.15 COAT HOOKS

- A. Manufacturers:
 - 1. Scheduled Manufacturer:
 - a. Ives
 - 2. Acceptable Manufacturers:
 - a. Rockwood
- B. Provide coat hooks as specified.

2.16 FINISHES

- A. FINISH: BHMA 626/652 (US26D); EXCEPT:
 - 1. Hinges at Exterior Doors: BHMA 630 (US32D)
 - 2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
 - 3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
 - 4. Protection Plates: BHMA 630 (US32D)
 - 5. Overhead Stops and Holders: BHMA 630 (US32D)
 - 6. Door Closers: Powder Coat to Match
 - 7. Wall Stops: BHMA 630 (US32D)
 - 8. Latch Protectors: BHMA 630 (US32D)
 - 9. Weatherstripping: Clear Anodized Aluminum
 - 10. Thresholds: Mill Finish Aluminum

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

- C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
 - 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in Submittals Article unless otherwise required to comply with governing regulations.
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce 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 according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Lock Cylinders:
 - 1. Install construction cores to secure building and areas during construction period.
 - 2. Replace construction cores with permanent cores as indicated in keying section.
 - 3. Furnish permanent cores to Owner for installation.
- J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
 - 1. Conduit, junction boxes and wire pulls.
 - 2. Connections to and from power supplies to electrified hardware.
 - 3. Connections to fire/smoke alarm system and smoke evacuation system.
 - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
 - 5. Connections to panel interface modules, controllers, and gateways.
 - 6. Testing and labeling wires with Architect's opening number.
- K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

- M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- N. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- P. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Section 079100.
- Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- R. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
 - 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:

HARDWARE GROUP NO. 01

FOR USE ON DOOR #(S):
D146

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY	195L F9	626	MKS
1	EA	SURFACE CLOSER	4040XP H TBWMS	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	COAT AND HAT HOOK	582	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 02

FOR USE ON DOOR #(S):

D108

ELECTRIFIED

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	LD-98-L-06	626	VON
1	EA	FSIC RIM CYLINDER	20-057 F KEYWAY	626	SCH
1	EA	ELECTRIC STRIKE	6300 FSE	630	VON
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN

1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	BY DIV 28		B/O
		POWER SUPPLY	BY DIV 28		B/O

CARD IN. USER PRESENTS CREDENTIAL, ELECTRIC STRIKE KEEPER RELEASES, USER OPENS DOOR TO ENTER.

HARDWARE GROUP NO. 03

FOR USE ON DOOR #(S):
D147

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	VANDL CLASSROOM LOCK	ND94PD RHO F KEYWAY	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 04

FOR USE ON DOOR #(S):
A103

REUSE EXISTING HARDWARE.

HARDWARE GROUP NO. AL01

FOR USE ON DOOR #(S):
D105

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	628	IVE

			195S F9 VERIFY TAIL		
1	EA	CLASSROOM	PIECE BEFORE ORDERING	626	MKS
1	EA	K-I-L CYLINDER	VERIFY KEYWAY	626	SCH
1	EA	SURFACE CLOSER	4040XP HEDA TBWMS	689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA TBSRT	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30 SRT	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61 SRT	689	LCN
1	EA	WALL STOP	WS406/407CCV BY ALUMINUM MFR	630	IVE
1	EA	SEALS			

END OF SECTION

SECTION 088000 - GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data on Insulating Glass Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 12 by 12 inch in size of glass units.
- E. Certificate: Certify that products of this section meet or exceed specified requirements.
- F. Installer's qualification statement.
- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM) for glazing installation methods. Maintain one copy on site.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.04 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Guardian Glass, LLC: www.guardianglass.com/#sle.

2. Saint Gobain North America: www.saint-gobain.com/#sle.
3. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

2.02 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.03 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

- C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 FIELD QUALITY CONTROL

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.08 SCHEDULES

- A. Monolithic Glass
 - 1. Glass Type A02: Clear annealed float glass.
 - a. Minimum Thickness: 12 mm (1/2 inch).
 - 2. Glass Type T02: Fully tempered float glass.
 - a. Minimum Thickness: 12 mm (1/2 inch).

- b. Safety glazing required.

END OF SECTION

SECTION 090561 - COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Resilient tile and sheet.
 - 2. Carpet tile.
 - 3. Thin-set ceramic tile and stone tile.
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. Patching compound.

1.02 ADMINISTRATIVE REQUIREMENTS

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

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Visual Observation Report: For existing floor coverings to be removed.
- C. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - 1. Moisture and alkalinity (pH) limits and test methods.
 - 2. Manufacturer's required bond/compatibility test procedure.
- D. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
 - 1. Certificate: Manufacturer's certification of compatibility with types of flooring applied over remedial product.
- E. Testing Agency's Report:
 - 1. Description of areas tested; include floor plans and photographs if helpful.
 - 2. Summary of conditions encountered.
 - 3. Moisture and alkalinity (pH) test reports.
 - 4. Copies of specified test methods.
 - 5. Recommendations for remediation of unsatisfactory surfaces.
 - 6. Submit report to Architect.
 - 7. Submit report not more than two business days after conclusion of testing.
- F. Adhesive Bond and Compatibility Test Report.
- G. Copy of RFCI (RWP).

1.04 QUALITY ASSURANCE

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
- B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
 - 1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
- C. Contractor's Responsibility Relating to Independent Agency Testing:
 - 1. Provide access for and cooperate with testing agency.
 - 2. Confirm date of start of testing at least 10 days prior to actual start.
 - 3. Allow at least 4 business days on site for testing agency activities.
 - 4. Achieve and maintain specified ambient conditions.
 - 5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

1.06 FIELD CONDITIONS

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
 - 1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 - 2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
 - 3. Products:
 - a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
 - b. LATICRETE International, Inc; SKIM LITE: www.laticrete.com/#sle.

- c. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch:
www.usg.com/#sle.
- d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

- A. Follow recommendations of testing agency.
- B. Perform following operations in the order indicated:
 - 1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
 - a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
 - b. Removal of existing floor covering.
 - 2. Preliminary cleaning.
 - 3. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
 - 4. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 5. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 6. Patching, smoothing, and leveling, as required.
 - 7. Other preparation specified.
 - 8. Adhesive bond and compatibility test.
 - 9. Protection.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

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

3.03 PRELIMINARY CLEANING

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.

- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
- F. Report: Report the information required by the test method.

3.05 ALKALINITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.06 PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Do not fill expansion joints, isolation joints, or other moving joints.

3.07 ADHESIVE BOND AND COMPATIBILITY TESTING

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

3.08 PROTECTION

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

END OF SECTION

SECTION 092116 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal stud wall framing.
- B. Grid suspensions systems for gypsum board ceilings
- C. Acoustic insulation.
- D. Gypsum wallboard.
- E. Joint treatment and accessories.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.
 - 2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Steel Framing Industry Association (SFIA) Certification:
 - 1. Submit documentation that metal studs and connectors used on project meet or exceed requirements of International Building Code.

1.04 QUALITY ASSURANCE

- A. SFIA Code Compliance Certification Program: www.CFSteel.org/#sle: Use metal studs and connectors certified for compliance with International Building Code.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 - 1. See PART 3 for finishing requirements.
- B. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions in accordance with ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
 - 1. Local authorities having jurisdiction.
 - 2. Structural Classification: Heavy-duty.
- C. Grid Suspension Systems: Provide grid suspension systems in accordance with ASTM C840 and GA-216 complying with the following:
 - 1. ICC-ES Evaluation Report No. ESR-122, ESR-1289, ESR-3941 or ESR-AC156, as applicable to the manufacturer.

2.02 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
 - 1. Corrosion Protection Coating Designation: G40, or equivalent in accordance with AISI S220.
- B. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 2. MarinoWARE: www.marinoware.com/#sle.
 - 3. CEMCO; California Expanded Metal Products Co..
 - 4. Substitutions: See Section 016000 - Product Requirements.
- C. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
 - 1. Studs: C-shaped.
 - a. Minimum Base-Steel Thickness: 0.0296 inch.
 - b. Depth as indicated on Drawings.
 - c. **Equivalent thickness products not allowed.**
 - 2. Runners: U shaped, sized to match studs.
 - 3. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
- D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
- E. Grid Suspension Systems for Gypsum Board Ceilings: Steel grid system of main tees and support bars connected to structure using hanging wire.
 - 1. Products:

- a. Armstrong World Industries, Inc.; Dryall Grid System:
www.armstrongceiings.com/#sle.
 - b. CertainTeed Corporation; 1-1/2" Drywall System: www.certainteed.com/ceilings-and-walls/#sle.
 - c. Rockfon; Chicago Metallic 640/660 Suspension System:
www.rockfon.com/products/#sle.
 - d. USG Corporation; Drywall Suspension System: www.usg.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
2. Accessories:
- a. Wire: ASTM A641/A641M, Class 1, zinc coating, soft temper. Size as required for applications and seismic requirements.

2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
1. American Gypsum Company: www.americangypsum.com/#sle.
 2. CertainTeed Corporation: www.certainteed.com/#sle.
 3. Gold Bond Building Products, LLC provided by National Gypsum Company:
www.goldbondbuilding.com/#sle.
 4. USG Corporation: www.usg.com/#sle.
 5. Substitutions: See Section 016000 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels, Type X, as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold resistant board is required at all locations.
 3. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
- C. Backing Board For Wet Areas:
1. Application: Surfaces behind tile in wet areas including shower ceilings and other areas indicated in drawings.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
 - a. Fire-Resistance-Rated Type: Type X core, thickness 5/8 inch.
 - b. Products:
 - 1) CertainTeed Corporation; 5/8" GlasRoc Tile Backer Type X:
www.certainteed.com/#sle.
 - 2) Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Fire-Shield Tile Backer: www.goldbondbuilding.com/#sle.
 - 3) USG Corporation; Durock Brand Glass-Mat Tile Backerboard 5/8 in. (15.9 mm): www.usg.com/#sle.
 - 4) Substitutions: See Section 016000 - Product Requirements.

2.04 GYPSUM BOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness 3 inches.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
1. Products:

- a. Franklin International, Inc; Titebond Acoustical Smoke & Sound Sealant:
www.titebond.com/#sle.
 - b. Specified Technologies Inc; Smoke N Sound Acoustical Sealant:
www.stifirestop.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
- C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
- D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
- 1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 2. Joint Compound: Setting type, field-mixed.
- E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C1007/AISI S220 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
- 1. Level ceiling system to a tolerance of 1/1200.
 - 2. Laterally brace entire suspension system.
- C. Studs: Space studs at 16 inches on center.
- 1. Extend partition framing to structure in all locations.
 - 2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Blocking: Install wood blocking for support of, but not limited to the following:
- 1. Framed openings.
 - 2. Wall-mounted cabinets.
 - 3. Toilet accessories.
 - 4. Wall-mounted door hardware.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 - 1. Place one bead continuously on substrate before installation of perimeter framing members.
 - 2. Place continuous bead at perimeter of each layer of gypsum board.
 - 3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 BOARD INSTALLATION

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

3.05 INSTALLATION OF TRIM AND ACCESSORIES

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

3.06 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, embed with setting type joint compound and finish with setting type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive eggshell, satin, semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive flat paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
- D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
- E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.08 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

3.09 PROTECTION

- A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 093000 - TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Non-ceramic trim.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Master Grade Certificate: Submit for each type of tile, signed by the tile manufacturer and tile installer.
- G. Installer's Qualification Statement:
 - 1. Submit documentation of completion of apprenticeship and certification programs.
- H. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.04 QUALITY ASSURANCE

- A. Maintain one copy of ANSI A108/A118/A136, TCNA (HB), and TCNA (HB-GP) on-site.
- B. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.06 FIELD CONDITIONS

- A. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

- A. Manufacturers: All products of each type by the same manufacturer.
 - 1. Dal-Tile Corporation: www.daltile.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Mosaic Tile, Type FT1: Color Body Porcelain .
 - 1. Products: As indicated in Finish Schedule Legend.
- C. Porcelain Tile, Type WT1, WT2: Glazed Ceramic .
 - 1. Thickness: 3/8 inch.
 - 2. Products: As indicated in Finish Schedule Legend.

2.02 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Satin nickel, style and dimensions to suit application, set with tile mortar or adhesive.
 - 1. Applications:
 - a. Open edges of wall and floor tile.
 - 2. Products:
 - a. Schluter-Systems; Profiles as indicated on drawings: www.schluter.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.03 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
 - 1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.
 - 2. Products:
 - a. ARDEX Engineered Cements; S 28: www.ardexamericas.com/#sle.
 - b. Custom Building Products; Complete Contact-LFT Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
 - c. LATICRETE International, Inc; MULTIMAX LITE: www.laticrete.com/#sle.
 - d. Mapei Corporation; Granirapid System: www.mapei.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.

2.04 GROUTS

- A. Provide setting and grout materials from same manufacturer.
- B. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
 - 1. Applications: Where indicated.

2. Products:
 - a. ARDEX Engineered Cements; ARDEX WA: www.ardexamericas.com/#sle.
 - b. Custom Building Products; CEG-IG 100% Solids Industrial Grade Epoxy Grout: www.custombuildingproducts.com/#sle.
 - c. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.
 - d. Mapei Corporation; Kerapoxy CQ: www.mapei.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORY MATERIALS

- A. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
 2. Fluid or Trowel Applied Type:
 - a. Material: Synthetic rubber or Acrylic.
 - b. Thickness: 25 mils, minimum, dry film thickness.
 - c. Products:
 - 1) ARDEX Engineered Cements; ARDEX 8+9: www.ardexamericas.com/#sle.
 - 2) Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: www.custombuildingproducts.com/#sle.
 - 3) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
 - 4) Mapei Corporation; Mapelastic AquaDefense: www.mapei.com/#sle.
 - 5) Substitutions: See Section 016000 - Product Requirements.
- B. Waterproofing Membrane at Showers: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 1. Fluid or Trowel Applied Type:
 - a. Thickness: 25 mils, minimum, dry film thickness.
 - b. Products:
 - 1) ARDEX Engineered Cements; ARDEX 8+9: www.ardexamericas.com/#sle.
 - 2) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
 - 3) Substitutions: See Section 016000 - Product Requirements.
- C. Reinforcing Mesh: 2 by 2 inch size weave of 16/16 wire size; welded fabric, galvanized.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
 1. Test in accordance with Section 090561.

2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep control and expansion joints free of mortar, grout, and adhesive.
- I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - MORTAR BED METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F114 with waterproof membrane.
- B. Waterproofing Membrane: Install as recommended by manufacturer .
- C. Mortar Bed Thickness: 1-1/4 inch, unless otherwise indicated.
- D. Grout with epoxy.
- E. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 INSTALLATION - SHOWERS AND BATHTUB WALLS

- A. At tiled shower receptors install in accordance with TCNA (HB) Method B420, mortar bed floor, and W245, thin-set over coated glass mat backer board walls.
- B. Grout with epoxy.

3.06 INSTALLATION - WALL TILE

- A. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245, thin-set, with waterproof membrane.
- B. Waterproof Membrane: Install as recommended by manufacturer.
- C. Grout with epoxy.

3.07 CLEANING

- A. Clean tile and grout surfaces.

3.08 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

3.09 INTERIOR TILE SCHEDULE

- A. Tile: As indicated in Finish Schedule and Finish Schedule Legend.

END OF SECTION

SECTION 095100 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Evaluation Service Reports: Show compliance with specified requirements.
- E. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.
- F. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

1.05 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.

2. Certaineed Architectural: www.certaineed.com/ceilings-and-walls/#sle.
3. USG Corporation: www.usg.com/ceilings/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

- B. Suspension Systems:
1. Same as for acoustical units.

2.02 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
1. Local authorities having jurisdiction.

2.03 ACOUSTICAL UNITS

- A. Acoustical Panels, Type ACP1: Painted mineral fiber, with the following characteristics:
1. Classification: ASTM E1264 Type III.
 - a. Form: 2, water felted.
 - b. Pattern: CE (perforated, small holes and lightly textured).
 2. Size and Thickness: As indicated on drawings.
 3. Light Reflectance: Not less than 85 percent, determined in accordance with ASTM E1264.
 4. NRC Range: Not less than 0.60, determined in accordance with ASTM E1264.
 5. Articulation Class (AC): _____, determined in accordance with ASTM E1264.
 6. Ceiling Attenuation Class (CAC): Not less than 35, determined in accordance with ASTM E1264.
 7. Panel Edge: As indicated on drawings..
 8. Color: White.
 9. Antimicrobial Treatment: Manufacturer's standard broad spectrum formulation that inhibits fungus, mold, mildew, and bacteria.
 10. Suspension System: Exposed grid.

2.04 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System: Hot-dipped galvanized steel grid with steel cap.
1. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
 2. Profile: Tee; 15/16 inch face width.
 3. Finish: Baked enamel.
 4. Color: White.

2.05 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.
- D. Perimeter Moldings: Same metal and finish as grid.
 - 1. Size: 1 inch.
 - 2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
 - 3. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.
- E. Extruded Aluminum Metal Edge Trim: Provide attachment clips, splice plates, corner pieces, and other clips, for a complete trim system, and complying with seismic design requirements.
 - 1. Baked Enamel or Powder Coat Finish: Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, applying, and baking finish.
 - a. Thickness: 1.5 mils minimum dry film.
 - b. Height: As indicated in drawings.
 - c. Basis-of-Design Product: Armstrong World Industries, Inc.; Axiom.
 - 1) Substitutions: See Section 016000 - Product Requirements.
- F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Install in bed of acoustical sealant.
 - 2. Use longest practical lengths.
 - 3. Miter corners.
- D. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.
 - 1. Use seismic clips for attachment.

- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
 - 3. Double cut and field paint exposed reveal edges.
- F. Where round obstructions occur, provide preformed closures to match perimeter molding.

3.05 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet, non-cumulative.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Clean surfaces.
- C. Replace damaged or abraded components.

END OF SECTION

SECTION 095426 - SUSPENDED WOOD CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wood grilles.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning, attachment of wood ceiling components to grid, accessory attachments, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
- C. Product Data: Provide data on wood ceiling components and suspension system components.
- D. Samples: Submit two full size samples illustrating material and finish of wood ceiling components.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Installer's qualification statement.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements for additional provisions.
 - 2. Wood Ceiling Components: Provide a quantity equal to 2 percent of total product installed.

1.03 QUALITY ASSURANCE

- A. Designer Qualifications for Seismic Design: Perform design under direct supervision of Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood ceiling components to project site in original, unopened packages.
- B. Store in fully enclosed space, flat, level and off the floor.

1.05 FIELD CONDITIONS

- A. Maintain room temperature between 60 degrees F and 75 degrees F and relative humidity between 35 to 55 percent before, during, and after installation.

PART 2 PRODUCTS

2.01 SUSPENDED WOOD CEILING SYSTEM

- A. Performance Requirements:
 - 1. Design for maximum deflection of 1/360 of span.
 - 2. Design to resist seismic load by using practices specified in ASTM E580.
 - 3. Surface Burning Characteristics: Flame spread index of 200 maximum, smoke developed index of 450 maximum, when tested in accordance with ASTM E84.
- B. Wood Grilles: Pre-assembled module of wood veneer grilles with battens.
 - 1. Grille Size: As indicated on drawings.
 - 2. Grille Spacing: As indicated on drawings.
 - 3. Edge Profile: Square.
 - 4. Wall Intersection Parallel to Grille: Floating, open reveal.
 - 5. Veneer Species: White Maple.
 - a. Veneer Cut: Quarter cut.
 - b. Factory Finish: Wood stain as selected, clear sealer top coat.
 - 6. Attachment to Suspension Grid: Direct screw attachment to suspension grid.
 - 7. Suspension System: See Section 095100.
 - 8. Products:
 - a. 9Wood; Wood Grille, 1100 Series: www.9wood.com/products/grilles/#sle. (Basis of Design)
 - b. Certainteed Architectural; Wood - Grille Modules: www.certainteed.com/ceilings-and-walls/#sle.
 - c. USG Corporation; True Wood Grilles: www.usg.com/ceilings/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not install ceiling until after interior wet work is dry.

3.02 PREPARATION

- A. Coordinate the location of hangers with other work.
- B. Layout wood ceiling components in pattern according to reflected ceiling plan and as shown on shop drawings.
- C. Acclimate wood ceiling materials by removing from packaging in installation area a minimum of 48 hours prior to installation.

3.03 INSTALLATION

- A. General: Install suspended wood ceiling system in accordance with Cisca (WC).
- B. Suspension System:

1. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
 - a. Comply also with seismic requirements indicated in Section 095100.
 2. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
 3. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
 4. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
 5. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
 6. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
 7. Do not eccentrically load system or induce rotation of runners.
- C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
- D. Wood Ceiling:
1. Install wood ceilings in accordance with manufacturer's instructions.
 2. Fit wood components in place, free from damaged edges or other defects detrimental to appearance and function.
 3. Install components in uniform plane, and free from twist, warp, and dents.
 4. Cut to fit irregular grid and perimeter edge trim.
 5. Make field cut edges of same profile as factory edges, seal and finish according to manufacturer.

3.04 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

3.05 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Clean and touch up minor finish damage. Remove and replace components that cannot be successfully cleaned and repaired.

END OF SECTION

SECTION 096500 - RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate floor patterns.
- D. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.

1.05 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

- A. Linoleum Tile: - Type RES1 Homogeneous wear layer bonded to backing, with color and pattern through wear layer thickness.

1. Manufacturers:
 - a. Forbo Flooring, Inc: www.forboflooringna.com/#sle.
 - b. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
2. Minimum Requirements: Comply with ASTM F2195, Type corresponding to type specified.
3. Backing: Polyester.
4. Thickness: 0.08 inch, minimum, excluding backing.
5. Tile Size: 13.11 by 13.11 inches.
6. Color: As indicated on drawings.

2.02 RESILIENT BASE

- A. Resilient Base - Type RB1: ASTM F1861, Type TS, rubber, vulcanized thermoset; style as scheduled.
 1. Manufacturers:
 - a. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
 - b. Mannington Commercial: www.manningtoncommercial.com/#sle.
 - c. Roppe Corporation: www.roppe.com/#sle.
 2. Height: 4 inches.
 3. Thickness: 0.125 inch.
 4. Finish: Satin.
 5. Length: Roll.
 6. Color: As indicated on drawings.

2.03 ACCESSORIES

- A. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
 1. VOC Content Limits: 150 g/L or less.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 1. Test in accordance with Section 090561.
 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Prepare floor substrates for installation of flooring in accordance with Section 090561.
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C. Clean substrate.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Fit joints and butt seams tightly.
 - 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.
- E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- F. Install flooring in recessed floor access covers, maintaining floor pattern.

3.04 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Install square tile in pattern indicated on drawings. Allow minimum 1/2 full size tile width at room or area perimeter.

3.05 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 096813 - TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

- A. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- B. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints and location of edge moldings.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Accessory Samples: Submit two 6 inch long samples of each accessory.
- F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- G. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.05 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Tile Carpeting:
 - 1. Interface, Inc: www.interface.com/#sle.
 - 2. Mannington Commercial: www.manningtoncommercial.com/#sle.

3. Milliken & Company: www.milliken.com/#sle. (Basis of Design Product)
4. Mohawk Group: www.mohawkgroup.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Tile Carpeting, Type CPT1: Tufted, manufactured in one color dye lot.
 1. Product: Moraine manufactured by Milliken.
 2. Basis of Design Product: As indicated in the Finish Schedule Legend, or a comparable product by one of the manufacturers listed above. Submit prior to bidding for approval.
 3. Tile Size: As indicated on drawings.
 4. Color: As indicated on drawings.
 5. Pattern: As indicated on drawings.
 6. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 7. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 8. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity.
 9. Primary Backing Material: PVC-Free WellBAC® Comfort Cushion.
 10. Total Weight: 86.7 oz/sq yd.

2.03 ACCESSORIES

- A. Edge Strips: Rubber, color as selected by Architect.
- B. Adhesives:
 1. VOC Content Limits: 150 g/L or less.
- C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 1. Test in accordance with Section 090561.
 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Prepare floor substrates for installation of flooring in accordance with Section 090561.
- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Adhere carpet tile to substrate.
- H. Trim carpet tile neatly at walls and around interruptions.
- I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- C. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 097200 - WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall covering.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on wall covering, adhesive, and primer.
- C. Shop Drawings: Indicate wall elevations with seaming layout.
- D. Samples: Submit two samples of wall covering, 12 by 12 inches in size illustrating color, finish, and texture.

PART 2 PRODUCTS

2.01 WALL COVERINGS

- A. General Requirements:
 - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 75/450, maximum, when tested in accordance with ASTM E84.
- B. Wall Covering - Type WC1: Fabric-backed PVC free roll stock.
 - 1. Comply with ASTM F793/F793M, Category V, Type II.
 - 2. Total Weight: 18 linear yard.
 - 3. Roll Width: 50 inches.
 - 4. Color: As indicated on drawings.
 - 5. Manufacturers:
 - a. Basis of Design: Designtex; Product as indicated on Finish Schedule Legend.
 - b. Substitutions: See Section 016000 - Product Requirements.
- C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
- D. Substrate Primer and Sealer: Latex type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.
- B. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.02 PREPARATION

- A. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.
- B. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- C. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.
- D. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.
- E. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply adhesive to wall surface immediately prior to application of wall covering.
- C. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.
- D. Butt edges tightly.
- E. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

END OF SECTION

SECTION 099000 - PAINTINGS AND COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Interior painting and coating systems.
- C. Scope:
 - 1. Finish surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - a. Interior:
 - 1) Metal: Structural steel columns, joists, trusses, beams, miscellaneous and ornamental iron, structural iron, and other ferrous metal.
 - 2) Drywall: Walls, ceilings, gypsum board, and similar items.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Product characteristics.
 - 2. Surface preparation instructions and recommendations.
 - 3. Primer requirements and finish specification.
 - 4. Storage and handling requirements and recommendations.
 - 5. Application methods.
 - 6. Clean-up information.
- C. Samples: Submit four paper draw down samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to manufacturer's label.

1.03 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.04 MOCK-UPS

- A. See Section 014000 - Quality Requirements for general requirements for mock-ups.
- B. Provide one accent wall as directed by Architect to demonstrate color and finish.
- C. Locate where directed by Architect.

- D. Mock-up may remain as part of the work.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, product name, product code, color designation, VOC content, batch date, environmental handling, surface preparation, application, and use instructions.
- C. Paint Materials: Store at a minimum of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

- A. Do not apply materials when environmental conditions are outside the ranges required by manufacturer.
- B. Follow manufacturer's recommended procedures for producing the best results, including testing substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Products: Subject to compliance with requirements, provide Sherwin-Williams Company (The) products indicated; www.sherwin-williams.com/#sle.
- B. Comparable Products: Products of approved manufacturers will be considered in accordance with 016000 - Product Requirements, and the following:
 - 1. Manufacturer approves products in writing for application specified.
 - 2. Products that meet or exceed performance and physical characteristics of basis of design products.
 - 3. Other Acceptable Manufacturers:

2.02 PAINTINGS AND COATINGS

- A. General:
 - 1. Provide factory-mixed coatings unless otherwise indicated.
 - 2. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's instructions.
- B. VOC Content: Utah Administrative Code R307-361 Products shall comply with VOC limits of authorities having jurisdiction and, for interior and exterior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 100 g/L.
 - 3. Dry-Fog Coatings: 150 g/L.
 - 4. Primers, Sealers, and Undercoaters: 100 g/L.
 - 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 7. Pretreatment Wash Primers: 420 g/L.

- C. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

2.03 PAINT SYSTEMS - INTERIOR

- A. Metal: Structural steel columns, joists, trusses, beams, miscellaneous and ornamental iron, structural iron, and ferrous metal.
 - 1. Alkyd Systems, Water-Based:
 - a. Semi-Gloss Finish:
 - 1) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, <100 g/L VOC: www.sherwin-williams.com/#sle.
 - a) 5 mils wet, 2 mils dry per coat.
 - 2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series, <50 g/L VOC: www.sherwin-williams.com/#sle.
 - a) 4 to 5 mils wet, 1.4 to 1.7 mils dry per coat.
- B. Drywall: Walls, ceilings, gypsum board, and similar items.
 - 1. Latex Systems:
 - a. Semi-Gloss Finish:
 - 1) 1st Coat: Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600, 0 g/L VOC: www.sherwin-williams.com/#sle.
 - a) 4 mils wet, 1.5 mils dry per coat.
 - 2) 2nd and 3rd Coat: Sherwin-Williams ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series, 0 g/L VOC: www.sherwin-williams.com/#sle.
 - a) 4 mils wet, 1.5 mils dry per coat.
 - 2. Epoxy Systems, Water-Based at kitchens,, toilet rooms and similar areas:
 - a. Semi-Gloss Finish:
 - 1) 1st Coat: Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600, 0 g/L VOC : www.sherwin-williams.com/#sle.
 - a) 4 mils wet, 1.5 mils dry per coat.
 - 2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46 Series, <50 g/L VOC:www.sherwin-williams.com/#sle.
 - a) 4 mils wet, 1.5 mils dry per coat.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

- C. Gypsum Board: Fill minor defects with filler compound; sand smooth and remove dust prior to painting.
- D. Ferrous Metal:
 - 1. Remove rust, loose mill scale, and other foreign substances using methods recommended by paint manufacturer and blast cleaning according to SSPC-SP 6. Protect from corrosion until coated.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.
- C. Apply coatings at spread rate required to achieve manufacturer's recommended dry film thickness.
- D. Regardless of number of coats specified, apply additional coats until complete hide is achieved.

3.04 PRIMING

- A. Apply primer to all surfaces unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.
- B. Primers specified in painting schedules may be omitted on items factory primed or factory finished items if acceptable to top coat manufacturers.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

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

END OF SECTION

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Corner guards.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, rough-in measurements, and adhesives.
- C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
 - 1. Submit two sections of corner guards, 24 inches long.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from UV light damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards:
 - 1. Basis of Design: Koroseal Interior Products; G875: www.koroseal.com/#sle.
 - 2. Or comparable product from one of the following:
 - a. Babcock-Davis: www.babcockdavis.com/#sle.
 - b. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - c. Inpro: www.inprocorp.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 PRODUCT TYPES

- A. Corner Guards - Surface Mounted:
 - 1. Material: High impact vinyl.
 - 2. Width of Wings: 3/4 inches.
 - 3. Corner: Radiused.
 - 4. Length: One piece.
- B. Adhesives and Primers: As recommended by manufacturer.

2.03 FABRICATION

- A. Fabricate components with no seams.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces for adhered items are clean and smooth.

3.02 INSTALLATION

- A. Position corner guard at top of base to full height of wall or opening.

3.03 CLEANING

- A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Diaper changing stations.
- D. Owner Furnished Accessories: The following are Owner furnished and Contractor installed:
 - 1. Soap dispensers.
 - 2. Paper towel dispensers.
 - 3. Toilet paper dispensers.
 - 4. Seat cover dispensers.
 - 5. Sanitary Napkin/Tampon Dispenser.

1.02 ADMINISTRATIVE REQUIREMENTS

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

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Samples: Submit two samples of each accessory, illustrating color and finish.
- D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.
 - 1. Provide structural design calculations for grab bars and shower seats indicating compliance with ICC (IBC) structural loading requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. AJW Architectural Products: www.ajw.com/#sle.
 - 2. American Specialties, Inc: www.americanspecialties.com/#sle.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation: www.bradleycorp.com/#sle.
 - 5. Substitutions: Section 016000 - Product Requirements.
- B. Diaper Changing Stations:
 - 1. American Specialties, Inc: www.americanspecialties.com/#sle.

2. Bradley Corporation: www.bradleycorp.com/#sle.
3. Diaper Deck & Company: www.diaperdeck.com/#sle.
4. Koala Kare Products: www.koalabear.com/#sle.
5. Substitutions: 016000 - Product Requirements.

- C. Provide products by single manufacturer, unless other manufacturers are listed for a product.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Keys: Provide six universal keys minimum to Owner.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.
- C. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.
- D. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.
1. Size: 24 by 36 inches unless indicated otherwise on Drawings.
 2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
 4. Products: Bobrick; B-165 or comparable product from manufacturers listed in Article 2.01.
- B. Grab Bars: Stainless steel, textured surface.
1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Length and Configuration: As indicated on drawings.

- d. Products: Bobrick Corporation; B-6806, except B-6861 at showers, or comparable products from manufacturers listed in Article 2.01.
 - C. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
 - 1. Products: Bobrick Corporation; B-254 or comparable product from manufacturers listed in Article 2.01.
- 2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES
- A. Shower Curtain Rod: Stainless steel tube, 1-1/4 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.
 - 1. Length: As required for opening indicated.
 - 2. Products: Products: Bobrick Corporation; B-6047 or comparable product from manufacturers listed in Article 2.01.
 - B. Shower Curtain:
 - 1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 - 2. Size: Minimum 12 inches wider than opening by 72 inches high, hemmed edges.
 - 3. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
 - 4. Color: White.
 - 5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
 - 6. Products: Products: Bobrick Corporation; B-204 or comparable product from manufacturers listed in Article 2.01.
 - C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped seat, hand as required.
 - 1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected by Architect.
 - 2. Size: ADA Standards compliant.
 - 3. Products: Bobrick Corporation; B-5181 or comparable product from manufacturers listed in Article 2.01.
 - D. Wall-Mounted Soap Dish: Heavy duty, seamless stainless steel, recessed, without grab bar, satin finish; with mechanical fastening suitable for substrate .
 - 1. Products: Bobrick Corporation; B-4390 or comparable product from manufacturers listed in Article 2.01.
 - E. Robe Hook: Heavy-duty stainless steel, double-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
 - 1. Products: Bobrick Corporation; B-6727 or comparable product from manufacturers listed in Article 2.01.
- 2.06 DIAPER CHANGING STATIONS
- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Polyethylene.
 - 2. Mounting: Surface.
 - 3. Color: Gray.
 - 4. Minimum Rated Load: 250 pounds.

5. Products: Koala Kare Products; Bobrick Corporation; KB110-SSRE or comparable product from manufacturers listed in Article 2.01.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. See Section 061000 for installation of blocking, reinforcing plates, and concealed anchors in walls.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

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

END OF SECTION

SECTION 104400 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com/#sle.
 - 2. Larsen Manufacturing Company.
 - 3. Nystrom, Inc: www.nystrom.com/#sle.
 - 4. Potter-Roemer: www.potterroemer.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group, Inc. - JL Industries; Academy Series: www.activarcpg.com/#sle.
 - 2. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
 - 3. Nystrom, Inc: www.nystrom.com/#sle.
 - 4. Potter-Roemer: www.potterroemer.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Multipurpose Dry Chemical, Monoammonium Phosphate-Based Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: 4-A:60-B:C type.
 - 2. Finish: Baked polyester powder coat, red color.

2.03 FIRE EXTINGUISHER CABINETS

- A. Cabinet Construction: Non-fire rated.
 - 1. Formed aluminum, ASTM B221 and not less than the strength and durability characteristics of 6063-T3 for aluminum sheet.
- B. Cabinet Configuration: Semi-recessed type.
 - 1. Size to accommodate accessories.
 - 2. Projected Trim: Returned to wall surface, with 2-1/2 inch projection with 1-3/4 inch wide face.
 - 3. Door Style: Vertical duo panel with frame.
 - 4. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- C. Door: Metal thickness matching cabinet, reinforced for flatness and rigidity with cam lock that allows door to be opened during emergency by pulling sharply on door handle. Hinge doors for 180 degree opening with continuous piano hinge.
- D. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- F. Fabrication: Weld, fill, and grind components smooth.
- G. Finish of Cabinet Exterior Trim and Door: Clear anodic.
- H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

- A. Lettering: "FIRE EXTINGUISHER" decal, or vinyl self-adhering, prespaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings at height indicated in Drawings.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.

END OF SECTION

SECTION 123600 - COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinet work.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Installer's qualification statement.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.05 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 FABRICATORS

- A. Refer to Section 064100 - Architectural Wood Casework for approved fabricators.

- B. Single Source Responsibility: Work of this section to be provided by the same fabricator as Section 064100.

2.02 COUNTERTOPS

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat Sheet Thickness: 1/2 inch, minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Avonite Surfaces: www.avonitesurfaces.com/#sle.
 - 2) Dupont: www.corian.com/#sle.
 - 3) Formica Corporation: www.formica.com/#sle.
 - 4) LG Hausys America, Inc: www.lghausysusa.com/#sle.
 - 5) Wilsonart: www.wilsonart.com/#sle.
 - 6) Substitutions: See Section 016000 - Product Requirements.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - d. Color and Pattern: As indicated on drawings.
 - 3. Other Components Thickness: 1/2 inch, minimum.
 - 4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
 - 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
 - 6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

2.03 MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C. Joint Sealant: Mildew-resistant silicone sealant, white.

2.04 ACCESSORIES

- A. Grommets: Circular, with matching cap and slot for wire passage.
 - 1. Finish: Metal.
 - 2. Outside Diameter: 2-1/2 inch.
 - 3. Color: Doug Mocket, clear anodized.

2.05 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.

1. Join lengths of tops using best method recommended by manufacturer.
 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 2. Height: 4 inches, unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/32 inch wide, maximum.

3.05 CLEANING

- A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 21 0000

FIRE PROTECTION

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

- A. The requirements of Section 230100, 230800, 230900, and 251000 shall govern the work in Section 210000, where applicable, and where not in conflict with governing codes and ordinances. Division 1 is a part of this and all other sections of these specifications.
- B. Contractors not listed on the approved list must submit for approval and review prior to bid as required by bid documents.

1.2 SCOPE

- A. The work required includes the designing, hydraulically calculating pipe sizes, flows, and pressure, furnishing and installation of fire protection systems in accordance with the drawings, specifications, latest standards and codes for complete systems for the building.
- B. The work specified in this section shall be installed by none other than a recognized fire sprinkler contractor. All fire protection system piping shall be hydraulically calculated. All systems shall be subject to the inspection and approval of the local fire authority or his representative for compliance of applicable standards.
- C. All work shall be coordinated with other subcontractors.
- D. The sprinkler system shall consist of the required number of sprinkler heads, piping, hangers, drains, test pipes, alarms, valves, gauges, fire department connections, and all other parts to assure a complete system to meet the requirements of the owner's insurance underwriter, local authority having jurisdiction, and in accordance with nationally recognized standards.
- E. Codes & Standards:
 - 1. Water Supply: National Fire Code #24 - International Building Code.
 - 2. Wet Sprinkler System & Combined Systems: N.F.C. #13 and #14 - I.B.C.
 - 3. Alarm Equipment: N.F.C. #70 & 72A
 - 4. Standpipe & Hose Systems: N.F.C. #14 - I.B.C.
 - 5. Supervision: N.F.C. #13 and #14 - I.B.C.
 - 6. Temporary Fire Protection: N.F.C. #14 - I.B.C.
 - 7. Sprinkler Heads: N.F.C. #13
 - 8. Sleeves and Location: N.F.C. #13
- F. Work Included Elsewhere:
 - 1. Access Doors - By Division 23 Contractor.
 - 2. Painting of sprinkler piping - By Painting Contractor.
 - 3. Color coding or pipe identification - By Mechanical Contractor.

1.3 WORK BY FIRE PROTECTION CONTRACTOR

- A. This contractor shall furnish and install all labor, material, and equipment to make a complete and working fire protection system fully tested and approved in accordance with the drawings, standards of this specification for the new building, and minor system modifications in the existing building.

1.4 QUALIFICATION OF DESIGNER

- A. Designer shall be an engineering technician or Senior Engineering Technician (Level III or Level IV), NICET certification for fire sprinkler system design.

1.5 QUALIFICATION OF INSTALLER

- A. It is intended that the system be designed and installed by a firm regularly engaged in the design and installation business of Fire Sprinkler contracting. The Owner's representative may require evidence to support the ability of the contractor to perform work in the scope and volume as specified. A contractor, who cannot verify such experience, may be found not suitable to perform the work.

PART 2 – PRODUCTS

2.1 HANGERS

- A. All hangers to be in accordance with NFPA Pamphlet No. 13.

2.2 SPRINKLER HEADS

- A. Sprinkler heads shall be U.L. approved. "K" factors shall be the same on each system and/or floor. See plans for head types.
- B. Sprinklers shall be of the proper temperature rating. Location of sprinkler head wherever reasonably possible shall be symmetrical and coordinated with the ceiling pattern.
- C. Number and location of sprinkler heads shown on the drawings are schematic. Exact number and location of heads shall be determined by the system design, and architectural coordination.
- D. Drawings note specific architectural requirements for head spacing and locations. Coordinate with project architect prior to installation.

2.3 PIPING

- A. All piping above ground shall be Schedule 40 domestic steel pipe and fittings. Schedule 40 equivalent, Thinwall, Dyna Flow and foreign made pipe or fittings will not be permitted on this project.
- B. Note on plans where specific location and routing of fire piping is shown.
- C. All fire piping shall be run high and tight to structure unless otherwise noted.

2.4 EARTHQUAKE BRACING

- A. Install earthquake bracing in accordance with NFPA #13 Standards and Utah State Fire Marshall's Office.

2.5 SLEEVES

- A. Sleeves shall be furnished, together with their location and elevations to the construction manager, timely with required schedule or concrete pours. If sleeves are missed by this contractor, he shall be responsible for core drilling thru concrete at his own expense, and he shall be responsible for his cutting and patching. Sleeves shall be of the size, type, and length required by N.F.P.A. codes. See Section 230900 for Sleeves".

PART 3 – EXECUTION

3.1 TEMPORARY FIRE PROTECTION DURING COURSE OF CONSTRUCTION

- A. This contractor shall provide fire protection as required by I.F.C. #14 - Chapter 8 and shall be coordinated with the local fire department.

3.2 SHOP DRAWINGS

- A. Shop drawings, submittals, and hydraulic calculations, as necessary and required, shall be submitted to the Owner's representative for approval prior to incorporating materials or equipment into the work. Shop drawings shall be complete and in accordance with I.F.C. #13, #14, #20, and all applicable standards, submittals, and equipment, valves, flow switches, controls, and other important items shall be complete, showing details, description, and characteristics; hydraulic calculations shall be based on the water system fire flow capacities shown on the drawings and shall show flows, pressures, velocities, pipe size, and equivalent lengths as required for the system.
- B. Calculations shall be arranged in an orderly manner with sufficient reference points for the approving authority to review and approve.
- C. Testing shall be accomplished by this contractor for all required systems, equipment, and appurtenances, as required by the various standards and codes. The Owner's representative shall witness and sign off each item required. This contractor shall furnish required forms.

3.3 TESTS

- A. Install all test pipes and valves as required by NFPA No. 13. Locate inspector's test valves and auxiliary drain valves above ceilings in areas approved by the Architect and provide hose bibb connections. Conduct all tests as required by NFPA Standards and Insurance Services Office and submit copies of completed test forms to the building owner.
- B. All fire sprinkler related tests requiring the witnessing by local authorities will be the responsibility of this contractor. If tests are not run or do not have the proper witness or documentation, then they will be run late and all damage caused by the system, or caused in uncovering the system for such tests, will be borne by this contractor.

- C. The Utah State Fire Marshall and building owner shall be notified (in writing) at least three days in advance of the following:
1. Hydrostatic test and final inspection of overhead, prior to the installation of the ceilings.
 2. 200 PSI for 2 hours minimum test requirements, or as required by State Fire Marshall.

3.4 GENERAL REQUIREMENTS

- A. This contractor shall submit complete drawings, hydraulic calculations, and proper documentation to the local authority having jurisdiction and receive their approval before submitting such material to the Owner's representative for final approval. The contractor will be required to show proof of submittal to the Owner's insurance underwriter and local building authorities before installation may begin.
- B. All work of this contractor will be coordinated with other trades to insure minimal changes to the sprinkler system from the designs. Careful coordination of mechanical and electrical ducts, pipe and conduit shall be required. The ceiling cavity must be carefully reviewed and coordinated with all trades. In the event of conflict, the installation of the mechanical equipment and piping shall be in the following order: plumbing waste, rainwater, and soil lines' supply, return, and exhaust ductwork; water piping; fire protection piping; and pneumatic control piping.
- C. Every effort shall be required to ensure that the heads form a symmetrical pattern in the ceiling with the ceiling grid, the lights, and diffusers and grilles and as shown on the Architect's reflected ceiling plan. Offsets shall be made in piping to accommodate ductwork in ceiling. Heads should be symmetrical, and all piping run parallel or perpendicular to building lines. In no case shall sprinkler heads be installed closer than 6" from ceiling grids or closer than approved distances from ceiling obstructions.
- D. All sprinkler piping shall be run concealed unless approved by the Owner's representative. All lines will be run as high as possible so as to not interfere with future changes to ceiling heights or other mechanical equipment. This contractor will be responsible for all sleeves, core drills, and sealing of penetrations in walls, floors, and structural members to facilitate the installation of the system, however, no holes in, or attachments to structural members will be allowed unless approved by the Owner's representative.
- E. All required drains and test pipes will be installed and finished in a workmanlike manner, terminating at a proper location to accommodate the required outflow without damaging the building or landscaping. Drain and test pipe locations shall be approved by the owner's representative.
- F. All piping and heads located in un-heated spaces shall be installed with a glycol loop system. Coordinate location with the owner's representative. Indicating valves with tamper switches shall be installed and wired as required by code. Coordinate with electrical contractor.
- G. No piping or valve assemblies shall be run exposed in a finished area without the prior approval of the owner's representative.

3.5 JOB CLOSEOUT

- A. This contractor shall assure that all tests are run before any consideration for final payment will be considered. This includes maintenance manuals, hydraulic calculations and instruction to on-site personnel.

- B. This contractor shall, in addition to the above, furnish the owner one (1) set of reproducible drawings of the sprinkler system "record drawings" for his project files.

End of Section

BLANK PAGE

SECTION 22 0000

PLUMBING

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. Piping diagrams are schematic and indicate preferred pipe routing. It is the intent that the installation be complete. Where fixtures are not shown connected to any required services, they shall be connected properly and completely. Connect all fixtures to various services, i.e., hot water, cold water, waste, and vent, etc., as required.
- B. The work shall include furnishing of all materials and labor required for the job as described, together with all accessories and trim implied or required to finish the work, and generally as follows:
 - 1. Plumbing fixtures and piping.
 - 2. Sanitary sewer systems.
 - 3. Backflow prevention systems.

1.2 STANDARDS

- A. Plumbing installation shall be made in accordance with the 2021 International Plumbing Code, City Code, and all other governing codes.
- B. In the event drawings violate the codes as being locally enforced, the contractor shall base his estimate on the enforced code requirements.

1.3 DISINFECTING

- A. After flushing the mains, introduce a water and chlorine solution concentrated to 300 PPM to disinfect the system and oxidize piping contaminants. Retain treated water and chlorine for a period of not less than three hours or more than six hours before final flushing out of system.
- B. All valves should be opened periodically during the process and the residual chlorine checked to ensure that at least 50 percent of the initial concentration is present to complete the disinfection. If there is less than 50 percent, the valves should be allowed to drain water until the 50 percent or greater level is obtained. A make-up chlorine solution of a concentration equal to the initial concentration must be added as needed during the withdrawal of the spent solution.
- C. A warning sign shall be conspicuously posted at each water outlet and faucet during the disinfecting process to prevent occupants from drinking the water.
- D. Flushing: Following disinfection, all treated water shall be flushed from the system through its extremities. Flushing shall continue until samples show that the quality of the water delivered is comparable with the quality of the public water supply and satisfactory to the public health authority having jurisdiction. Flushing shall be repeated if samples taken daily over a period of three days show the water quality is not being maintained. Samples shall be taken only from taps located and installed in such a manner that they will not contribute any contamination. Samples shall not be drawn from hydrants or through unsterilized hose. Test samples shall be certified by a recognized and approved testing laboratory, and a certificate of acceptability shall be submitted.

- E. Written certification of the disinfecting process and purity of water samples shall be forwarded to the Owner's representative.

PART 2 – PRODUCTS

2.1 CLEANOUTS

- A. Approved cleanouts shall be installed in the base of each vertical drainage line, and in the horizontal line at each change in direction. In addition, there shall be cleanouts spaced at a maximum of 50' in all horizontal lines. All cleanouts shall be extended to accessible surfaces. All cleanouts to grade shall be capable of cleaning in both directions.

2.2 FIXTURE STOPS

- A. All stops for plumbing fixtures shall be McDonald 1/4 turn ball valves.

2.3 PLUMBING FIXTURES

- A. This contractor shall furnish and install all fixtures shown on the architectural or mechanical drawings or specified hereinafter, clean and adjust all fixtures and replace any damaged fixtures at the contractor's expense.
- B. The fixtures shall be all new and complete as shown and described in manufacturer's catalog, and as required for the work, including accessible loose key 1/4 turn ball valve stops above the floor in supplies to all fixtures, and cast brass P-traps, unless otherwise shown. Trim for all fixtures shall be chrome-plated, and all trim shall match in design. Supply faucets shall have renewable seats and barrels.
- C. Approved Fixtures:

Water closets & lavatories:	Kohler, American Standard, or approved equal.
Flush valves:	Sloan, No substitutions.
Sinks:	Just, Elkay, or approved equal.
Faucets:	Moen, No substitutions.
Shower trim:	Symmons, Bradley, T&S Brass, Moen, or approved equal.
Tempering valves:	Bradley, Symmons, Watts, or approved equal.
Floor drains, Showe drains:	Zurn, JR Smith, Watts, Josam, or approved equal.

PLUMBING FIXTURES

WC-1	Water Closet: (ADA)	Kohler K-4368 "Highcliff" siphon jet, floor-mounted, extended lip bowl, 1-1/2" top spud, vitreous china, Sloan Regal sensor 1.6 EBV500A battery powered flush valve; K-4666-C "Lustra" extra heavy solid plastic white open front seat with stainless steel self-sustaining check hinge; 431310-100 bolt caps.
L-1	Lavatory: (ADA)	Kohler K-2214-0 "Ladena" 18-5/8" x 12-1/4" x 8-1/8" 4" center set under mounted vitreous china rectangular lavatory with overflow, Moen Laris 84014 4" center set faucet with grid strainer, Watts USG-B ASSE 1070 thermostatic mixing valve. Tailpiece and flexible supplies w/stops and brass P-trap.
TV-1	Tempering Valve:	Watts series USG-8 (ASSE 1070) tempering valve, 3/8" inlets and 3/8" outlet, to mix cold water with 120 deg. F. hot water for 110 deg. F. tempered water supply. 0.50 GPM min. flow and 1 GPM at 10 psi pressure drop. Tempering valve shall be complete with check stops, bronze body, and adjustment cap with locking feature. Valve shall be installed as high as possible below sink or lav.
S-1	Sink: Kitchenette	Just UD-11832-A-J, 30-3/4" x 18-1/2" x 7 7/8", 18 ga. 2-compartment Undermount 304 stainless steel, drilled for single-hole faucet, sound dampening, cup strainer, Moen 87702 "Sombra" brushed nickel deck mounted faucet with swing spout, less spray, 4" wrist blade handles, aerator, flexible supplies and brass P-trap.
S-2	Sink: Shared Learning	Just US-1824-A-J, 23-1/2" x 18-1/4" x 7 1/2" D, 18 ga., 304 stainless steel, single bowl under mount with satin finish, sound dampening, cup strainer, Moen 8248 8" widespread rigid faucet with yoke, 4" wrist blade handles, and aerator, flexible supplies, brass P-trap.
S-3	Sink: Prep	Just US-1824-A-J, 23-1/2" x 18-1/4" x 7 1/2" D, 18 ga., 304 stainless steel, single bowl under mount with satin finish, sound dampening, cup strainer, Moen 8248 8" widespread rigid faucet with yoke, 4" wrist blade handles, and aerator, flexible supplies, brass P-trap.
WB-1	Washer Box:	Guy Gray 82048 for in-the-wall installation with concealed piping, dual 1/2" water hammer arrestor ball valves with single level on-off control and hose connections. Rough chrome plate finish. (Verify mounting height with existing conditions). Provide 1-1/2" standpipe drain with P-trap for waste connection.
IM-1	Ice Maker Box:	Guy Gray BIM-875 for in-the-wall installation with concealed piping, 1/2" ball valve. 18-gauge dipped galv. steel finish. Face plate with 20-gauge box. (Verify mounting height with conditions).
FD-1	Floor Drain:	Zurn #Z-415-4 2" cast iron drain with nickel bronze round top. Drain to have deep seal P-trap. Provide Pro Vent systems Proset trap guard in all FD-1 floor drains.

- SD-1 Shower Drain: Zurn #Z-415-4 2" cast iron drain with chrome-plated bronze square top. Drain to have deep seal P-trap.
- SH-1 Shower: (ADA) Bradley Model 1C-EF-SF-AKV-LBJ-15 single lever compression shower valve with volume control and adjustable temperature limit. Shower shall have shower head w/ ball joint and shower arm with wall flange. Handheld 60" SS hose w/spray head, Bradley Model DV diverting valve and vacuum breaker. All items shall be set to handicapped heights & comply with standards of the Utah State Physical Handicapped Code.

2.4 PANS AND WATERPROOF MEMBRANES

- A. All floor drains shall be fitted with clamping collar and waterproof membrane.
- B. Membrane and waterproofing pans for shower stalls sinks shall be furnished and installed by plumbers so they are 100% watertight. Drains shall have clamping device which clamps drain to pans. There shall be a mastic seal between floor drain bottom and lead or membrane so when clamping device is tightened, there is a complete watertight seal.
- C. Care should be taken not to clog weep holes. All pans will be tested by placing test plug in drain and filling with water overnight.

2.5 VACUUM BREAKERS, DOUBLE CHECK VALVE ASSEMBLIES, & BACKFLOW PREVENTERS

- A. Vacuum breakers and backflow preventers shall comply with the requirements of the 2021 IPC and Utah State Plumbing Code for the actual installed duty.
- B. Vacuum breakers and backflow preventers shall be of the type, style, and arrangement approved by the Code.
- C. All vacuum breakers and backflow preventers shall be installed with the necessary isolation valves and test cocks.
- D. Backflow preventers shall be located at a maximum of 4' - 0" A.F.F. and shall be accessible for service. Backflow preventers shall have a water filter with a replaceable cartridge.

PART 3 – EXECUTION

3.1 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect plumbing materials before, during, and after installation and to protect the installed work and materials of all other trades.
- B. Replacements:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no additional cost to the Owner.

3.2 TESTING

- A. Furnish all required personnel and equipment and make all tests required to receive the approval of the Owner and all agencies having jurisdiction.

3.3 CLEANING UP

- A. Prior to acceptance of the building, thoroughly clean all exposed portions of the plumbing installation, removing all labels and all traces of foreign substance, using only a cleaning solution approved by the manufacturer of the plumbing item and being careful to avoid all damage to finished surfaces.

3.4 WATER CLOSET INSTALLATION

- A. General: Install water closets as shown on the drawing and as follows:
 - 1. Supply pipe extending from wall shall be covered by chrome plated sleeve and wall flange.
 - 2. Additional wall plates shall be provided where each pipe extends through finished wall.
 - 3. Two rubber or plastic seat bumpers with metal holders shall be provided and secured to the wainscot behind the fixture.
 - 4. The centerline of the flush valve shall be on the centerline of the fixture, 39 inches above the finished floor and a minimum of 2-1/4 inches from the wall.
 - 5. Chrome plated pipe support shall be provided on the long flush pipe outlet and shall be secured rigidly to the wall with suitable anchors.
 - 6. The backflow preventer for the flush valve shall be installed at the discharge of the valves.
 - 7. The flush valve water piping concealed in the partition shall be rigidly supported; piping between flush valve and wall shall be provided with a factory fabricated chromium plated spacer sleeve and wall flange.

3.5 LAVATORY INSTALLATION

- A. General: Install lavatories as shown on the drawings and as follows:
 - 1. Lavatories for use by wheelchair handicapped shall be installed with a minimum rim height of 34", a minimum vertical clearance of 29" from floor, and a minimum clear knee recess of 30" in width and 20" in depth.
 - 2. Trap on lavatory for use by wheelchair handicapped shall be installed so as to provide maximum clearance under bowl. Exposed waste, trap and hot water supply under lavatory shall be insulated in accordance with the requirements for domestic hot water piping.
 - 3. All lavatories shall be installed with a rim height of 34".

3.6 FIXTURE CONNECTIONS

- A. Floor Mounted Water Closets: Provide connections between soil pipes and floor connected water closets made with cast-iron floor flanges.
- B. Connection sizes shall be 4-inch for water closets.
- C. Floor flanges shall be slipped over the ends of the pipes and caulked in position.
- D. Special short-radius fittings shall be used where space does not permit the use of standard fittings below the flanges.

- E. Setting Compounds and Gaskets: Provide watertight and gas tight seals between flanges and fixtures with plumbing-fixture-setting compound or manufacturer's standard non-asbestos gaskets.
- F. Neither rubber gaskets nor putty shall be used in sealing connections.

3.7 BACKFLOW PROTECTION VALVE INSTALLATION

- A. General: The entire water distribution system shall be protected against contamination due to backflow from non-potable sources. Each connection to a fixture or an item of equipment shall be protected in accordance with the requirements of the 2021 International Plumbing Code.
- B. Reduced Pressure Zone Backflow Preventer: Install a reduced pressure zone backflow preventer in the building water supply main to expansion tanks, condenser water systems, and boilers as shown on the drawings and/or as required by the local codes.

3.8 INSTALLATION OF PIPE SLEEVES

- A. Basic Requirements: Install pipe sleeves as follows:
 - 1. Pipe sleeves shall be provided for all pipes passing through walls, slabs on grade and floors. Sleeves may be omitted where pipes pass through exterior walls above ground to lawn faucets, wall hydrants and downspout nozzles.
 - 2. Sleeves for pipes passing through exterior walls and slabs on grade which do not have membrane waterproofing shall be of cast-iron or galvanized steel pipe or black steel pipe, Schedule 40.
 - 3. Sleeves for pipes passing through exterior walls, slabs on grade and floors which are provided with membrane waterproofing shall be of threaded galvanized steel pipe fitted with companion flanges and arranged to secure membrane. Companion flanges shall be drilled and tapped in such a manner that bolting is affected from the outer (or upper) face only.
 - 4. Sleeves for pipes passing through potentially wet floors that do not have membrane waterproofing such as in toilet rooms, cafeteria kitchens, serving areas, dishwashing rooms, utility cores, mechanical equipment rooms, and areas that are provided with fire protection sprinkler systems, shall be galvanized steel pipe, shall project 2 inches above the finished floors, and shall be caulked watertight.
 - 5. Sleeves for pipes passing through all other floors and walls shall be constructed of galvanized or black steel pipe, standard weight.
- B. Sleeves on New Work: On new work, sleeves shall be built into the walls and floors as the work progresses.

3.9 INSTALLATION OF CLEANOUTS AND FERRULES

- A. Riser Connection to Sewer or Drain: Where soil, waste, or roof drainage risers connect to a sewer or drain extending from the building above the lowest floor, the fitting at the base of each stack or downspout shall be a sanitary tee or a combination Y and 1/8 bend with cleanout plug in the end of the run of the main.
- B. Test Tees: Each vertical soil, waste, and vent pipe and each downspout and roof drainage pipe which connects to horizontal drain piping below ground shall be fitted with a test tee above the lowest floor or ground. Where accessible, test tee may be installed in the horizontal pipe at the base of the riser.

- C. Cover Plates: Where cleanouts or test tees occur on concealed pipes in finished rooms, they shall be provided with a 1/8-inch thick, machine finished, brass cover plate of sufficient diameter to cover the opening in the finished wall or partition. The cleanout plug shall have a solid head, tapped for a 1/4-inch brass screw to secure the cover plate. Where cleanout plugs extend beyond the wall finish, the cover plates shall be of machine finished brass and shall be only of sufficient depth to fit against the wall to cover plug. Cleanout cover plates shall be painted to match adjacent wall finish.
- D. Cleanouts Plugs for Threaded Fittings: Cleanout plugs for threaded fittings shall be in accordance with ANSI B16.12. Except for test openings, where size must be sufficient to admit test plug, bushings will be permitted on pipes 5-inches and larger to reduce plug size to 4 inches; cleanout plugs for piping 4 inches and smaller shall be the same size as the pipe.
- E. Cleanout Plugs for Hub-and-Spigot Fittings: Cleanout plugs for hub-and-spigot fittings shall be screwed into ferrules caulked into the fitting. Ferrules and plugs shall be in accordance with ANSI B16.12, except that plugs required to be flush with the floor shall have square countersunk heads in lieu of raised heads.
- F. Cleanout Plugs for Copper Drainage Lines: Cleanout plugs on copper drainage lines shall be installed in solder-joint fittings having threaded openings provided for the cleanout, or in solder-joint fittings with threaded adapters.

3.10 WATER PIPING INSTALLATION

- A. General: Water piping shall be complete from service connection to all fixtures and equipment outlets. Sizes of pipes shall be as shown or specified.
- B. Reaming: Ends of pipes and tubes shall be reamed before being made up.
- C. Threaded Joints: Threaded joints shall be made up metal-to-metal, with a noncorrosive lubricant applied to the male thread only. Lampwick or other packing material shall not be used in making up threaded joints.
- D. Chromium Plated Piping: Chromium plated piping shall be threaded and made up carefully, and not more than one full turn of thread shall be exposed beyond any fittings.
- E. Long Screws and Bushings: Long screws and bushings (other than bushings cast in the sand) shall not be used on water piping.
- F. Soldering: Ends of tubing and recesses of fittings to be soldered shall be thoroughly cleaned. Joints shall be assembled without binding. Solder shall penetrate fully and shall fill the joint completely. Joints shall be made using lead-free solder, as specified.
- G. Joint Materials: All joint materials shall be free from oil, tar, and greasy substances, and shall be dry when placed in the joint. The material shall be handled with care to prevent contamination.
- H. Copper Tubing: All copper tubing shall be free from cuts, dents or other surface damage at the time of final inspection. Damaged tubing shall be removed and replaced with new.
- I. Copper Tube Anchoring: Horizontal runs of copper tubing over 50 feet in length shall be anchored to wall or floor construction. Anchors shall be located near the midpoints of the runs so as to force the expansion equally to the ends or in a direction where expansion can take place without excessive strain.

- J. Dielectric Couplings: Where non-ferrous metal piping and zinc-coated metal piping are joined, dielectric (insulating) couplings, fittings or unions shall be provided.
- K. Reducing Fittings: Where pipe sizes shown or specified differ from the connection sizes of meters, pumps, fixtures, outlets, and the like, reducing fittings shall be installed close to them.
- L. Pipe Branches: Branches from water supply mains shall be taken from the top, bottom or side, using crossover fittings where required by structural or operating conditions.
- M. Up feed Hot Water Return: On up feed hot water distribution systems for which return circulation piping is shown, a 1/2" circulation connection shall be made at a point on each riser just below the highest outlet connection. Provide branch circulation lines with gate valves near the valves on corresponding supply lines.
- N. Down feed Hot Water Supply: Each down feed main for a hot water supply system shall be graded upward to the first branch connection, which shall be taken from the top of the main. Beyond the first connection the main shall grade downward, and all branch connections shall be taken from the bottom of the main. Connect a 1/2-inch circulating line to the bottom of each down feed riser. Provide branch circulating lines with gate valves in locations corresponding to the supply branch valve locations.
- O. Grading: Hot water supply and hot water circulating lines shall be accurately and uniformly graded to avoid traps which might impede or destroy circulation. All lines shall be graded so as to facilitate drainage.
- P. Unions: Unions shall be installed near points of connection to each piece of equipment, and elsewhere as required for installation of piping, removal and replacement of regulating and control equipment and the like. Right and left couplings or nipples are prohibited.
- Q. Water Hammer Arresters: Water hammer arresters shall be provided where indicated on the drawings. Water hammer arresters shall be approved and installed in accordance with the requirements of PDI-WH201 and shall bear the PDI seal of approval.
- R. Roughing: Roughing shall be provided for equipment furnished under other sections of the specifications.

End of Section

SECTION 22 0700

INSULATION

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. It is the intent of this section of the specifications that all hot (above 105 deg. F.) and cold (below 55 deg. F.) surfaces of all piping and mechanical system components be insulated, unless specifically excluded herein.
- B. Systems to be insulated:
 - 1. Supply air ductwork
 - 2. Culinary hot and cold-water piping systems
 - 3. Heating hot water piping systems
 - 4. Water, tempering valve and pipe, and waste lines below lavatories and ADA sinks
- C. The providing of all materials, supplies, equipment, tools, transportation, and facilities and performing all labor and service necessary to provide the work outlined above and as shown on the working drawings.

PART 2 – PRODUCTS

2.1 COMPLIANCE

- A. All insulation shall (as a minimum) conform to the requirements of the building code and have a flame spread rating of less than 25 and smoke developed less than 50.
- B. Insulation shall be as manufactured by Johns-Manville, Owens-Corning, Knauf, Armstrong, or CertainTeed.

2.2 HEATING & CHILLED WATER PIPING, DOMESTIC HOT & COLD-WATER PIPING

- A. All piping shall be insulated with 2-piece heavy density pipe insulation having an average thermal resistivity in the range of 4.0 to 4.6 Hr Deg. F. Ft²/BTU per inch of thickness on a flat surface at a mean temperature of 75 deg. F. Thickness of insulation shall be as follows:

Minimum Pipe Insulation in inches

PIPING SYSTEM TYPES	FLUID TEMP. RANGE, (deg. F)	CONDUCTIVITY (Btu-in./(h-ft ² -deg F))	<1"	1" TO <1 1/2"	1 1/2" TO <4"	4" TO <8"	8" TO >8"
HEATING HOT WATER	141-200	0.25-0.29	1.5	1.5	2.0	2.0	2.0
DOMESTIC HOT WATER (120 deg F)	105-140	0.21-0.28	1.0	1.0	1.5	1.5	1.5
DOMESTIC HOT WATER (140 deg F)	141-200	0.25-0.29	1.5	1.5	2.0	2.0	2.0
DOMESTIC COLD WATER	40-60	0.21-0.27	0.5	0.5	1.0	1.0	1.0

- a. Piping in conditioned partitions may have insulation reduced by 1" to a minimum insulation of 1" if piping diameter is less than 1 1/2" See IECC 2018 403.11. Reduced insulation length must be less than 12 ft.

- B. Pipe insulation shall be covered with an all-service jacket.

2.3 WATER & WASTE PIPING EXPOSED BELOW LAVATORIES AND ADA SINKS

- A. Insulate all exposed surfaces with an approved ADA insulation kit as required by sink manufacturer.

2.4 MEDIUM PRESSURE DUCTS

- A. Medium pressure ducts shall be externally insulated with 1 1/2" thick 1.0 lb. density mineral fiberglass insulation. Insulation shall be furnished with an integral FSK vapor barrier jacket. Insulation shall be applied with edges tightly butted and secured by impaling on pins welded to the duct or on metal clips, previously adhered to the ducts with manufacturer's adhesive. Pins or clips shall be spaced to hold insulated firmly against the duct surface. Where required, insulation on the underside of all horizontal ducts and sloping ducts shall be additionally secured by applying an adhesive. All penetrations shall be sealed with vapor barrier adhesive. All seams shall be covered with 2" wide strips of same insulation facing material adhered with adhesive.

2.5 LOW PRESSURE ROUND DUCTS

- A. All round metal ducts shall be wrapped with 1" thick fiberglass duct wrap with factory-applied vapor barrier. All joints shall be sealed with mastic and taped to form a neat and complete insulation system.

PART 3 – EXECUTION

3.1 GENERAL

- A. The contractor shall provide a complete installation which is neat in appearance and functional.
- B. Remove all excess materials and packaging from job site.
- C. All insulation shall be continuous thru wall and ceiling openings and thru sleeves.
- D. Insulation on all cold surfaces where vapor barrier jackets are used will be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor-sealed to prevent condensation.
- E. Valves and fittings inside the building shall be insulated as specified for the piping systems and covered with high temperature P.V.C. insulation fitting covers.
- F. Fittings and valves for pipe size smaller than 4" shall be insulated and finished with Insulating and Finishing Cement to a thickness equal to the adjoining pipe insulation. Fittings and valves for pipe sizes 4" and larger shall be insulated with segments of the molded insulation secured with No. 20 gage galvanized annealed steel wire finished with a smoothing coat of finishing cement. Vapor seal with a layer of glass fabric embedded between two 1/16" coats of vapor seal adhesive. Lap seal outer jacket at least 1" on itself adjoining insulation.
- G. All terminations of insulation ends shall be tapered and covered with finishing cement.
- H. In exposed areas, all fittings shall be additionally finished with FSK wrap smoothly adhered. Overlap the FSK wrap on itself and adjoining pipe insulation. Overlap to be at least 1" on pipe insulation below 4" and 2" on sizes 4" and above.
- I. Insulation inserts and shields for cold surface piping such as roof drain lines and domestic cold-water piping shall be installed at all pipe hangers. Inserts between the pipe and pipe hangers shall consist of calcium silicate block insulation of equal thickness to the adjoining insulation and shall be provided with vapor barrier where required. Insulation inserts shall not be less than the following lengths:

1/2" to 2-1/2" pipe size	6" long
3" to 6" pipe size	9" long
8" to 10" pipe size	12" long
- J. Rigid metal shields shall be applied between hangers or supports and the pipe insulation. Shields shall be formed to fit the insulation and shall extend up to the centerline of the pipe and length specified for the insulation hanger inserts.
- K. Vapor barrier wrap shall be sealed tight and not penetrated by the hanger or shield.
- L. Adhesives, mastics, and coatings shall be applied at the manufacturer's recommended minimum coverage per gallon.
- M. Where insulation pipes pass thru sound or fire-rated walls, floors, or ceilings, the insulation sleeves shall be sound or fire-rated to match rating of surface penetrated.

3.2 INSULATION WORKMANSHIP

- A. All insulation shall be applied by specialists experienced in the field and shall be neat in appearance. Neatness in appearance shall be equated to proper insulation application procedures, and sloppy workmanship will not be tolerated. Work which is deemed unacceptable shall be condemned, removed, and replaced at the contractor's expense.
- B. Protect floors, valve handle, accessories, etc., to keep paste off areas not being insulated.
- C. Splitting of longitudinal sections on flexible foam pipe insulation will not be permitted.
- D. Do not install insulation on pipes which require heat taping without coordinating with mechanical contractor.

3.3 CLEAN-UP

- A. The piping shall be cleaned and tested prior to installation of insulation.
- B. Fittings shall be cleaned after insulation is installed.

End of Section

SECTION 23 0000

HEATING COOLING

PART 1 – GENERAL

1.1 SCOPE

- A. The installation covers the furnishing and installing piping systems, and all necessary trim and specialties, etc., as specified and shown on drawings or as required to provide the complete heating and air conditioning systems shown on the drawings and specified herein.

1.2 PIPE

- A. A complete and ample system of heating water/glycol piping shall be installed as shown on the plans.
- B. Branches leading from the mains shall be taken off from the top or sides of the mains at 90 deg., except where otherwise directed. These branches shall be arranged with swing connections to accommodate expansion and contraction.
- C. All mains reducing in size shall be reduced with eccentric reducing fittings, with top of pipe level for water.
- D. Run all piping as high as possible.

PART 2 – PRODUCTS

2.1 HOT WATER SPECIALTIES

- A. Furnish and install complete the water specialties including all air vents, and specialty items required to provide a complete and operable hot and chilled water system.
- B. Manual air vents shall be installed at all high points in the water system. Air vents shall be 3/8" ball valves and shall be installed on a 1/2" pipe nipple--6" long. Run 1/4" copper tube from vent to near floor--anchor tube securely to wall, pipe, or structural member.

PART 3 – EXECUTION

3.1 COORDINATION

- A. All equipment and piping shall be arranged to allow for easy maintenance and access to service valves.
- B. Provide valves and unions or flanges at all pieces of equipment to allow maintenance.
- C. Install all automatic valves, sensor well, flow switches, etc., as directed by the control contractor.

End of Section

BLANK PAGE

SECTION 23 0100

GENERAL PROVISIONS

PART 1 – GENERAL PROVISIONS

1.1 GENERAL CONDITIONS

- A. The contractor shall carefully read the General Conditions of the Contract and all information to bidders which, with the following specifications for heating, plumbing, exhaust ventilation, and temperature control are a part of the Contract.

1.2 BASIC BID

- A. Shall include all labor and materials specified in this division. The term "furnish" and/or "install" or similar implication shall mean "furnish and install complete."

1.3 SCOPE OF WORK

- A. The work to be done under this section includes the furnishing of all labor, materials, equipment, controls and accessories required to complete all heating, air conditioning, ventilating, plumbing, drainage, heat recovery, and other mechanical systems as shown on plans and/or described in these specifications, including miscellaneous items required to provide a complete and functional facility.
- B. Work shall include, but shall not be necessarily limited to, the following:
 - 1. Testing
 - 2. Balancing
 - 3. Insulation systems
 - 4. Air distribution system
 - 5. Exhaust systems
 - 6. Automatic control systems
 - 7. Plumbing systems
 - 8. Special systems
- C. The mechanical contractor shall provide all miscellaneous electrical work and control wiring for special systems where the wiring requirements are provided by the equipment manufacturers and/or suppliers, unless all of the required wiring is clearly shown on the electrical drawings to be provided by the electrical contractor.

1.4 CODES AND ORDINANCES

- A. All work shall be installed in accordance with the city, state, and local plumbing codes, and all other codes, ordinances, and regulations which govern the type of work covered by these specifications.
- B. Should the drawings conflict with the code, the code shall govern the proper installation of the work, and no extra charge shall be made for such change.
- C. Should the contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, or utility company regulations, he shall bear all costs arising in correcting the deficiencies.

- D. Where the work required by the drawings and specifications exceeds the minimum code requirements, the work shall be done as shown or specified.
- E. NOTE: Code compliance, or similar terminology, shall be interpreted to mean "the interpretation of the code as enforced by the local building authority".

1.5 DRAWINGS AND SPECIFICATIONS

- A. These specifications are intended to cover all labor, material, and standards of mechanical workmanship to be employed in the work shown on the drawings, called for in these specifications, or reasonably implied by terms of same. The drawings and specifications are intended to supplement one another, and any part of the work that may be mentioned in the one and not represented in the other shall be done the same as if it had been mentioned or represented in both.
- B. Large scale drawings shall take precedence over layouts and small-scale details.
- C. The mechanical drawings are schematic in nature, and show the general arrangement of all piping, ductwork, mechanical equipment, and appurtenances. They shall be followed as closely as the actual building construction and the work of other trades will permit.
- D. Due to tight structural conditions and space limitations in selected areas the contractor should anticipate structural and space conflicts and shall make allowances for them in his bid. Until the steel fabrication shop drawings are submitted for review, the mechanical coordination cannot be completed.
- E. The architectural and structural drawings shall be considered part of the mechanical work insofar as these drawings furnish this Division with information relating to design and construction of the building. Architectural and structural drawings take precedence over the general building layouts and details shown on the mechanical drawings.
- F. The structural engineer and architect shall approve all attachments to or modifications of any structural members in the building required for installation of the mechanical systems.
- G. Because of the small scale of the mechanical drawings, it is not possible to indicate all offsets, fittings, and accessories which will actually be required. This contractor shall investigate the structural and finish conditions affecting the work and provide all necessary offsets, fittings, valves, trim, and accessories required to meet actual job-site conditions.

1. Dimensions -

- a. Verify dimensions governing mechanical work at the building. No extra compensation shall be claimed or allowed on account of differences between the actual job-site dimensions and those indicated on the drawings.

2. Adjoining work -

- a. Examine all adjoining work on which the mechanical work is dependent and report any work which must be corrected. No waiver of responsibility shall be claimed or allowed due to failure to report unfavorable conditions affecting the mechanical work.

1.6 INTERPRETATION OF DRAWINGS AND DOCUMENTS

- A. If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications, or other proposed contract documents, or finds discrepancies in or omissions from the drawings or specifications, he may submit to the Owner's representative, a written request for an interpretation or correction thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation or correction of the proposed documents will be made only by addenda duly issued, and a copy of such addenda will be mailed or delivered to each person receiving a set of such documents. The Owner will not be responsible for any other explanations or interpretations of the proposed documents. All questions shall be submitted at least seven days in advance of bidding.
- B. The Owner's representative will interpret the meaning of any part of the drawings and specifications about which any misunderstanding may arise, and his decisions will be final. Should there appear to be any error or discrepancy in or between the drawings and specifications, the contractor shall refer the matter to the Owner's representative for adjustment before proceeding with the work. Should the contractor proceed with the work without so referring the matter, he does so on his own responsibility.

1.7 WORKMANSHIP

- A. Workmanship shall be the best quality of its kind for the respective industries, trades, crafts, and practices, and shall be acceptable in every respect to the Owner's representative.

1.8 SUBSTITUTIONS

- A. See Special Conditions pertaining to Substitutions.
- B. Requests for prior approval must be submitted to owner's representative a minimum of five working days prior to bid date.

1.9 FEES & PERMITS

- A. This contractor shall obtain all necessary permits and pay all fees required in connection with the work.
- B. Division 21, 22, 23, and 25 contractors shall be responsible for fees, permits, and scheduling of the state boiler inspector for all required items.
- C. Site utility contractor shall provide water meter and meter box as required by local water department.

1.10 SITE INSPECTION AND EXAMINATION OF DRAWINGS

- A. The contractor shall carefully study all drawings and specifications pertaining to the work. If any of the work as laid out, indicated, or specified is contrary to or conflicts with any governing ordinances or regulations, the same shall be reported to the Owner's representative before submitting a bid. The Owner's representative will then issue instructions as to procedure.
- B. The contractor shall carefully examine the building site and compare the drawings with existing conditions. By the act of submitting a bid, the contractor shall be deemed to have made such examination, to have accepted such conditions, and to have made allowance therefore in preparing his bid.

1.11 VERIFICATION OF DIMENSIONS

- A. Before proceeding with any work, the contractor shall carefully check and verify all dimensions, sizes, etc., and shall assume full responsibility for the rigging and fitting-in of his ductwork, piping, and equipment. Where apparatus and equipment has been indicated on the drawings, dimensions have been taken from typical equipment of the class indicated. The contractor shall carefully check the drawings to see that the equipment he is required to install will fit into the spaces provided and will allow for proper maintenance and service of the equipment.

1.12 COORDINATION

- A. This contractor shall coordinate his work with other specification divisions and shall provide all necessary specialty items, trim, and incidental 115 volt and 24-volt power and control wiring (which is not shown or specified under other divisions) required to provide a complete functional acceptable system.
- B. The Division 21, 22, 23, and 25 contractors shall coordinate his work such that all slots and openings through floors, walls, ceilings, and roofs are properly located and shall do any cutting and patching caused by neglecting to do so.
 - 1. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into the construction as the work proceeds.
 - 2. It is the responsibility of Division 21, 22, 23, and 25 to locate these items and see that they are properly installed.
- C. The locations of all piping, ducts, apparatus, and equipment indicated on the drawings are approximate only, and shall be changed as required to meet the actual architectural and structural conditions at the job site. All changes shall be approved by the Owner's representative. Any change in work which has not been installed shall be made by the contractor without additional compensation, except changes which are caused by architectural and structural changes which substantially increase the size of any of the mains, or which substantially increase the number of fixtures or length of pipe runs. Any and all changes shall be made only upon approval of a written change order.
 - 1. Right of way - Lines which pitch shall have the right of way over those which do not pitch. For example, plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have right of way over lines whose elevations can be changed.
 - 2. Offsets, transitions, and changes in direction in pipes and ducts shall be made as required to avoid conflicts with building footings and foundations or other buried ducts or utilities, and to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings. Furnish and install all traps, air vents, sanitary vents, and devices as required to affect these offsets, transitions and changes in direction.
- D. It shall be each contractor's responsibility to verify exact location, elevation, and/or route of the various mechanical system components with architectural details and with Owner's representative's personnel on job.
- E. Where deviations from locations and/or arrangements described are necessary to meet actual job conditions, the changes shall be made without cost to the Owner.
- F. The Owner's representative reserves the right to make any reasonable change in location of any outlet, piping, or equipment, before installation, without additional cost.

1.13 LOCATION OF CEILING OUTLETS

- A. This contractor shall assist the Owner's representative, General Contractor, Electrical Contractor and other interested parties in the establishment of room centerlines, axis of rooms and all walls.
- B. All grilles, registers, ceiling diffusers, etc. shall be located with reference to these established data points.
- C. These outlets shall be referenced to such features as room centerlines, walls and ceiling furrings, balanced border widths, etc.
- D. Outlets in acoustical tiles, panels, etc. shall occur in joints or centers of whole pieces, etc.
- E. The final determination of the exact location of all outlets shall be subject to the direction and approval of the Owner's representative.

1.14 PROVISIONS FOR REMOVAL & ADEQUATE CLEARANCE

- A. Install Mechanical work to permit removal of heating and cooling coils, filters, belt guards, sheaves, drives, and other parts requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
- B. Arrange pipes, ducts, and equipment to permit ready access to filters, valves, cocks, traps, starters, motors, control components, and to clear the openings of swinging doors and access panels.

1.15 RECORD DRAWINGS

- A. The contractor shall maintain one set of record drawings. These prints shall show the location, elevations and details of all items of work installed under this contract. Buried piping shall be located by dimensions from foundation walls and depths of bury shall be indicated. These shall be marked in red. The completed set of record drawings must be submitted to the Owner's representative before the contractor is eligible to receive the final payment. An up-to-date record set of drawings shall be maintained during the progress of the project and be available to the Owner's representative upon request.

1.16 COORDINATION DRAWINGS

- A. The contractor shall provide coordination drawings, when requested by the Owner's representative, to ensure that the various mechanical system components are coordinated with each other, and with other building systems.
- B. The coordination drawings shall be drawn to scale (usually 1/4" = 1'-0") and shall show all systems as they relate to each other, especially in areas of potential conflict.
- C. Coordination drawings shall be professionally drafted and shall be clear and concise in their presentation and clarity.
- D. All coordination drawings shall be prepared in digital format in the latest version of Revit. Material shall be submitted in both printed and disk form.
- E. All ductwork and piping attachments to the building structure shall be detailed and shall be coordinated with the Owner's representative.

1.17 COOPERATION WITH OTHERS

- A. The contractor shall so organize the work that progress will harmonize with the work of all trades, so that all work may proceed as expeditiously as possible. The contractor shall be held responsible for any delays which might be caused by his negligence or failure to cooperate with other contractors or crafts.

1.18 FOREMAN

- A. A full-time foreman shall be designated by the contractor to the Owner's representative and shall be available on site for consultation. This individual, when appointed, will not be replaced without prior approval from the Owner's representative. The foreman shall be responsible for the coordination and correct placing of the work.

1.19 GUARANTEE

- A. By the acceptance of the contract award for the work herein described, the contractor assumes the full responsibility imposed by the guarantee as set forth herein and should protect himself through proper guarantee from equipment and specialty manufacturers and subcontractors as their interests may appear.
- B. All materials and equipment provided and installed under this division of the specifications shall be guaranteed for a period of one (1) year from the date of substantial completion and acceptance by the Owner, unless specifically noted elsewhere in the specification. Should any trouble develop during this period due to defective materials or workmanship, the contractor agrees to correct the trouble without any cost to the Owner, any defect noticed at the time of installation and/or during the guarantee period shall be corrected immediately to the satisfaction of the Owner.

1.20 SCHEDULES, MATERIALS AND EQUIPMENT

- A. As soon as practicable, and within 30 days after date of award of contract, and before commencement of work, a complete schedule of equipment and materials proposed for installation shall be submitted to the Owner's representative. The schedule shall include catalogs, cuts, drawings, and such other descriptive data or samples that are requested by the Owner's representative. Schedules shall include all items of equipment used. No partial submittals will be accepted.
- B. Provide complete, corrected shop drawing of each required equipment & material to the Owner's representative for review, approval. DO NOT SUBMIT without general contractor's signed stamp, indicating the general contractor has reviewed the submittal for completeness and conformance to the Contract Documents.
- C. Submittals shall be complied by division and shall be a complete submittal. Partial submittals will be rejected.
- D. Inform the Owner's representative by notation, or in the letter of transmittal, of any proposed deviation from the requirements of the Contract Documents.
- E. Provide required shop drawings or other submittals within time stipulated on approved progress schedule.

- F. Do not commence work requiring a shop drawing or other submittal until approval of the required submittal has been received. Such approval will be based upon a review only for conformance with the design concept of the project and with the information given in the Contract Documents, and does not relieve the contractor from responsibility for errors or omissions in the shop drawings.
- G. Schedules shall be complete and shall be completely indexed by division, and shall include the following items, as well as all material, etc for a complete project submittal:
1. Valves
 2. Hot water specialties
 3. Piping systems
 4. Pipe supports & restraints
 5. Plumbing fixtures
 6. Exhaust air fans
 7. Dampers
 8. Medium pressure ducts
 9. Medium pressure fittings
 10. Medium pressure flexible ducts
 11. Low pressure flexible ducts
 12. Grilles & registers
 13. Diffusers
 14. VAV reheat boxes
 15. Insulation systems
 16. Vibration isolators
 17. Seismic restraints
 18. Automatic temperature controls
 19. Air balance contractor qualifications
 20. Fire safing system with installation diagrams
 21. Other schedule items
- H. Submittals received which do not contain all of the above items will be returned unchecked.

I. Purpose and Contractor's Responsibility:

The purpose of the final submittal is to "assist the contractor selecting the equipment." The contractor shall review the submittals prior to submission to the Owner's representative to make sure that the submittals are complete in all details including the following items:

1. Manufacturers' names shall be mentioned in specifications as accepted by Owner at time of bidding.
2. Equipment dimensions shall be verified to fit the spaces provided with sufficient clearances, as may be required by the equipment or indicated on the drawings.
3. Equipment shall be reviewed with respect to schedules, specifications, plans and details.
4. Equipment submittal sheets shall be clearly marked indicating equipment symbol and exact selection of proposed equipment.

J. Review:

Review and acceptance of submittal does not relieve the contractor of his responsibility to fulfill the contract requirements. Review and acceptance of the submittal will not be used as a means of changing the contract requirements. Items not covered in the accepted submittal, or items incorrectly covered but not recognized or identified, shall not be used when contrary to the requirements of the contract documents.

K. Acceptance of Substitute Equipment:

If the proposed installation is approved, this contractor shall make all incidental changes in piping, ductwork, supports, installation, wiring, heaters, panel boards, and as otherwise necessary. Provide any additional motors, valves, controllers, fittings, and other additional equipment required for the proper operation of the system resulting from the contractor's selection of alternate equipment, including all required changes in the effected trades.

L. Owner's Refusal Right:

In the event that items submitted are substitutions for specified items and are found to be not acceptable, the right shall be reserved to require the specified items.

1.21 OPERATING INSTRUCTIONS AND CATALOG INFORMATION

- A. This prime Division 23 contractor shall compile on a digital catalog of every product used by him and subcontractors in the completion of the work. The digital catalog shall also include copies of the test data (Section 230501), balancing reports (Section 230593), Before final acceptance by the Owner's representative, he shall turn over to the Owner this compilation of catalog data. A double index shall be provided, one giving an alphabetical list of products for which catalogs are included, and one giving their addresses, whose products are included in the work. Provide data for each item of equipment listed in SCHEDULES, MATERIALS & EQUIPMENT, as shown in Section 230100. Provide copy of submittal data. All products shall be assembled by Division.
- B. Complete digital copies shall be delivered to the Owner's representative for his approval.
- C. Provide warranty schedule and schedule of overload protection as required in Section 230800.
- D. Manuals not in compliance will not be reviewed and will be rejected.
- E. Digital copy shall be identified as follows:

BRIGHTON HIGH SCHOOLTEEN CENTER
CANYONS SCHOOL DISTRICT
OPERATING & MAINTENANCE MANUAL
2025

SET #

PART 2 – PRODUCTS

2.1 MATERIALS, EQUIPMENT AND ACCESSORIES

- A. Unless otherwise specified, all equipment, accessories, and materials shall be new and undamaged, and the workmanship shall be of the best quality for the use intended and shall be acceptable to the Owner's Representative.
- B. Equipment, accessories, and materials shall be essentially the standard products of the manufacturer, or as specified herein. Where two or more units of the same class of new equipment are required, these units shall be products of a single manufacturer.

- C. Should mechanical equipment other than that used in the design be furnished, it shall be the responsibility of the mechanical subcontractor to provide large scale (1/2" = 1'-0") installation drawings, as required, showing service and maintenance points with proper clearance allowances for service.
- D. All equipment shall be selected to deliver full rated capacity at the job site elevation.

PART 3 – EXECUTION

3.1 FUNCTIONING AND OPERATION OF EQUIPMENT

- A. Contractor's Responsibility:
- B. Installation and startup shall be so made that its several component parts will function together as a workable system and shall be left with all equipment properly adjusted and in working order.

3.2 CLEANING AND PATCHING BY MECHANICAL CONTRACTOR

- A. The contractor shall remove all stains or grease marks on walls, floors, glass, hardware, fixtures, or elsewhere, caused by his workman or for which he is responsible. He shall remove all stickers on plumbing fixtures, do all required patching up and repair all work of others damaged by this division of the work, and leave the premises in a clean and orderly condition.

3.3 INSTRUCTIONS TO OWNER'S REPRESENTATIVES

- A. The mechanical contractor shall provide, without expense to the Owner, competent instructors to train the Owner's representatives in the care, adjustment, maintenance, and operation of all parts on the heating, ventilating, plumbing, and automatic temperature control systems and equipment. Training shall be a minimum of 8 hours with no less than 4 hours for ATC training.

3.4 PROTECTION AGAINST THE ELEMENTS

- A. The contractor shall, at all times, take reasonable and adequate precautions to protect his work and all stored materials and equipment from damage by the elements, including flooding, windstorms, etc., and shall not expose the work of any other contractor to such damage.
- B. In addition to requirements specified in Division 01, stored material shall be readily accessible for inspection by the Owner's representative until installed.
- C. All items subject to moisture damage, such as controls, shall be stored in dry, heated spaces.

3.5 REMOVAL OF DEBRIS, ETC.

- A. Upon completion of this division of the work, remove all surplus material and rubbish resulting from the work, and leave the premises in a clean and orderly condition.

3.6 OPENINGS FOR MECHANICAL SYSTEMS

- A. All openings required for installation of mechanical systems shall be provided by the mechanical contractor. Any piece of equipment which is to be installed in any space of the building and which is too large to permit access through stairways, doorways or shafts shall be brought to the job by the Contractor involved and placed in the space before the enclosing structure is completed. Materials shall be delivered at such stages of the work as will expedite the work as a whole.

3.7 SAFETY REGULATION

- A. The contractor shall comply with all local and OSHA safety requirements in performance with this work. (See General Conditions). This contractor shall be required to provide equipment, supervision, construction, procedures, and all other necessary items to assure safety to life and property.

3.8 OWNER FURNISHED EQUIPMENT

- A. This contractor shall include in his bid the necessary labor and material to properly coordinate and install the required piping, trim, specialties, controls, ductwork, and other necessary utilities and services to equipment furnished by the Owner.
- B. This contractor shall relocate (where noted), rough-in and make final connections to owner furnished equipment.
- C. See bid documents for a list of owner furnished equipment which is not otherwise identified on the mechanical drawings or in the mechanical division of the specifications.

3.9 RELEASE OF FILES

- A. Release of AutoCad, Revit or Word files will not be provided by Olsen & Peterson Consulting Engineers, Inc.
- B. Olsen & Peterson Engineers, Inc. retains the sole right to all files and intellectual property.

End of Section

SECTION 23 0501

TESTING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The work outlined in this section shall be performed by the several trades involved.
- B. The mechanical contractor shall provide all supervision, labor, materials, tools, scaffolding, and equipment required to complete all system testing.
- C. The mechanical contractor shall remove and repair any defective component as indicated by the system tests and retest.
- D. The mechanical contractor shall test the operation of all safety and high limit controls to ensure proper installation and operation. Any defective devices shall be replaced.

1.2 TESTS AND ADJUSTMENTS

- A. Before any piping is covered, tests shall be made in the presence of the Owner's Representative, and any leaks or defective work corrected. No caulking of threaded work will be permitted.
- B. Before application of insulation covering, and as far as practical before concealing any piping, all piping shall be hydrostatically tested and proved tight.
- C. Stubs shall be capped and all control valves shall be removed during the test.
- D. System may be tested in sections, providing connections to last section tested are included in each succeeding test.
- E. All medium pressure duct systems shall be tested per SMACNA standards under this section. Coordinate with section 233000.
- F. Following minimum pressures shall be used for testing:
 - 1. Domestic hot and cold-water piping at 150 psig for six hours.
 - 2. Plumbing waste and vent piping at 10 ft. head for six hours.
 - 3. Medium pressure air ducts in accordance with SMACNA standards.
 - 4. Heating hot water system piping at 150 psig for six hours.

- 1.3 All valves and equipment which may be damaged shall not be subjected to the test pressure.

PART 2 – PRODUCTS

2.1 EQUIPMENT

- A. The contractor shall furnish all necessary gauges, plugs, test fans, pumps, etc., as required to conduct the tests.

2.2 REPORTS

- A. The contractor shall give the Owner's Representative one week's notice prior to performing the tests. All tests shall be recorded, and copies of reports bound in the O & M manuals and given to the Owner.

PART 3 – EXECUTION

3.1 PROCEDURE

- A. The contractor shall be responsible to conduct all tests in a safe manner, protecting the work of other trades from water or physical damage.
- B. The tests, as indicated, shall be in addition to any test, as required, by any governing agency. Submit all approved tests, as required, by any governing agency to the Owner's representative.
- C. Each test and any necessary repairs and retest shall be performed by the contractor which installed the system.
- D. Upon completion, a test shall demonstrate that the culinary hot water system is circulating, that all traps are properly vented, that there is an ample supply of hot and cold water to fixtures, that no fixture or equipment can be back siphoned, and that there are no back-flow connections.

End of Section

SECTION 23 0593

BALANCING

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. The mechanical contractor shall employ an independent technical firm to perform the checking, adjusting, and balancing (CAB) of the HVAC systems. This firm shall be one whose operations are limited to the field of professional CAB, and this firm shall meet the following qualifications:
 - 1. The firm shall be a member of AABC and/or NEBB.
 - 2. The firm shall be one which is organized to provide professional services of this specific type.
 - 3. The firm shall have completed projects of similar scope within the past 12 months and shall be capable of performing the services specified at the location of the facility described within the time frame specified, and following up the basic work as may be required.
 - 4. All personnel used on the job site shall be engineering technicians, who shall have been permanent, full-time employees of the firm for a minimum of six (6) months prior to the start of the work for this project.
- B. As a part of this contract, the mechanical contractor shall make all changes in the sheaves, belts, and dampers, including the addition of dampers required for correct balance as required by the CAB firm, at no additional cost to the Owner.
- C. The mechanical contractor shall provide and coordinate services of qualified, responsible subcontractors, suppliers, and personnel as required to correct, repair, or replace any and all deficient items or conditions found during the testing, adjusting, and balancing period.
- D. In order that all systems may be properly checked, balanced, and adjusted as required by these specifications, the mechanical contractor shall operate said systems at his expense for the length of the time necessary to properly verify their completion and readiness for the CAB and shall further pay all costs of operation during the CAB period.
- E. The project completion schedule shall be coordinated with the CAB work to provide sufficient times to permit the completion of CAB services prior to Owner occupancy.

1.2 DOCUMENTS

- A. The Owner's representative will furnish, without charge to the CAB firm, one set of mechanical specifications, all pertinent change orders, and the following:
 - 1. One complete set of plans less the structural sheets.
 - 2. One set of mechanical floor plans of the conditioned spaces.
- B. These sheets should be ozalid type (blue or black on light background) reproductions to facilitate marking.
- C. Approved submittal data on equipment installed to accomplish the test procedures outlined in paragraph "Services of the CAB Firm" of this specification will be provided by the mechanical contractor.

- D. The Owner's representative will transmit one copy of the following "Records for Owner" to the CAB firm for review and comments:
1. Record drawings
 2. Approved fixture brochures, wiring diagrams, and control diagrams.
 3. Shop drawings
 4. Instructions
 5. Motor and valve charts
 6. Operating and Maintenance Manuals

1.3 SERVICES OF MECHANICAL CONTRACTOR

- A. The mechanical contractor shall have all systems complete, calibrated, and in operational readiness prior to notifying the CAB firm that the project is ready for their services. The mechanical contractor shall coordinate system readiness with the system commissioning contractor and shall certify in writing to the Owner's representative that the system is complete and ready to balance.

1.4 SERVICES OF THE CAB FIRM

- A. The technical CAB firm shall submit biographical data on the individual proposed to directly supervise the CAB work. It shall also submit their record of specialized experience in the field of air and hydronic system balancing.
- B. Act as liaison between the Owner's representative and contractor and periodically inspect the installation of mechanical piping systems, sheet metal work, temperature controls and other component parts of the heating, air conditioning and ventilating systems as the installation progresses. The inspection will cover only those parts of the systems relating to the checking and balancing.
- C. To check, adjust, and balance system components to obtain optimum conditions in each conditioned space in the building.
- D. Prepare and submit to the Owner's representative, complete reports on the balance and operations of the systems.
- E. The CAB firm shall be responsible for inspecting, adjusting, balancing, and logging the data on the performance of the following general systems, including all components.
1. Existing systems as required.
 2. Heating water systems, including coils, controls, etc.
 3. Temperature control system in its entirety including the verification of all control sequences and safety devices.
 4. Domestic hot water recirculating systems.
- F. Before any adjustments are made, the air systems are to be checked for such items as dirty filter, duct leakage, damper leakage, equipment vibrations, correct damper operations, etc.
- G. Before any adjustments are made to water systems, the strainers shall be cleaned, temperature control valve operation shall be checked, pump rotation shall be checked, pressure reducing valves shall be adjusted, etc.

- H. It shall be the responsibility of the CAB personnel to check, adjust, and balance the components of the various systems as listed above using an applicable "proportionate balance procedure" in order that each of them will operate under optimum noise, temperature and air flow conditions in the conditioned spaces in the building "while simultaneously operating at the most energy efficient condition."
- I. During the balancing process, if abnormalities or malfunctions of equipment or components are discovered by the CAB personnel, the owner's representative shall be advised promptly so that the condition may be corrected by the project contractor. Data from malfunctioning equipment or components shall not be recorded in the final CAB report.

PART 2 – PRODUCTS

2.1 EQUIPMENT AND INSTRUMENTS

- A. This contractor shall provide all necessary labor, equipment, scaffolding, instruments, and materials required to adjust, balance, and check all systems.

PART 3 – EXECUTION

3.1 REPORT

- A. The activities, as described hereinbefore, will culminate in a report to be provided to the Owner's representative. This report shall be furnished in digital format. A digital copy shall be bound in the final O & M manual. The intent of the final report is to provide a reference of actual operating conditions for the building operating personnel.
- B. The CAB report shall include the following as a minimum:
 - 1. Preface:
 - a. A general discussion of the systems, any idiosyncrasies, any problems encountered, an outline of normal sequence of operation for the HVAC system cycles, any un-corrected noise problem.
 - 2. Pitot Tube Traverses:
 - a. For use in future trouble-shooting by maintenance personnel, all exhaust ducts, main supply ducts and return ducts will have air velocity and volume measured and recorded by the traverse method. Locations of these traverse test stations will be described on the sheet containing the data.
 - 3. Temperature Tabulation:
 - a. Of all conditioned spaces on a room-by-room basis, a total of at least three readings will be taken of each room on successive days. Record outside ambient temperature at two-hour intervals. The total variation in conditioned space temperatures shall not exceed 2 deg. variance from the thermostat settings.

4. Air Volumes and Velocities:
 - a. As measured at each supply grille, return air grille, and exhaust air grille or air handling device. In all fan systems, the air quantities indicated on the plans may be varied as required to secure a maximum temperature variation of two degrees within each separately controlled space, but the total air quantity indicated for each zone must be obtained. It shall be the obligation of the contractor to furnish or revise fan drive and/or motors, if necessary, without cost to the Owner, to attain the specified air volumes.
 5. Air Pressure:
 - a. As measured across each supply fan, cooling coil, heating coil, air handling unit filter and exhaust fan. Relate these readings to the particular fan curve in terms of CFM handled at the various static pressures, and their relationship to fan power and fan instability.
 6. Water Temperature:
 - a. Shall be taken entering and leaving the coils under maximum load conditions in each case.
 7. Electrical Current/Voltage:
 - a. Measurements to be taken at the drive motor on each piece of equipment.
 8. Fan Speeds:
 - a. To be measured in RPM.
 9. Instrumentation List:
 - a. A list of instruments by type and make used in gathering the CAB data.
 10. Drawings:
 - a. The CAB contractor's working drawings shall have the VAV, and supply air openings numbered and/or lettered to correspond to the numbers and letters used on the report data sheets so that data in the report can be correlated with each specific supply air opening in the building. If room numbers actually used in the building differ from those on the plans, the building room numbers shall be marked on these plans. Only one such marked-up set of drawings need be provided with the six copies of the CAB report.
- C. Before final acceptance of the CAB report, the report data, at the discretion of the Owner's representative, shall be verified one time on the job site, by selection of check points (not to exceed 10 percent of total) at random, in the presence of the Owner's representative. Representatives of the testing firm doing the work shall be present and provide the necessary equipment for test data verification.

- D. The firm shall be responsible for inspecting, adjusting, balancing, and logging the data on the performance of fans, all dampers in the duct system, all air distribution devices, the flows of freon or water thru all coils, and the power consumption of all motors.
- E. During the CAB work, the temperature regulation will be adjusted for proper relationship between controlling instruments. The Owner's representative will be advised of any instruments out of calibration so that the controls subcontractor may come in and recalibrate, using data supplied by the balancing firm.
- F. An additional inspection in the building shall be made by the firm during the season opposite that in which the initial adjustments were made. At that time, any necessary modifications to the initial adjustment required to produce optimum operation of the system components shall be made to produce the proper seasonal conditions in each conditioned space.
- G. At the time of opposite season checkout, the Owner's representative shall be given timely notification before any readings or adjustments are made so that they may participate in the checkout.

End of Section

BLANK PAGE

SECTION 23 0900

BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section specifies the basic materials and methods to be used in Division 22, 23 and 25 work.

1.2 MATERIALS & EQUIPMENT

- A. All materials shall be new and undamaged. Protect all stored materials and equipment from damage by the elements, including exposure to excessive heat, flooding and rain, windstorms, etc.
- B. All materials and equipment shall be installed in strict compliance with the manufacturer's recommendations.

1.3 CUTTING AND PATCHING

- A. Any cutting, patching, or filling necessary for the proper execution of this work, except as noted in the drawings, shall be done by this contractor.
- B. No rough or unsightly work will be allowed. Cutting of structural members shall be done only on approval of the Owner's representative.
- C. The attention of the contractor is directed to the requirements of running pipes thru concrete slabs, walls, and beams. These conditions are to be anticipated and sleeves installed as provided for under "Sleeves".

1.4 INSERTS

- A. Furnish and set, in all necessary locations, before or during construction, unistrut inserts for use in connection with the support and seismic restraint of piping, ductwork, and equipment furnished under this division of the work.

1.5 SLEEVES

- A. Sleeves for Concrete or Masonry Surfaces:
- B. For pipes passing thru masonry or concrete construction, provide sleeves at least two pipe sizes larger than the pipe passing thru and made from sections of steel pipe.
- C. Provide galvanized iron sleeves with collar on each side of wall for all ducts passing thru masonry or concrete construction.
- D. Provide 22-gauge sheet metal collars on each side of wall for all ducts passing thru gypsum wall construction or similar construction.
- E. Sleeves shall be placed in structural members only where approved by the Owner's representative.
- F. Sleeves through foundation walls below grade shall be mechanical seal type with watertight sealing grommets and pressure rings. Sealing grommets shall be non-melting at temperatures incurred. Foundation wall sleeves shall be "O.Z. Type WSK".

G. Sleeves thru Finished Surfaces:

For pipes passing thru finished partitions or ceilings, provide galvanized sheet iron sleeves of suitable size. The sleeves shall be fastened to construction to prevent creep along pipe and the sleeve ends shall be flush with finished surfaces. Provide escutcheon plates at each side of finish wall or floor or ceiling for all pipes passing thru same.

1. Sleeves thru Fire-rated Surfaces:

- a. All pipe sleeves and ductwork penetrating fire walls and surfaces shall be packed inside after pipes and/or ducts have been placed with a U.L. listed fire safing system. The contractor shall submit to the Owner's representative for review and approval specific installation diagrams showing exact method(s) to be used.

2. Sleeves thru Sound Rated Surfaces:

- a. All pipe sleeves and ductwork penetrating sound rated walls or surfaces shall be packed with dense fiberglass, sealed with duct sealer and fitted with metal cover flanges on both sides.

3. Sleeves thru Floors:

- a. Sleeves thru floors above grade shall extend 1" above the floor and shall be sealed watertight with waterproof silicone caulking.

1.6 PIPING & DUCTWORK SUPPORT

- A. Steel roof deck shall not be used to support loads from plumbing, HVAC ducts, light fixtures, architectural elements or equipment of any kind, unless specifically noted otherwise. Lightweight suspended acoustical ceilings with a total weight per wire not exceeding 50# may be hung from the steel roof deck. The hangers should be staggered to distribute the load over multiple deck flutes.
- B. Bracing of miscellaneous items (mechanical, electrical, plumbing, etc.) to the bottom chord of joists or girders will not be allowed in any instance. All lateral braces must connect to the top flange/top chord of the framing member above unless noted otherwise on the structural drawing.
- C. Beam clamps shall not be used to hang piping from open web joist, trusses or girders.
- D. Beam clamps **are not** allowed for support of piping from joists. Uni-strut supports from top chord of joist is a method of attachment. Coordinate with structural details.
- E. All concentrated loads greater than 100 pounds supported by open web steel joists and girders shall be located within 6 inches of joist or girder panel points or the joist or girder shall be reinforced with an additional web member. Refer to the "TYPICAL DETAIL AT ADDITIONAL CONCENTRATED POINT LOAD" in the structural drawings.
- F. Concentrated point loads, single or multiple, totaling 100 pounds or less can be located at any point along the top or bottom chord of an open web steel joist or girder between adjacent panel points without meeting the requirements above. A limit of four concentrated 100# maximum point loads per joist or girder will be permitted on spans of 12' or greater, one concentrated 100# max. load on spans less than 12', unless specifically noted otherwise on the structural drawings.
- G. Joist bridging shall never be used to support hanging loads.

- H. Bracing of miscellaneous items (mechanical, electrical, plumbing, etc.) to the bottom chord of joists or girders will not be allowed in any instance. All lateral braces must connect to the top flange/top chord of the framing member unless noted otherwise on the structural drawings.
- I. For all attachments to open web steel joists, the attachment to the joist shall equally distribute the load to both chord angles in a manner that does not induce torsion (twist) to the chords. Beam clamps may not be used.
- J. Steel roof deck shall not be used to support loads from plumbing, HVAC ducts, light fixtures, architectural elements or equipment of any kind, unless specifically noted otherwise. Lightweight suspended acoustical ceilings with a total weight per wire not exceeding 50# may be hung from the steel roof deck. The hangers should be staggered to distribute the load over multiple deck flutes.

1.7 PIPE LOCATION AND ARRANGEMENT:

- A. No water supply piping inside the building shall be placed in direct contact with the earth. Buried water piping shall be placed in split tile or PVC pipe below the 4" of gravel to keep pipe from direct contact with ground.
- B. Unless otherwise noted on the drawings, all water piping shall be kept out of concrete floor slabs.
- C. Under no circumstances shall plastic piping or ducting materials be run inside of supply or return air plenums.
- D. All piping shall be properly racked and supported to run straight and true.
- E. All changes in direction shall be made with approved fittings. Pipes shall not be bent to change direction.
- F. All piping shall be racked and run to facilitate maintenance work. Under no circumstances shall valves, shock absorbers, drip traps, or piping specialties be installed in a "closed space" without proper access provided for future maintenance. See "Access Doors" section of specifications.
- G. NOTE: All piping shall be capped or plugged at the end of each work shift and when not being extended, to prevent the entry of rocks and debris.
- H. Any timelines are broken or disconnected, they shall be capped immediately after flushing to remove rock and debris from pipes. If rocks or other foreign materials are found in the system after it has been closed, the contractor shall stand the expense of their removal.
- I. All valves, piping, and equipment to be installed so as to permit disassembly for maintenance purposes.
- J. Provide drain valves at all low points in piping systems. Run to floor drain where possible, otherwise provide 3/4" hose connection with vacuum breaker.

1.8 PIPE JOINING

- A. **All steel pipe under 2" in size shall be joined by screwed connections.**
- B. All joinings shall be made to maintain the full metal strength of the pipe, with neat and workmanlike appearance.
- C. All piping must be perfectly clean before the system is filled.

- D. Copper Piping in Domestic Water Service: Piping shall be cut (with a pipe cutter) so ends are square and will "bottom" in fittings. There must be no gaps left thru which solder can run into the line. If a hack saw must be used, it shall be guided with a miter box to ensure a square, even cut. Tubing shall be reamed to remove burrs, being careful not to expand tubing while reaming.
- E. The outside of the copper pipe and the inside of the fittings, where solder will be applied, shall be burnished with fine crocus cloth or fittings brushes until all dirt and oxide is removed.
- F. A light coat of soldering flux shall be applied to both pipe and fittings. Acid flux shall not be used.
- G. Joints in copper pipe shall be uniformly heated to proper soldering temperature to ensure that solder will flow to all parts of the joint. The solder shall be fed to the joint until a uniform line of solder appears around the pipe at the end of the fittings.
- H. Copper piping used in domestic water service shall be joined with 'Stay-Safe-50' or 'Silvabrite-100' no lead solder.
- I. When valves are being installed in copper piping, the non-metallic parts shall be removed to prevent the heat of soldering from damaging the valves. No heat shall be applied near where an excessive temperature may cause damage.

1.9 SCREWED CONNECTIONS

- A. All pipe shall be reamed at the ends and free of all inside scale or burrs. Threads shall be cut clean and sharp, and to a length equal to 1-1/8 the length of the female thread receiving the pipe. The pipe shall be screwed in the full length of the female thread.
- B. Pipe shall be made tight with teflon thread tape or thread lubricant worked into male thread only. Surplus material shall be wiped off and the joint left neat and clean. Lubricant shall be powdered graphite and linseed oil, or plumbage and linseed oil.

1.10 PIPE GRADING

- A. Piping shall be uniformly graded in direction of flow as noted below:

PIPING	FALL/RISE	DIRECTION	PER/RUN
Water	1"	Up	40'
Waste - 4" & smaller	1"	Down	4'
Vent	1"	Up	4'
Condensate Drip	1"	Down	4'
Heating Water/Glycol	1"	Up	40'

1.11 VIBRATION ISOLATION

- A. connecting to pumps, air handling units, cooling towers, and other flexibly mounted equipment.
- B. Flexible connection shall be specifically designed to absorb noise and vibration and to prevent damage to equipment caused by piping stress. Unit construction shall consist of heavy bellows type neoprene rubber hose sections with stainless steel liners and attachments to match piping, or three (3) grooved flexible couplings for grooved pipe systems.

PART 2 – PRODUCTS

2.1 PIPING SYSTEMS

- A. All piping shall be in accordance with the American Society for Testing and Materials, ASTM A-53. No foreign made piping or connectors will be accepted in this construction.
- B. Culinary cold, hot, and recirculating hot water above grade shall be Type "L" copper with soldered wrought copper fittings. Press-Fit or Pull-T type fittings on copper piping are not allowed.
- C. Waste and vent piping above grade shall be standard weight cast iron pipe with no-hub, tyseal, M-G, or A.B.I. 'Best' gasketed fittings for sizes 2" and larger; and galvanized Schedule 40 with tarred Durham drainage fittings for 1-1/2". All drain waste, vent, sewer, and storm lines shall be of cast iron soil pipe and fittings and shall conform to the requirements of CISPI Standard 301, ASTM A 888 or ASTM A 74. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and be listed by NSF International.
- D. Joints:
 - 1. No-Hub Couplings: No-hub coupling shall conform to CISPI Standard 310 and shall be listed by NSF International.
 - 2. Compression Gaskets for Hub & Spigot: Compression gaskets shall conform to the requirements of ASTM Standard C 564 and ASTM C 1563.
 - 3. Joints for pipe and fittings shall conform to the manufacturer's installation instructions and local code requirements. All cast iron pipe and fittings, above ground, shall bear the collective trademark of the Cast Iron Soil Pipe Institute, or have prior approval of the engineer.
- E. Heating hot water piping system piping above grade shall be Schedule 40 black steel pipe. All piping 2" and larger shall be welded.
- F. Condensate drip lines shall be Type "M" copper with soldered wrought fittings.

2.2 HANGERS AND SUPPORTS

- A. Vertical Piping:
 - 1. Attachment - Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and to carry the weight of the pipe and contents. Stacks shall be supported at their bases, and if over two (2) stories in height at each floor by approved metal floor clamps.
- B. Cast iron soil pipe shall be supported at not less than each story height and at its base.
- C. Screwed pipe (IPS) shall be supported at not less than every other story height.

- D. Copper tubing shall be supported at each story for piping one and one-half (1-1/2) inches in diameter and at not more than six (6) foot intervals for piping one and one-quarter (1-1/4) inches in diameter and smaller. Piping shall be wrapped with three wraps of vinyl tape to isolate pipe from ferrous pipe supports.
- E. Horizontal Piping: Under no circumstances shall piping be supported from the metal roof deck.
- F. Any attachments allowed to acoustical decking shall be attached per deck manufactures requirements, and as directed by structural engineer.
- G. It is essential that all piping be supported from top chord of roof structure at joist panel point locations. Coordinate with structural requirements.
- H. Supports - Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.
- I. Cast Iron Soil Pipe - Where joints occur, soil pipe shall be supported at not more than 5-foot intervals, except that where 10-foot pipe lengths are used, supports at 10-foot intervals are acceptable. Supports shall be placed within eighteen (18) inches of the hub or joint. No-hub joints and fittings shall be restrained with rods and clamps per manufacturer's recommendations.
- J. Screwed pipe (IPS) shall be supported at approximately 12-foot intervals.
- K. Copper tubing shall be supported at approximately 6-foot intervals for piping one and one-half inches and smaller in diameter and at 10-foot intervals for piping two inches and larger in diameter.
- L. Piping placed underground shall be laid on a firm bed for its entire length.
- M. Hangers shall be Grinnell Figure 260 for both bare and insulated pipe.
- N. Where piping is run adjacent to walls or steel columns, it shall be supported from steel brackets or vertical channel hangers. Brackets shall be Grinnell Figure PS 732 or PS 3282 as directed, or approved substitute. Channel systems shall be approved for each condition on an individual basis.
- O. Furnish all hangers, inserts, brackets, anchors, guides, sliding supports, etc., and all auxiliary steel necessary for the installation. All supports shall be designed in accordance with the AISC Steel Handbook and painted with one shop coat of primer paint.
- P. Insulation inserts and shields for cold surface piping will be provided under Section 220700 of these specifications.
- Q. Pipe covering protection saddles shall be installed at all pipe hangers which support insulated "hot surface" piping. Saddles shall be tack welded to the piping and shall match the insulation thickness applied.
- R. All copper, fiberglass, or plastic piping shall be securely supported from the building structure at intervals specified and/or as recommended by the pipe manufacturer. Hanger shields for suspended piping shall be functionally similar to isolators with Grinnell Fib. 97. Non-ferrous piping shall be isolated from contact with ferrous supports with three wraps of vinyl tape.
- S. Plumbers' tape, chain, or wire will not be permitted for pipe support.
- T. **Beam clamps for piping at roof joists will not be allowed.**
- U. Beam clamps shall not be used to hang piping from open web joist, trusses or girders.

2.3 VALVES AND STRAINERS

- A. All valves and strainers shall be by one manufacturer. Approved valve manufacturers are Crane, Stockham, W. C. Norris, Grinnell, or Powell. Crane numbers are used for convenience.
- B. Heating and Domestic Hot and Cold Water:
- C. Gate Valves:
 - 1. Valves 2" and smaller shall be Crane No. 428, bronze, screwed, 200# WOG gate valve with solid wedge disc and rising stem.
- D. NOTE: If unable to use a rising stem valve because of insufficient clearance, use a Crane No. 438 non-rising stem valve.
- E. Globe Valves:
 - 1. Valves 1-1/2" and smaller shall be Crane No. 37, bronze, screwed, 200# WOG globe valve with a replaceable teflon disc and teflon packing. The disc shall be suitable for hot water up to 360 deg. F. at 150 psi.
- F. Check Valves:
 - 1. Valves 1-1/2" and smaller shall be Crane No. 37, bronze, screwed, Y-pattern 200# WOG swing check valve. Valves 2" and larger shall be Crane No. 373.
- G. Ball Valves:
 - 1. For hot and cold domestic water service: Valves 2" and smaller shall be Crane No. 2190H bronze, screwed, 200# WOG, Gem ball valve with Buna-N rubber capsule. Watts B6000 or Apollo 70-100.
- H. For heating service as isolation or balancing valves: Valves 2" and smaller shall be Crane No. 219H, bronze, screwed, 200# WOG, Hydro Gem ball valve with EPT Nardel capsule. (If solder-joint ball valves are desired, use Crane No. 2192H). NOTE: Valves must be suitable for temperature and pressure required in the individual application.
- I. Strainers:
 - 1. Strainers 1-1/2" and smaller shall be Crane No. 988-1/2, iron body, screwed Y-pattern, 200# WOG, sediment separators with a 20-mesh Monel screen.
- J. All strainers shall be installed with fine mesh supplementary "construction screens" which shall remain in place while the system is flushed and chemically cleaned. The "construction strainer" basket shall be removed just prior to balancing the water systems.
- K. Provide blow-down ball valve on all strainers same size as strainer tapping.

2.4 NON-SLAMMING OR SPRING-LOADED CHECK VALVES

- A. Types: Provide valves of the fully guided or cone-and-diaphragm types.
- B. Bodies: Provide flanged or wafer type bodies constructed of cast iron ASTM A 126, Class B; cast steel ASTM A 216/A 216M, Class WCB; stainless steel, Type 304 or cast bronze ASTM B 61.

- C. Trim: Seats, discs and springs shall be constructed of 18-8 stainless steel or bronze complying with ASTM B 62. Seats may be of elastomers suitable for 250 degrees F. minimum continuous working temperature or not less than 50 degrees F. above the operating temperature of the system, whichever is higher.
- D. Mating Surfaces: Mating surfaces of closure faces shall be bronze or Type 316 or 17-4PH stainless steel or elastomer approved for the particular service and materials must be compatible to prevent electrolytic action.
- E. Pressure Loss: Pressure loss through the valves, measured in feet of water, shall not exceed 6/10 of the water velocity in feet per second.
- F. Bubble-Tight: Non-slamming and spring-loaded check valves shall provide bubble-tight shut-off when handling water up to 250 degrees F. and 125 pounds per square inch differential pressure. Design shall prevent rubbing of seat materials when opening and closing. Poppet valves shall have conical springs.

2.5 GENERAL DUTY VALVES & SPECIALTY COCKS

A. Cocks:

- 1. Balancing cocks 1-1/2" and smaller shall be Crane No. 80E, bronze, screwed, 200# WOG.
- 2. Balancing cocks 2" and larger shall be Crane No. 325, all iron, flanged 125# WOG.
- 3. Gage cocks shall be Crane No. 744, 1/4", bronze, screwed.
- 4. Petcocks shall be Crane No. 702, 1/4", bronze, screwed with lever handle.
- 5. Trycocks shall be Crane No. 734, 3/8", bronze, screwed, 250# rated with stuffing box.
- 6. Provide two complete sets of wrenches for all cocks and stops.

2.6 BACKFLOW PREVENTERS

- A. Backflow preventers shall comply with the requirements of the 2021 IPC and State Plumbing Code as to type, style, size, location, and arrangement for the actual installed duty.
- B. Where backflow preventers are installed which release water thru the valve to the atmosphere, these units shall be provided with drip pans which collect the free water. The drip pans shall be piped to the nearest drain.
- C. All backflow preventers shall be installed with all necessary isolation valves and test cocks.

2.7 AUTOMATIC VALVES AND WELLS

- A. The mechanical subcontractor shall install the automatic temperature control valves, temperature sensing wells, and flow switches, as directed by the automatic temperature control subcontractor.

2.8 UNIONS

- A. Ground joint unions shall be installed on pipe 2-1/2" and under where indicated on drawings. Whenever piping is connected to a major piece of apparatus, unions shall be provided as near as practical on each side of the apparatus.

2.9 ISOLATION FITTINGS

- A. Approved isolation fittings shall be installed at the junction of all copper and steel piping to prevent electrolytic action. **Fittings shall be NZR brass unions or fittings.**

2.10 CHEMICAL CLEANING

- A. Prior to operating any heating systems, all piping systems and components shall be chemically cleaned and flushed by an experienced chemical cleaning service approved by the Engineer.
- B. Pipe Exterior: Wash and wipe pipe exterior to remove construction dirt, loose scale and flux.
- C. Pipe Interior: Flush pipe interior with clean water. Continue flushing until the piping system runs clean. After flushing inspect strainer screens, refrigeration machine water boxes, piping low points, and tank drains to determine the presence of construction debris. If debris is found, disassemble equipment and remove debris. Re-flush the system and re-inspect.
- D. Do not operate existing pumps until system has been cleaned and flushed.

2.11 GLYCOL FILL

- A. This contractor shall drain down existing systems as required. Contractor shall furnish all propylene glycol solution for the heating water system to provide a concentration similar to existing systems. Glycol solution shall be Dowfrost HD or Jeffcool P150 HD low toxicity polypropylene with extra strength corrosion inhibitors and colored dye for identification.

2.12 VALVE TAGGING

- A. All valves shall be designated by distinguishing numbers and letters on required charts and diagrams. The contractor shall furnish and install approved brass tags for all designated items, which numbers and letters on the tags corresponding to those on the charts and diagrams.
- B. Brass tags shall be not less than 1-1/2" diameter with depressed black filled numbers not less than 1/2" high and black filled letters not less than 1/4" high. Tags shall be securely fastened to valves with approved brass "S" hooks, or brass jack chain, in a manner to permit easy reading. Zips ties are not acceptable. Do not attach to valve wheel. Brass tags shall be as manufactured by Seton Name Plate Company, New Haven, Connecticut, or approved equal.
- C. Each valve shall have an identifying number identifying the unit. Standard identifications may be used for identifying type of service or fluid in pipe. The contractor shall submit his system of identification to the Owner's representative for approval prior to ordering. Any work done without this approval is done at the contractor's risk.
- D. Charts of all valves shall be furnished to the Owner's representative by the contractor.

E. Identify all valves. A sample identification shall be as follows:

VALVE IDENTIFICATION CHART

NUMBER	DESCRIPTION	LOCATION	NORMAL POSITION
1.	Cold Water Supply to Water Heater	Mech. Room #121	Open
2.	Cold Water Supply to Hose	Room #13	Open
3.	Cold Water Supply to Equip. in Room #12	Room #18	Open
4.	Hot Water Supply to Toilet Room #212	Chase #210	Open
5.	Air Vents - Cooling Coil #12 (2 required)	Fan Room 3122	Closed
6.	Heating Hot Water Balancing Valve (Southwest Zone)	Above Ceiling Room #412	Marked On Valve

F. The above room numbers shall be the room numbers actually used.

G. Mechanical Equipment & Ductwork:

All mechanical equipment, including meters, fans, pumps, and other devices shall be identified with signs made of laminated plastic 1/8" or larger engraved letters. Signs shall be securely attached by rustproof screws or some other permanent means (no adhesives).

H. Information on the sign shall include name of equipment, rating, maintenance instructions, and any other important data not included on factory attached nameplate.

I. Signs shall be attached to equipment so they can be easily read.

J. Identify all ducts exposed in mechanical equipment rooms and in ducts and pipe chases. Sample duct identification shall be as follows:

1. "Cold Duct - High Pressure - To Second Floor System"
2. "Exhaust Duct - Toilet Room - To EF-3"
3. "Ventilation Air Duct - To Utility Room #228"

K. Ducts shall be labeled at all wall penetrations and at connections to equipment.

2.13 PAINTING

A. Mechanical Contractor: All equipment which is to be furnished in factory prefinished conditions by the mechanical contractor shall be left without mark, scratch, or impairment to finish upon completion of job. Any necessary refinishing to match original shall be done. Do not paint over nameplates, serial numbers, or other identifying marks.

B. Mechanical Contractor: Spot painting for application of pipe and equipment identification markers. All piping exposed to weather.

- C. Painting Contractor: All insulated piping and all piping in equipment rooms of finished areas shall be painted, as required by the painting specifications. Colors to be selected by owner.
- D. Coding, Pipe Identification & Painting:
- E. All pipes are to be labeled and color coded with contents clearly identified and arrows indicating direction of flow. Pipes shall be identified at the following locations:
 - 1. Adjacent to each valve.
 - 2. At every point of entry and exit where piping passes thru wall or floor.
 - 3. Every 50 feet on long continuous lines.
 - 4. On each riser and junction.
 - 5. Adjacent to all special fittings or devices (regulating valves, etc.)
 - 6. Connection to equipment.
- F. Apply markers to they can be read from floor.
- G. Labels and markers shall be of the self-sticking, all temperature permanent type as manufactured by W. H. Brady Co., 727 West Glendale Avenue, Milwaukee, Wisconsin, or Seton Name Plate Corp., 592 Boulevard, New Haven, Connecticut.
- H. Pipe color coding shall be uniform throughout.
- I. Background colors shall be as follows:

Yellow:	Dangerous Materials (natural gas condensate, etc.)
Bright Blue:	Protective Materials (filtered water)
Green:	Safe Materials (chilled water, cold water, instrument air, sanitary sewer, etc.)
- J. Letters of identification legend shall be 2" high for pipes 3" and larger, and 1" high for pipes 2-1/2" and under.
- K. Markers shall be installed in strict accordance with the manufacturer's instructions.
- L. On chalky and loose insulation, soft, porous, fiber-filled or fiberglass coverings, a spiral wrap of pipe banding tape shall be made around the circumference of the pipe. Sufficient spiral wraps shall be made to accommodate the horizontal dimension of the pipe marker.
- M. On bare pipes, painted pipes, and pipes insulated with a firm covering, pipe banding tape matching the background color of the marker shall be used for 360 deg. color coding. After applying pipe markers, wrap pipe banding tape around pipe at each end of marker. Tape should cover 1/4" to 1/2" of each end of marker and should overlap approximately 1/2" to 1" on itself. Be sure pipe surface is dry and free of dirt or grease before applying markers or banding tape.
- N. Stenciling may be used in lieu of the above labels and markers if finished application gives the same overall appearance, that is that stenciling is applied over a background color. If stenciling is used, letter heights, background colors, banding, and arrow shall be as specified above. Submit sample to Owner's representative before proceeding with work.

O. Ceiling Markers:

1. Use stick on ceiling markers on all accessible ceiling grid to indicate location of VAV boxes, valves, and dampers.

P. Color code as follows:

Yellow	HVAC
Green	Plumbing
Blue	Air
White	Duct Valves
Orange	Electrical Devices
Red	Fire

PART 3 – EXECUTION

3.1 COORDINATION

- A. All equipment and piping shall be arranged to allow for easy maintenance and access to service valves.
- B. Provide valves and unions or flanges at all pieces of equipment to allow maintenance.
- C. Install all automatic valves, sensor well, flow switches, etc., as directed by the control contractor.

3.2 TESTING

- A. All piping shall be tested in accordance with Section 230501 prior to applying insulation or concealing in partitions, wall, etc.

3.3 ACCESS

- A. All valves and equipment shall be located to allow easy access for inspection, service and maintenance, test and balance, and operation. If valves are installed in inaccessible locations, it shall be this contractor's responsibility to furnish and install access doors of a type approved by the owner's representative.
- B. Locate piping, valves, etc., to allow easy access to and maintenance of equipment. Do not block walkways, filter access, maintenance access, or tube-pull space in equipment rooms.

3.4 LOCATIONS & ARRANGEMENTS

- A. All equipment and accessories shall be installed to facilitate proper service and maintenance in compliance with the manufacturer's recommendations.

3.5 WIRING BY THE ELECTRICAL CONTRACTOR

- A. It is the intent of these specifications that all line voltage electrical power wiring and power connections to equipment be furnished and installed by the electrical contractor, unless otherwise specified or shown on the drawings.
- B. The mechanical contractor shall coordinate actual job-site power requirements with the electrical contractor prior to installation of power wiring and electrical equipment.

- C. The electrical contractor shall provide necessary wiring to electric heat tape as required and shall coordinate with the mechanical contractor the location and capacity of required circuits.
- D. When mechanical system components are furnished with remote mounted control panels, alarm bells, alternators, etc. the electrical contractor shall run all required line voltage power wiring as directed by the mechanical contractor. It shall be the mechanical contractor's responsibility to coordinate the work and provide the necessary wiring diagrams.
- E. When exhaust fans are provided which are not controlled by the ATC contractor, they shall be wired to local line voltage wall switches. The wall switch locations shall be coordinated with the owner's representative.
- F. Line and low voltage control wiring will be furnished and installed by the ATC contractor in accordance with NEC and Division 26. Minimum 3/4" conduit.

3.6 INSTALLATION OF ABOVE GROUND PIPING

- A. Provide piping systems of sizes indicated on the drawings. Systems shall be installed complete.
- B. Install piping systems in conformance with ANSI B31.
- C. Install piping to allow for expansion and contraction of the piping systems. Provide offsets and swing joint connections at coils, pumps and other equipment to eliminate undue strain to the equipment connections.
 - 1. Connect flanges and tack weld piping systems in place before full circumferential welds are made.
 - 2. Springing of piping at equipment connections will not be permitted.
 - 3. The use of "cold-spring" is not permitted.
- D. Branch connections to up feed systems shall be made at the top or at a 45-degree angle above the centerline. Branch connections for down feed systems shall be made at the bottom or at a 45-degree angle below the centerline.
- E. Install water piping with a pitch or slope of not less than 1-inch in 40 feet.
 - 1. Provide 3/4-inch diameter plugged drain valves at each low point in mechanical rooms.
- F. High Points: At each high point of the piping system provide a 3/8-inch diameter plugged globe valve.
 - 1. Where high points are located in an inaccessible position, provide a 3/8-inch diameter bleed line from the high point of the piping system and extend to an approved location, with access. Anchor bleed piping and provide 3/8-inch diameter globe valve.
- G. Support, anchor, and guide piping systems to preserve piping flexibility and the isolation effects of sound and vibration isolation hangers.
- H. Conform to the welding and welder qualification requirements paragraph of this Section.
 - 1. Ream and clean ends of piping.
 - 2. Support piping align and tack weld making allowance for pipe pitch and insulation. Temporarily block piping at hangers.

- I. All installed pipelines shall be straight, free from dents, scars and burrs, with ends reamed smooth and shall remain straight against strains tending to cause distortion during system operation. The Contractor shall make proper allowance for pipeline expansion and contraction so that no unsightly distortion, noise, damage or improper operation will occur.
- J. Piping shall be run in a neat and efficient manner and shall be neatly organized. Piping shall be run parallel or at right angles to the building walls or construction. The Contractor shall study the general, electrical, and other drawings to eliminate conflict of piping with structure, sheet metal, lighting, or other services. Unless specified otherwise, no piping shall be exposed in a finished room, all changes in direction shall be made with fittings.
- K. All piping shall be clean and free from acids and loose dirt when installed.
- L. Temporary pipe plugs of rags, wool, cottons, waste or similar materials shall not be used.
- M. All piping shall be so arranged to not interfere with removal of other equipment or devices and shall not block access openings, etc.
- N. Piping shall be arranged to facilitate equipment maintenance.
- O. Flanges or unions shall be provided in the piping at connections to all items of equipment.
- P. All piping shall be installed to ensure noiseless circulation.
- Q. All valves and specialties shall be so placed to permit easy operation and access, and all valves shall be regulated and adjusted at the completion of the work.

3.7 VALVE INSTALLATION

- A. After the piping system has been tested and put into service, but before final testing, adjusting and balance, inspect each valve for possible leak. Open and close each valve to verify proper operation.

End of Section

SECTION 23 3000

AIR DISTRIBUTION

PART 1 – GENERAL

1.1 SCOPE

- A. Work shall include the air distribution, ventilation, and exhaust duct systems, and all materials, equipment, and labor required to complete the systems shown on plans and specified herein.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Construct all ducts, plenums, etc., of the gauges specified in the latest editions of the applicable SMACNA manuals, unless otherwise shown. Sheets shall be free from blisters, slivers, pits, and imperfectly galvanized spots.
- B. Duct construction and installation details shall comply with the latest edition of the SMACNA Duct Construction Standards.
- C. Ducts from the fan unit discharge to VAV terminal boxes shall be constructed to meet the requirements of a +4-inch pressure class. All other supply air ducts shall be designed to meet the requirements for +2-inch pressurized ducts. All exhaust ducts shall be -2-inch suction ducts.

2.2 +4" PRESSURE CLASS DUCTWORK

- A. All ductwork on the discharge side of Air Conditioning units to the terminal boxes shall be +4" pressure class duct. It is the essence of the duct system to have a minimum pressure loss. Therefore, ducts shall be run in a straight line and shall be run so that the lowest beam or obstruction shall generally determine the centerline of the straight run. Eccentric reducing transition shall be avoided but may be used where space is a determining factor. Bends and elbows other than those shown on the drawings shall have the approval of the Owner's representative before installation. No pipes, conduits, or any other obstructions shall be run through +4" P.C. ductwork.

2.3 ROUND DUCTWORK +4" PRESSURE CLASS

- A. The round +4" P.C. HVAC ductwork, fittings, and accessories shall be factory fabricated, spiral conduit. Ductwork may, when approved by the owner's representative, be fabricated in a 26 ga. standing rib configuration. The ducts shall be constructed of rust-resistant zinc-coated steel and shall be of the sizes called for on the drawings.
- B. All fittings in the round ducts shall be factory fabricated to match the spiral ducts and shall be of the same manufacturer.
- C. Round duct joints in diameters through 50 inches shall be sealed as follows:

Approved sealer equal to "Hard Cast" shall be applied to the coupling and fittings. Sealer is applied to the outside of the joint, extending 1 inch on each side of the joint bead and covering all screw heads. Plastic backed tape is immediately applied over the wet sealer.

- D. The duct sealer must be specifically formulated for the job sealing the field joints for high-pressure systems. The sealer shall be compatible with plastic-backed duct tape so the two shall cure and bond together. Samples of sealer and tape and the specification data sheets shall be submitted to the Owner's representative for approval.
- E. Flanged joints shall be sealed by Neoprene Rubber Gaskets.

2.4 ACCESS DOORS AND PANELS

- A. Location: Provide access doors in casings, plenums, and ducts where shown on the drawings and where specified for ready access to operating parts including fire dampers, smoke dampers, valves, and concealed coils.
- B. Pressure Clarification: Construct and install access doors in accordance with SMACNA Standards to suit the static pressure classifications and the locations where installed.
- C. Access Doors in Ducts: Provide and size doors as follows:
 - 1. Minimum 24-inch by 24-inch clear opening.
 - 2. When field conditions require an access opening smaller than 16-inch by 12-inch, provide a 24-inch long removable section of casing or duct, secured with quick acting locking devices, 6 inches on centers, to permit ready access without dismantling other equipment.
- D. Door Requirements: Provide doors in casings and duct as follows:
 - 1. Arrange doors so that system air pressure will assist closure and prevent opening when the system is in operation.
 - 2. Coordinate doors and equipment to provide unrestricted passage through clear door opening, without removal of any equipment.
 - 3. Where pressure regulating dampers are installed in ducts or plenums, provide access doors with a clear wire glass observation port, 6-inch by 6-inch minimum size. Anchor port with structural metal frame, resilient gaskets and stainless-steel bolts.
 - 4. Hinges for doors in zinc coated or aluminum construction shall be steel or iron, zinc coated with brass pins.
 - 5. Hinges for doors in copper, copper nickel alloy construction shall be all brass.

2.5 CLOSURE COLLARS

- A. A duct ending at a wall or partition shall have the edge turned back to form a closure collar and flanged tight to the wall or partition so that no sharp or ragged edge appears.

2.6 CLEARANCES

- A. Duct systems shall have a clearance from combustible construction of not less than 18 inches. This clearance may be reduced to not less than three inches, provided the combustible material is protected with materials approved for one-hour fire-resistive construction on the duct side.

2.7 BRANCH TAKEOFFS

- A. Branch takeoffs shall be as shown on the drawings, and shall be fitted with adjustable lock balancing dampers, complete with locking quadrants. Where dampers are not accessible for adjustment from above, concealed ceiling regulators with adjustable chrome-plated covers shall be provided.

2.8 WALL PENETRATIONS

- A. All ducts penetrating structural or architectural walls shall be sealed air and sound tight.

2.9 FIRE RATED SURFACE PENETRATIONS

- A. All ducts penetrating fire rated surfaces shall be sealed as directed in 15050.

2.10 EXPOSED ROUND +2" PRESSURE CLASS

- A. All joints and fittings shall be sealed with thermo-fit duct band by Raychem or approved equal. The contractor shall take care to ensure that all joints and fittings are neat in appearance.

2.11 DUCTWORK

- A. All ductwork shall be fabricated and installed in compliance with the latest SMACNA duct manuals.
- B. Sheet metal ducts shall be properly braced and reinforced with and, where they protrude above roof, they shall be properly flashed.

2.12 DUCT JOINTS

- A. All duct joints must be sealed airtight as required by Table 1-2 "SEAL CLASSIFICATION" of the "HVAC Duct Construction Manual". The term "seal" or "sealed" means use of mastic or mastic plus tape or gasketing as appropriate.

2.13 DIMENSIONS

- A. Ducts, unless otherwise approved, shall conform accurately to the dimensions indicated on the drawings, and shall be straight and smooth on the inside with joints neatly finished. All duct sizes shown on the drawings are free area inside dimensions. Acoustically-lined ducts shall have outside dimensions increased as required to accommodate the acoustic lining specified and still maintain the free area inside dimensions shown on the drawings.
- B. Under no circumstances shall the cross section of any duct be decreased by dents, pipes, or hanger rods running through it unless otherwise indicated on the drawings. Neither shall the shape be changed without approval. No abrupt transitions that restrict the area shall be used. Where necessary to gain clearance, the duct seams may be turned inside. Structural and Architectural drawings shall be consulted for areas with restrictive clearances.

2.14 FIELD VERIFICATION

- A. No ductwork shall be fabricated without first field verifying that the available space (under actual job conditions) will permit installation of the ductwork without structural or other conflicts.

2.15 FLEXIBLE CONNECTION

- A. This contractor shall provide flexible connections not less than 4 inches wide, constructed of heavy, waterproof, woven plastic-coated glass fabric at the inlet and outlet connections of each fan unit, securely fastened to the unit and to the ductwork by a galvanized iron band, and provided with tightening screws. Corners shall be sewn tight shut.

2.16 PRE-MANUFACTURED DUCTS

- A. Runouts above ceiling from primary supply air ducts to VAV terminal boxes may be rigid conduit or pre-manufactured high-pressure flex duct or a combination of the two.
- B. Runouts above ceiling from the terminal boxes to the ceiling diffusers shall be similar to "Genflex - Type IL". Maximum allowance length is 5'-0" in any given duct run. Duct to be factory fabricated with spring steel wire helix and 1" thick glass fiber insulation covered with external vapor barrier and lined with continuous non-perforated inner sleeve.
- C. Material shall comply with IMC Standard 10-1.

2.17 RECTANGULAR DUCT LINING

- A. The interior surface of all rectangular supply, return, fresh, relief, and exhaust air ducts (except where noted otherwise), shall be lined with 1" thick fiberglass dual density duct liner, having an average "K" factor of .24 BTU at 75 deg. F mean. The liner shall meet standards NFPA No. 90A and No. 90B and shall have the Underwriters' Laboratories, Inc., label.
- B. Duct liner shall be applied to the flat sheet with a 100% coverage of duct adhesive. The duct liner shall be cut to assure snug corner joints. The black surface of the liner shall face the air stream. On horizontal runs, tops of ducts over 12" in width and sides over 16" in height shall be additionally secured with welded pins and speed clips on a maximum of 15" centers. On vertical runs, gripnails or welded pins and speed clips shall be spaced on a maximum of 15" centers on all width dimensions over 12". Pins shall start within 2" of all cross joints within the duct section.
- C. Welded pins shall be cut virtually flush with the liner surface. Clips should be drawn down flush only and not so as to compress the liner and cause the leading edge of raise. All exposed edges and the leading edge of all cross joints of the liner shall be coated with adhesive.
- D. Material shall comply with IMC Standard 10-1.

2.18 REGISTERS, GRILLES AND DIFFUSERS

- A. Supply Air Registers:
 - 1. Furnish and install all supply air registers shown and specified on the drawings. All units to have opposed blade balancing dampers. Registers and diffusers to have 4-way air deflection. All register cores shall be removable, or plaster frames shall be furnished with units. Registers shall be of steel, or anodized aluminum construction. Finish shall be bright white unless otherwise noted. Units shall be Krueger, Carnes, Metalaire, Nailor, or Price.

B. Return, Exhaust & Transfer Air Registers:

1. Furnish and install all ceiling and sidewall return, exhaust, and transfer air registers shown and specified on the drawings. All units to be painted steel, or aluminum construction (where permitted by fire code) with bright white finish and opposed blade balancing dampers. All cores shall be removable, or plaster frames shall be furnished with units. Registers located near the floor shall be heavy duty gymnasium type. Registers shall be Krueger, Metalaire, Nailor, Carnes or Price.

C. Ceiling Diffusers:

1. All ceiling diffusers shall be of the round, square, or rectangular type with louvered face and 1, 2, 3, or 4-way air pattern as indicated on the drawings. Units shall be painted steel, or aluminum construction (where permitted by fire code) with bright white finish and inner assembly shall be easily removable from outer frame without special tools. Louvers shall be spaced on 1-1/2" centers maximum.
2. All diffusers shall be furnished with round or square opposed blade volume control and air extractor. Diffusers shall be Krueger, Price, Metalaire, Nailor, or Carnes.

D. General:

1. All registers, grilles, and diffusers located in locker/shower area shall be all aluminum construction.
2. Color and finish of all grilles, registers, and diffusers shall match ceiling grid. Coordinate with the Owner's representative.

G. In-Line Clothes Dryer Vent:

1. Relocate existing in-line dryer fans as indicated on drawings.

2.19 DRYER BOX – DB-1

- A. Recess wall type for stud frame or CMU wall. 22 Gauge aluminum construction.

2.20 VARIABLE AIR VOLUME RE-HEAT BOXES:

- A. Casings shall be 26 gauge galvanized with flange rectangular discharge duct connection. A one-piece aluminum backdraft damper shall be provided on the fan discharge. The damper shall be factory set and aligned to insure a precise seal. Leakage rate shall not exceed 2 percent of rated capacity at 0.5" static pressure.
- B. Automatic damper operators and controllers shall be furnished by the ATC contractor and installed by the VAV box manufacturer. Boxes to be c/w paint tie-in for interface with room occupancy sensors. Provide sheet metal enclosure around damper operator/controller.
- C. The VAV box manufacturer shall furnish and install an approved cross flow sensor with a gain factor of not less than three (3).
- D. VAV boxes shall be provided with a pressure independent 3-position volume regulator which operates thru a thermostatically reset velocity controller to provide constant air delivery within plus or minus 5 percent of rated flow, and down to 25 percent of the VAV box rated CFM. Factory calibrated field adjustable setpoints shall be provided to set maximum and minimum CFM.

- E. The hot water heating coil shall be a single or multiple row unit as specified with plate-type aluminum fins and mechanically bonded to a copper tube carrier pipe.
- F. The entire unit shall be serviceable from a single ceiling access door.
- G. Units shall be Price, Krueger, Nailor or approved equal

2.21 CROSS FLOW PRESSURE SENSORS FOR VAV BOXES

- A. Sensors shall be aluminum corrosion resistant of the crossflow type with ported tubes and baffle mounted to a center manifold. The center manifold shall have 1/4" barb fittings for FRPE tubing and shall provide a differential pressure proportional to the average velocity of air moving through duct.
- B. The sensors shall have an amplification factor (gain) of at least three and flow coefficient as follows:

Size	CV
4	209
5	315
6	462
7	612
8	817
10	1250
12	1792
14	2474
16	3235

2.22 DAMPERS - GENERAL

- A. Damper frames shall be of not less than 18-gauge galvanized steel, formed for extra strength, with mounting holes for enclosed duct mounting.
- B. All damper blades shall be of not less than 16-gauge galvanized steel formed for strength and high velocity performance. Blades on all dampers must be of not over 6" in width. Blades shall be secured to 1/2" diameter zinc-plated axles by zinc-plated bolts and nuts. All blade bearings shall be nylon. Blade side edges shall seal off against spring stainless steel seals. Teflon-coated thrust bearings shall be provided at each end of every blade to minimize torque requirements and insure smooth operation. All blades linkage hardware shall be constructed of corrosion-resistant, zinc-plated steel and brass.

PART 3 – EXECUTION

3.1 JOB SITE CONDITIONS

A. Inspection:

1. Prior to all work in this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that the work of this section may be installed in accordance with all pertinent codes and regulations in the approved shop drawings.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect.
2. Do not proceed with installation in areas of discrepancy, until all such discrepancies have been fully resolved.

3.2 INSTALLATION OF EQUIPMENT

- A. Install all equipment with adequate space for service and maintenance. **Minimum of 30" clearance for all service and control access.**
- B. VAV boxes and similar equipment which requires periodic service and maintenance shall be installed in plenum space within 2 ft. of finished ceilings, or within 2 ft. of the bottom chord of the structure.
- C. All visible surfaces behind grilles and registers shall be painted flat black.
- D. Care shall be taken to avoid interference with structure and the work of other trades. Do not cut into load carrying members without the approval of the Owner's representative.

3.3 INSTALLATION OF DUCTS

- A. All ducts shall be installed in compliance with the latest editions of the SMACNA manuals.
- B. All necessary allowance and provisions shall be made in the installation of sheet metal ducts for the structural conditions of the building, and ducts shall be transformed or divided as may be required. Whenever this is necessary, the required area shall be maintained. All changes, however, must be approved and installed as directed.
- C. Pre-manufactured ducts shall be connected to rigid ducts and equipment with solid wraps of fabric duct tape and tyton bands drawn tight to form an airtight joint.
- D. During the installation, the open ends of all ducts shall be protected by covering with plastic sheet tied in place to prevent debris and dirt from entering.
- E. Install this work in cooperation with other trades so that there will be no delay in the progress of construction work. It is extremely important that the duct system be clean before connections are made to the VAV boxes.
- F. Under no circumstances shall ductwork be supported from the metal roof deck. (See general requirements 230100)

- G. Ceiling outlets shall be rigidly supported from the overhead structure with G.I. wires or straps, or from rigid galvanized iron ductwork. Outlets shall not be supported from T-bar ceilings or metal roof deck.

H. Hanger and Supports:

1. Hangers for ducts up to 18" in width shall be placed on not more than 8'-0" centers. Ducts 19" and over in width shall be supported on not more than 4'-0" centers. Hangers shall be placed plumb and present a neat appearance. Construct hangers from galvanized band iron 1" x 1/8" for duct up to 36" wide. Hangers shall extend down the sides of the ducts not less than 9". On ducts less than 9" in depth, hangers shall extend the full depth of the ducts. Attach hangers to ducts using not less than three rivets or parker screws of appropriate sizes. It is essential that all ducts be rigidly supported. Where vertical ducts pass thru floors or roofs, supporting angles shall be rigidly attached to ducts and to the structure. Angles shall be galvanized and of sufficient size to support the ductwork rigidly. Place supporting angles on at least two sides of the duct. For round ducts, strap hangers shall extend completely around ducts.
2. Ceiling outlets shall be rigidly supported from the overhead structure with G.I. wires on straps, or from rigid galvanized iron ductwork. Outlets shall not be supported from T-bar ceilings unless approved by the owner's representative.

I. Ducts at Masonry:

1. Where ducts are shown connecting to masonry openings and along edges of all plenums at floors and walls, provide a continuous 2" x 2" x 3/8" galvanized angle iron which shall be bolted to the construction and made airtight to the same by applying caulking compound. Sheet metal at these locations shall be bolted to the angle irons.

3.4 STORAGE OF DUCTS

- A. Ductwork shall be stored in a protected area to prevent physical damage to the duct liner, and to ensure that the duct liner is not exposed to excessive heat or moisture which would deteriorate the air side surface.
- B. Ductwork which has been improperly stored and/or sustained physical damage will be rejected, and shall be removed from the job site as directed by the Owner's representative.

3.5 CLEANING OF DUCTS

- A. Before ducts are insulated and before the ceiling is installed and final connections made to the terminal boxes, the fans shall be operated at full capacity to blow out any dirt and debris from ducts. If it is not practical to use the main supply blower for this cleaning, the ducts may be blown out in sections by a portable fan. After the ducts have been cleaned and initially pressure tested, the final connection shall be made to the terminal boxes.

3.6 TESTING OF DUCTS

- A. Testing of ducts shall be done under section 230501 – Testing. Section 233000 to coordinate as required.

- B. Supply, return, and exhaust ducts, plenums, and casings operating at duct pressures from +2" to -2" shall be tested and made substantially airtight at static pressure indicated for the system before covering with insulation or concealing in masonry. Substantially airtight shall be construed to mean a leakage rate less than 5% of the rated airflow.
- C. Supply air ducts operating at pressures above +2" shall be tested and made substantially airtight. Leakage shall be less than 1% of the rated air flow.
- D. Ducts including all flexible runouts shall be tested in accordance with SMACNA Duct Construction Standards.
- E. After the vertical duct risers or branch ducts have all been tested and tied into the mains, and after the central station air handling apparatus has been installed, the mains shall be tested in accordance with SMACNA Duct Construction Standards.

End of Section

BLANK PAGE

SECTION 25 1000

AUTOMATIC TEMPERATURE CONTROLS

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

- A. The General Conditions, Supplementary General Conditions, alternates and addenda, applicable drawings and the technical specifications, shall all apply to all work under this division.

1.2 SCOPE OF WORK

- A. The scope of work shall include all labor, material, and equipment necessary as required to relocate and reprogram existing VAV box and thermostats.

1.3 MANUFACTURES/INSTALLERS

- A. Approved control systems & installers.
 - 1. EcoStruxure provided and installed by Utah/Yamas Controls, SLC as an extension to the District wide system – **No Substitutions.**

1.4 SYSTEM DESCRIPTION

- A. All heating valves shall be normally open. No exceptions.
- B. The system shall include all control devices, valves and damper parts as called for hereinafter.
- C. Division 26 contractor is required to supply and install a 3/4" EMT conduit system for the DDC control system at all areas except for the ceiling plenum. 3/4" EMT conduit shall be installed at all wall areas, hard ceiling areas, exposed ceiling areas.
- D. Plenum rated wire with permanent label shall be installed above areas with lay-in ceilings by Division 25.
 - 1. Plenum rated cable may be used in lieu of conduit above drop-in ceilings.
 - 2. Cables shall be run neat and straight, above ceiling without sagging.
 - 3. Cables shall not rest on or be supported by the ceiling.
 - 4. Cables shall be grouped according to system. Grouped cables shall be Velcroed together, **zip ties shall not be allowed.**
 - 5. Velcro straps shall be tagged with the various system and identified on 20-foot centers.
 - 6. Cables shall not receive excessive force when being installed.
 - 7. Cables that have been damaged during installation shall be replaced at contractors' expense. Contractor shall verify that all connections are in proper working order, terminated correctly and provide documentation to engineer prior to final walk through.
 - 8. All cables being run (not in conduit) shall, as a minimum standard, be listed and appropriately labeled as being resistant to the spread of smoke and fire in accordance with applicable article of NFPA-70 (NEC).
- E. Wireless devices or systems **WILL NOT** be accepted.

1.5 WORK TO BE PERFORMED BY OTHERS

- A. The mechanical contractor shall install all valves, immersion wells and pressure taps supplied to him by the ATC contractor.

1.6 INSTALLATION BY AUTOMATIC TEMPERATURE CONTROL (ATC) CONTRACTOR

- A. The successful control contractor shall furnish and install all necessary electrical control wiring and conduit for the complete temperature control system, heating and ventilating equipment motor starting circuit controls and all electrical control interlocks for same, and for control wiring for miscellaneous HVAC equipment furnished by the Owner.
- B. The ATC contractor shall be a licensed Electrical Contractor in the State of Utah with full time Master, Journeyman and apprentice electricians. If the ATC subcontracts the installation, it shall be to a licensed Electrical Contractor in the State of Utah. Full time Master, Journeyman and apprentice electricians shall be utilized for the installation.
- C. The ATC contractor shall furnish & install all necessary electrical control wiring and all temperature controls, heating and ventilating equipment motor starting circuit controls, all electrical control interlocks for same and for miscellaneous packaged equipment as defined within this specification. Full time Master, Journeyman and apprentice electricians shall be utilized for the installation.
- D. All ATC rough-in boxes shall be identified with the letters "ATC" written across the inside of the box with permanent marker. In addition, each ATC cover plate shall be painted white with the letters "ATC" stenciled in black.

1.7 SUBMITTAL AND TECHNICAL INFORMATION

- A. Submit digital shop drawings, including manufacturer's data for the following items to the mechanical engineer:
 - 1. Wiring and installation diagrams.
 - 2. ATC device specification sheets
 - 3. Control flow diagrams, complete with all control schematics and sequences of operation.

1.8 PROJECT COMPLETION REQUIREMENTS

- A. The ATC contractor shall provide as part of his contract the on-site services of a technician familiar with the system to assist the air & water balance contractor in completing his portion of the project. The technician shall be available for a minimum of an additional **4 hours** for this assistance.
- B. The ATC contractor shall provide as part of his contract the on-site services of a programmer familiar with the system for an additional **2 hours** which the Engineer and/or the School District may use as they see fit to fine-tune or add features to the system.
- C. Provide a digital copy of the project operating and maintenance instruction manuals for use during the training sessions. Digital copy shall contain all system components and DDC system "As-Built" drawings.
- D. Operation & Maintenance Manuals: These manuals shall provide descriptions of maintenance procedures for all system components, including sensors and controlled devices. They shall cover inspection, periodic preventative maintenance, fault diagnosis, and repair or replacement of defective components. They shall include complete as-built ATC installation drawings with sequences of operation for all mechanical systems controlled by the ATC contractor. Provide a digital copy of all "As-Built" system drawings.

1.9 CONTROLLERS

- A. Schneider Electric EcoStruxure BACnet Controls with freely programmable controllers, including VAV controllers, shall be utilized as indicated and specified elsewhere in this specification. Proprietary control system communication protocols will not be accepted.
- B. All main level controller inputs shall have at least 12-bit A/D converters for input accuracy. Less resolution is unacceptable for main level controllers or any controllers using an air monitoring station or monitoring building pressure. All main level controller outputs shall have board mounted hand-off-auto switches for local output override capability.
- C. The contractor shall utilize and employ only the following controllers for any central plant systems and air handling units. A single controller shall be designated with all programming and I/O for each system. This will allow standalone equipment operation in the event of communications failure. Connection of multiple small controllers or combined operation with other programmable controllers on air handlers and central plant equipment is not permitted. All controllers shall be freely programmable; controllers with canned programming are not acceptable.
- D. The only Variable Air Volume box controllers allowed for VAV applications shall be freely programmable. No substitutions, no canned application programming will be accepted.
- E. Direct Digital Control Systems and Approved Installing Contractors:
 - 1. EcoStruxure as supplied and installed by UTAH YAMAS Controls Inc. Salt Lake City, Utah
– No Substitutions.
- F. All controllers and devices shall be identified.

1.10 VALVE ACTUATORS

- A. Valve actuators shall be of the gear-train type. All moving parts shall be permanently lubricated and not require addition or replacement of oil. Actuators in and indoor or weather protected environment shall meet NEMA II requirements.
- B. Valve actuators shall accept the appropriate Ma, VDC or digital output signals provided by the DDC controllers.
- C. Actuator manufacturers shall be Belimo or Honeywell. No substitutions.

1.11 ROOM THERMOSTATS

- 1. Existing wall-mounted space temperature thermostats shall be relocated and re-programmed as indicated on drawings.

PART 2 – SEQUENCE OF OPERATION

2.1 VAV BOX CONTROL W/ REHEAT COILS

- A. The ATC contractor will wire to the room occupancy sensor supplied and installed by Division 26 for lighting. The Division 26 contractor will provide occupancy sensors with a dry contact for use by the ATC contractor to hard wire directly to the VAV box controllers. The VAV controller will be programmed to go to unoccupied set points when no occupancy is detected by the sensor. Upon occupancy detection, by the lighting sensor, the VAV box controller will automatically return to occupancy set points and operation provided the building occupancy schedule and/or the schedule for the VAV box zone is on by the master DDC control system schedule.
- B. Each VAV box shall display current KBTU discharging into the space. The ATC contractor shall provide all hardware, software and configuration to provide KBTU per VAV box. Values shall be displayed on the graphic pages, trended and alarmed with user adjustable alarm limits. The DDC system shall accumulate KBTU going into the space to display daily total heating KBTU and daily total cooling BTU consumed. The KBTU totals shall be logged into the controls database and utilized for required energy alarming. BTU per square foot, as determined by the area served square footage shall be displayed per VAV box and configured for high per square foot alarming.
- C. The occupancy schedule for the 3-position VAV controller shall be adjustable and configured in the DDC system. The DDC control system shall return the VAV box to an unoccupied state as determined by the building occupancy time schedule (adjustable). Unoccupied set up and set back settings shall be configured and completely adjustable.
- D. A VAV box mounted DDC controller shall be provided for control and operation of each VAV box and reheat coil. Sensor shall modulate the box primary air damper between minimum ventilation position and maximum designed airflow and position the reheat coil valve in sequence to maintain the desired space temperature. Heating and cooling set points shall be individually adjustable from the man-machine interface device (Host computer) or the District offices.
- E. Each VAV box shall be configured for central plant heat mode which shall reverse the operation of the VAV damper to open for heating instead of cooling whenever the air handler is in the warm-up mode.
- F. Each VAV box shall be configured and programmed for CFM set point modulation based on system variable as detailed in the Sequence of Operation. The ATC contractor shall demonstrate the program and the freely programmable VAV DDC controller.
- G. Each VAV box DDC controller shall have a 24-volt power connection with all 24-volt control wiring by the ATC contractor. 24-volt transformers shall be located in the DDC controller of the air handler serving the VAV box for ease of maintenance.

2.2 HOST COMPUTER & BUILDING GRAPHIC DISPLAY

- A. Graphics pages shall be created to remain consistent with the existing graphics on the districts host computer.
- B. The building system graphics shall be updated to reflect the revised systems.

End of Section

SECTION 26 0500 - ELECTRICAL GENERAL PROVISIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Architectural, Structural, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full.

1.2 DESCRIPTION OF WORK:

- A. The extent of electrical work is indicated on drawings and/or specified in Divisions 26, 27 and 28 sections of the specification. Provide all labor, materials, equipment, supervision and service necessary for a complete electrical system. Work includes, but is not necessarily limited to, the following items.

<u>ITEM</u>	<u>SECTION</u>
1. Electrical General Provisions	26 0500
2. Electrical Submittals O & M Manuals and Spare Parts	26 0502
3. Electrical Connections for Equipment	26 0507
4. Conductors and Cables	26 0519
5. Grounding	26 0526
6. Supporting Devices	26 0529
7. Conduit Raceway	26 0532
8. Electrical Boxes and Fittings	26 0533
9. Electrical Identification	26 0553
10. Lighting Control Equipment	26 0943
11. Wiring Devices	26 2726
12. Overcurrent Protective Devices	26 2815
13. Motor and Circuit Disconnects	26 2816
14. Demolition	26 4119
15. Interior and Exterior Building Lighting	26 5100
16. Canyons School District – Network Cabling Global Specification	27 1500
17. Intercommunication Systems	27 5123
18. Common Requirements for Security Systems	28 0501
19. Access Control System	28 2205
20. IP Video Surveillance System	28 2300
21. Fire Alarm and Detection System	28 3111

- B. Use of standard industry symbols together with the special symbols, notes, and instructions indicated on the drawings describe the work, materials, apparatus and systems required as a portion of this work.
- C. Visit the site during the bidding period to determine existing conditions affecting electrical and other work. All costs arising from site conditions and/or preparation shall be included in the base bid. No additional charges will be allowed due to inadequate site inspection.

1.3 DEFINITION OF TERMS:

- A. The following terms used in Divisions 26, 27 and 28 documents are defined as follows:
1. "Provide": Means furnish, install and connect, unless otherwise indicated.
 2. "Furnish": Means purchase and deliver to project site.
 3. "Install": Means to physically install the items in-place.
 4. "Connect": Means make final electrical connections for a complete operating piece of equipment.

1.4 RELATED SECTIONS:

- A. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.
- B. General and Supplementary Conditions: Drawings and general provisions of contract and Division 1 of the Specifications, apply to all Division 26, 27 and 28 sections.
- C. Earthwork:
1. Provide trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, buried cable, in-grade pull boxes, manholes, lighting pole foundations, etc. See Division 31, Sitework, and other portions of Divisions 26, 27 and 28, for material and installation requirements.
- D. Miscellaneous Metal Work:
1. Provide fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, lighting fixtures, panelboards, distribution boards, switchboards, motor controls centers, etc. See Division 5, Metals for material and installation requirements.
- E. Miscellaneous Lumber and Framing Work:
1. Provide wood grounds, nailers, blocking, fasteners, and anchorage for support of electrical materials and equipment. See Division 6, Rough Carpentry for material and installation requirements.
- F. Moisture Protection:
1. Provide membrane clamps, sheet metal flashing, counter flashing, caulking and sealants as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors and ceiling slabs and foundation walls. All penetrations through vapor barriers at slabs on grade shall be taped and made vapor tight. See Division 7, Thermal and Moisture Protection for material and installation requirements.
- G. Access panels and doors:
1. Provide in walls, ceiling, and floors for access to electrical devices and equipment. See Division 8, Doors and Windows for material and installation requirements.
- H. Painting:
1. Provide surface preparation, priming and finish coating as required for electrical cabinets, exposed conduit, pull and junction boxes, poles, surface metal raceways, etc. See Division 9, Finishes for material and installation requirements.

1.5 WORK FURNISHED AND INSTALLED UNDER ANOTHER SECTION REQUIRING CONNECTIONS UNDER THIS SECTION:

- A. Provide electrical service, make requisite connections and perform operational test. Items furnished and installed under other sections and connected under this section, include but are not limited to the following:
 - 1. Electric motors.
 - 2. Package mechanical equipment: fans, fan coil units, pumps, boilers, duplex compressors, etc.
 - 3. Motorized dampers.
 - 4. Fire and smoke dampers
 - 5. Duct mounted smoke detectors.
 - 6. Electric hardware.
 - 7. Systems/Open Office Furniture.
 - 8. Electric Chain Hoist.
 - 9. Temperature control panels.
 - 10. Fire Riser Connections.

1.6 ITEMS FURNISHED UNDER ANOTHER DIVISION, BUT INSTALLED AND CONNECTED UNDER THIS DIVISION:

- A. Items furnished under other Divisions, but turned over to Division 26 for installation and final connection include, but are not necessarily limited to, the following:
 - 1. Wall mounted control stations for motorized roll-up doors/grills.
 - 2. Wall mounted control stations for motorized projection screens.
 - 3. Wall mounted control stations for electric chain hoist repair lift.

1.7 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS:

- A. Before bidding, Contractor shall familiarize himself with the drawings, specifications and project site. Submit requests for clarification to Architect/Engineer in writing prior to issuance of final addendum. After signing the contract, the Contractor shall meet the intent, purpose, and function of the Contract Documents. Any costs of materials, labor and equipment arising therefrom, to make each system complete and operable, is the responsibility of the Contractor.

1.8 REQUESTS FOR INFORMATION (RFIs):

- A. Contractor shall review all Contract Documents thoroughly before submitting an RFI to avoid unnecessary questions and ensure the question has not already been addressed within the existing Contract Documents.
- B. RFIs should be used to seek clarification on issues or areas of confusion that cannot be resolved through a review of the Contract Documents.
- C. Each RFI shall contain the following:
 - 1. Description of the Issue/Question: Clearly detail the issue or confusion, referencing the related Contract Document drawings and/or specifications.
 - 2. Relevant Documents: Attach any necessary supporting documents that could aid in understanding the RFI.

3. Proposed Solution: Suggest a possible resolution to the problem or confusion.
- D. Non-Compliant RFIs
1. Frivolous or incomplete RFIs will not be accepted. RFIs that do not follow the guidelines set forth in this section, or are deemed unnecessary, may be returned without response at the discretion of the Engineer.

1.9 QUALITY ASSURANCE:

- A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies refers to the latest edition of such publications adopted and published prior to submittal of the bid proposed, unless noted otherwise herein. Such codes or standards are considered a part of this specification as though fully repeated herein.
- B. When codes, standards, regulations, etc. allow work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred as reducing the quality, requirements or extent of the Drawings and Specifications. Perform work in accordance with applicable requirements of all governing codes, rules and regulations including the following minimum standards, whether statutory or not:
1. National Electric Code (NEC).
 2. International Building Code (IBC).
 3. International Fire Code (IFC).
 4. International Mechanical Code (IMC).
- C. Standards: Comply with the following standards where applicable for equipment and materials specified under this Division.
1. UL Underwriters' Laboratories
 2. ASTM American Society for Testing Materials
 3. CBN Certified Ballast Manufacturers
 4. IPCEA Insulated Power Cable Engineers Association
 5. NEMA National Electrical Manufacturer's Association
 6. ANSI American National Standards Institute
 7. ETL Electrical Testing Laboratories
- D. All electrical apparatus furnished under this Section shall conform to (NEMA) standards and the NEC and bear the Underwriters' Laboratories (UL) label where such label is applicable.
- E. Comply with requirements of State and Local Ordinances. If a conflict occurs between these requirements and the Contract Documents, the most stringent requirements shall govern. The Contractor accepts this responsibility upon submitting his bid, and no extra charge will be allowed after the contract is awarded. This shall not be construed as relieving the Contractor from complying with any requirements of the Contract Documents that may be in excess of the aforementioned requirements, and not contrary to same.
- F. Obtain all permits, inspections, etc. required by authority having jurisdiction. Include all fees in bid. Furnish a certificate of approval to the Owner's Representative from the Inspection Authority at completion of the work.
- G. Employ only qualified craftsmen with at least three years of experience. Workmanship shall be neat, have a good mechanical appearance and conform to best electrical construction practices. Provide a competent superintendent to direct the work at all times. Any person found incompetent shall be discharged from the project and replaced

by satisfactory personnel.

- H. Contractor shall have a current state contracting license applicable to type of work to be performed under this contract.
- I. Required Pre-Electrical Construction Meeting with Electrical Engineer: Electrical contractor/representative will be required to attend a pre-electrical construction meeting (approximately 30-60 minutes) with engineering representative in the electrical engineers office prior to electrical construction commencement. This meeting will address any questions on the part of the contractor and the expectations of the Engineer with regard to specifications, plans and site visits for both rough and finish electrical work.
- J. AV contractor shall attend the electrical pre-construction meeting per specification 26 0500.

1.10 CONSTRUCTION CHANGE ORDER PROPOSALS

- A. In the event that a submission of a change order is issued by the contractor, the following information will be required to be submitted by the contractor, prior to any consideration by the owner/architect.
 - a. Where project manager or project engineer work is required, the labor cost shall not exceed 2% of the electrical portion of the change order.
 - b. All equipment, including conduit and wire, shall be itemized, identifying unit costs and quantities of equipment. Distributor quotes shall accompany all change order requests. The distributor quotes shall include costs for all equipment including conduit and wire. Lot pricing for equipment is not acceptable.
 - c. The general contractor shall review and confirm that the quantity and costs of materials submitted appear reasonable for the scope proposed.
 - d. Labor units shall not exceed base NECA #1 standards. No adjustment factors shall be approved.
 - e. Any research and labeling time, shall be the responsibility of the electrical contractor and shall not be included in the change order request.
 - f. Any costs associated with the purchase of tools or transportation shall be fully itemized for review by architect/owner.
 - g. Overtime rates shall only be approved where additional manpower cannot achieve the same result.
 - h. Change order form shall follow the following format:
 - i. PCO number
 - ii. Detailed description of work being performed
 - iii. Location on project where work is performed
 - iv. Chosen NECA column
 - v. Identified material:
 - 1. QTY
 - 2. Unit cost
 - 3. Mark up
 - 4. Material total
 - vi. Identified labor:
 - 1. QTY
 - 2. Unit cost
 - 3. Composite labor rate
 - 4. Labor total

1.11 RECORD DRAWINGS:

- A. Maintain, on a daily basis, a complete set of "Record Drawings", reflecting an accurate record of work in accordance with the following:
1. Show the complete routing and location of all feeders rated 100 amps and larger. Locate work buried below grade or under slab, work concealed above ceilings, and work in concealed spaces, dimensionally from fixed structural elements (not partition walls, etc.)
 2. Show the complete routing and location of all telecommunications conduits, systems raceways, and empty raceways, 1-1/4" and larger. Locate work buried below grade or under slab, work concealed above ceilings, and work in concealed spaces, dimensionally from fixed structural elements (not partition walls, etc.).
 3. Show all changes, deviations, addendum items, change orders, job instructions, etc., that change the work from that shown on the contract documents, including wall relocations, fixtures and device changes, branch circuiting changes, etc. Where locations of boxes, raceways, equipment, etc. are adjusted in the field to fit conditions, but such new locations may not be obvious by referring to the contract document, show new locations on the record drawings.
- B. At the discretion of the Architect/Engineer, the drawings will be reviewed on a periodic basis and used as a pre-requisite for progress payments. This requirement shall not be construed as authorization for the Contractor to make changes in the layout, or work without written authorization for such changes. The "Record Drawings" for daily recording shall consist of a set of blue line prints of the Contract Drawings.
- C. Upon completion of the work, purchase a complete set of electronic drawings. Transfer all "Record" information from the blue line prints to the drawings via the current CAD program that it was written. The Architect/Engineer shall review the drawings and the Contractor shall incorporate the resulting comments into the final record drawings. The Contractor shall make two complete copies of the drawings electronically and forward this to the Engineer.
- D. Certify the "Record Drawings" for correctness by placing and signing the following certifications of the first sheet of the drawings:

"CERTIFIED CORRECT (3/8" high letters)

(Name of General Contractor)

By: _____ Date: _____

(Name of Electrical Contractor)

By: _____ Date: _____

1.12 GUARANTEE:

- A. Ensure that electrical system installed under this contract is in proper working order and in compliance with drawings, specifications, and/or authorized changes. Without additional charge, replace any work or materials that develop defect, except from ordinary wear and tear, within one year from the date of substantial completion. Exception: Incandescent and fluorescent lamps shall be guaranteed for a period of two months from the date of substantial completion.

1.13 OTHER:

- A. Right to Hire. "Client" agrees that during the project and for a period of twenty four (24) months following substantial completion that it will not, directly or indirectly, employ or solicit to employ BNA Personnel.

PART 2 – PRODUCTS

2.1 GENERAL:

- A. Products are specified by manufacturer name, description, and/or catalog number. Discrepancies between equipment specified and the intended function of equipment shall be brought to the attention of the Architect/Engineer in writing prior to bidding. Failure to report any conflict, including catalog numbers, discontinued products, etc., does not relieve the Contractor from meeting the intent of the contract documents nor shall it change the contract cost. If the Contractor is unable to interpret any part of the plans and/or specifications, or should he find discrepancies therein, he shall bring this to the attention of the Architect/Engineer who will issue interpretation and/or additional instructions to Bidders before the project is bid.

2.2 MANUFACTURERS:

- A. Provide products of manufacturers specified. Manufacturers catalog numbers and descriptions establish the quality of product required. Substitutions will be considered if a duplicate written application (2-copies) is at the office of the Architect/Engineer eight (8) working days prior to the day of the bidding. The application shall include the following: 1) A statement certifying that the equipment proposed is equal to that specified; that it has the same electrical and physical characteristics, compatible dimensions, and meets the functional intent of the contract documents; 2) The specified and submittal catalog numbers of the equipment under consideration; 3) A pictorial and specification brochure.
- B. Any conflict arising from the use of substituted equipment shall be the responsibility of the Contractor, who shall bear all costs required to make the equipment comply with the intent of the contract documents.
- C. Samples may be required for non-standard or substituted items before installation during construction. Provide all samples as required.
- D. No materials or apparatus may be substituted after the bid opening except where the equipment specified has been discontinued.
- E. Provide only equipment specified in the Contract Documents or approved by addendum.

2.3 SPARE PARTS:

- A. Provide spare parts (fuses, diffusers, lamps, etc.) as specified. Transmit all spare parts to Owner's Representative prior to substantial completion.

PART 3 – EXECUTION

3.1 INSTALLATION:

- A. Layout electrical work in advance of construction to eliminate unnecessary cutting, drilling, channeling, etc. Where such cutting, drilling, or channeling becomes necessary for proper installation; perform with care. Use skilled mechanics of the trades involved. Repair damage to building and equipment at no additional cost to the contract. Cutting work of other Contractors shall be done only with the consent of that Contractor. Cutting structural members shall not be permitted.
- B. Since the drawings of floor, wall, and ceiling installation are made at small scale; outlets,

devices, equipment, etc., are indicated only in their approximate location unless dimensioned. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned, and coordinate such locations with work of other trades to prevent interferences. Verify all dimensions on the job. Do not scale the electrical drawings, but refer to the architectural and mechanical shop drawings and project drawings for dimensions as applicable.

- C. Perform for other trades, the electrical wiring and connection for all devices, equipment or apparatus. Consult Architectural, Mechanical, and other applicable drawings, and all applicable shop drawings to avoid switches, outlets, and other equipment from being hidden behind doors, cabinets, counters, heating equipment, etc., or from being located in chalkboards, tackboards, glass panels, etc. Relocate buried electrical devices and/or connections as directed at no additional cost.
- D. Coordinate the location of outlets, devices, connections, and equipment with the supplier of the systems furniture prior to rough-in.
- E. Where conduit, outlets or apparatus are to be encased in concrete, it must be located and secured by a journeyman or foreman present at the point of installation. Check locations of the electrical items before and after concrete and/or masonry installation and relocate displaced items.
- F. Provide block-outs, sleeves, demolition work, etc., required for installation of work specified in this division.

3.2 CLEAN:

- A. Clean up all equipment, conduit, fittings, packing cartons and other debris that is a direct result of the installation of the work of this Division.
- B. Clean fixtures, interiors and exteriors of all equipment, and raceways. Replace all filters in electrical equipment upon request for Substantial Completion.

3.3 POWER OUTAGES:

- A. All power outages required for execution of this work shall occur during non-standard working hours and at the convenience of the Owner. Include all costs for overtime work in bid.
- B. Submit written request at least 7 days in advance of scheduled outage and proceed with outage only after receiving authorization from the Owner's Representative.
- C. Keep all outages to an absolute minimum.

3.4 STORAGE AND PROTECTION OF MATERIALS:

- A. Provide storage space for storage of materials and apparatus and assume complete responsibility for all losses due to any cause whatsoever. In no case shall storage interfere with traffic conditions in any public thoroughfare or constitute a hazard to persons in the vicinity. Protect completed work, work underway, and apparatus against loss or damage.

3.5 EXCAVATING FOR ELECTRICAL WORK:

- A. General: Locate and protect existing utilities and other underground work in manner that will ensure that no damage or service interruption will result from excavating and backfilling. Perform excavation in a manner that protects walls, footings, and other structural members from being disturbed or damaged in any way. Burial depths must comply with NEC Section 300-5 (or State of Utah requirement, whichever is more stringent), unless noted otherwise on drawings.

- B. Protect persons from injury at excavations, by barricades, warnings and illumination.
- C. Coordinate excavations with weather conditions, to minimize possibility of washouts, settlements and other damages and hazards.
- D. Provide temporary covering or enclosure and temporary heat as necessary to protect bottoms of excavations from freezing and frost action. Do not install electrical work on frozen excavation bases or sub-bases.
- E. Do not excavate for electrical work until the work is ready to proceed without delay, so that total time lapse from excavation to completion of backfilling will be minimum. See other sections of specification for additional requirements for excavating.
- F. Store excavated material (temporarily) near excavation, in a manner that will not interfere with or damage excavation or other work. Do not store under trees (within drip line).
- G. Retain excavated material that

3.6 BACKFILL MATERIALS:

- A. For buried conduit or cable (other than below slab-on-grade, or concrete encased) - 2" thickness of well graded sand on all side of conduit or cable.
- B. For trench backfill to within 6" of final grade - soil material suitable for compacting to required densities.
- C. For top 6" of excavation - Top soil.
- D. Backfill excavations in 8" high courses of backfill material, uniformly compacted to the following densities (percent of maximum density, ASTM D 1557), using power-driven hand-operated compaction equipment.
 - 1. Lawn/Landscaped Areas: 85 percent for cohesive soils, 95 percent for cohesionless soils.
 - 2. Paved Areas, Other than Roadways (90 percent for cohesive soils, 95 percent for cohesionless soils).
- E. Subsidence: Where subsidence is measurable or observable at electrical work excavations during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality and condition of the surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.7 ROOF PENETRATIONS:

- A. Where raceways penetrate roofing or similar structural area, provide appropriate roof jack coordinate with the roofing contractor and the Architect in order to match the vent with the roof construction. The jack shall be sized to fit tightly to raceway for weather-tight seal, and with flange extending a minimum of 9" under roofing in all sides or as required by the roof type of construction. Completely seal opening between inside diameter of roof flashing and outside diameter of penetrating raceways. Coordinate all work with work required under roofing section of specifications.

3.8 FIRE PENETRATION SEALS:

- A. Seal all penetrations for work of this section through fire rated floors, walls and ceilings to prevent the spread of smoke, fire, toxic gas or water through the penetration either before, during or after fire. The fire rating of the penetration seal shall be at least that of the floor, wall or ceiling that it is installed, so that the original fire rating of the floor or wall is maintained as required by Article 300-21 of the National Electrical Code. Where

applicable, provide OZ Type CFSF/I and CAFSF/I fire seal fittings for conduit and cable penetrations through concrete and masonry walls, floors, slabs, and similar structures. Where applicable, provide 3M CID cast-in device for floor slabs. Where applicable, provide 3M fire barrier sealing penetration system, and/or IPC Flame Safe Fire Stop System, and/or Chase Foam fire stop system, including wall wrap, partitions, caps, and other accessories as required. All materials to comply with UL 1479 (ASTM E-814). Comply with manufacturer's instructions and recommendations for installation of sealing fittings and barrier sealing systems.

3.9 PROJECT FINALIZATION AND START-UP:

- A. Upon completion of equipment and system installation, assemble all equipment Factory Representatives and Subcontractors for system start-up.
- B. Each Representative and Subcontractor shall assist in start-up and check out their respective system and remain at the site until the total system operation is accepted by the Owner's representative.
- C. The Factory Representative and/or System Subcontractor shall give personal instruction on operating and maintenance of their equipment to the Owner's maintenance and/or operation personnel. To certify acceptance of operation and instruction by the Owner's Representative, the contractor shall prepare a written statement as follows:
 - 1. This is to certify that the Factory Representative and System Subcontractor for each of the systems listed below have performed start-up and final check out of their respective systems.
 - 2. The Owner's Representative has received complete and thorough instruction in the operation and maintenance of each system.

SYSTEM

(List systems included)

FACTORY REPRESENTATIVE

(List name and address of Factory Representative)

Owner's Representative

Contractor

- D. Send copy of acceptance to Architect/Engineer.

3.10 FINAL REVIEW:

- A. At the time of final review, the project foreman shall accompany the reviewing party, and remove coverplates, panel covers and other access panels as requested, to allow review of the entire electrical system.

END OF SECTION 26 0500

SECTION 26 0502 - ELECTRICAL SUBMITTALS AND O & M MANUALS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to all Division 26, 27 and 28 sections.
- B. Architectural, Structural, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full. Contractor must review the entire set of plans and specifications. Reviewing only the electrical set is not acceptable.
- C. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1.2 SUBMITTAL REQUIREMENTS:

A. GENERAL:

- 1. After the Contract is awarded but prior to ordering, manufacture, or installation of any equipment, prepare complete Submittals including shop drawings, product data, brochures, etc. for materials and equipment as required by each section of the specification.
- 2. Review of Submittals shall not relieve the Contractor of responsibility for dimensions and/or errors that may be contained therein, or deviations from the Contract Document's requirements. It shall be clearly understood that the noting of some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings and Brochures, the requirements of the Contract Document's shall govern and are not waived, or superseded in any way by the review of the Shop Drawings and Brochures.
- 3. Submittals are reviewed, not approved. Comments made within submittals do not alter the contract documents in any way. The contractor is still responsible, regardless of comments (if any) made within submittals, for complying with drawings and specifications.
- 4. Notify engineer in writing if any of the comments noted in the submittals alter the contract cost. A comment within the submittal process which increases/decreases cost of product is not an authorization to the contractor under any circumstances to proceed.
- 5. Notify engineer of any modifications between contract documents and submittals. It is the responsibility of the contractor to ensure compliance.
- 6. ELECTRONIC SUBMITTAL REQUIREMENTS:
 - a. Provide submittals in Portable Document Format (PDF).
 - b. Documents must be electronically bookmarked and keyword searchable using Adobe Acrobat (<http://www.adobe.com/acrobat>) or Bluebeam Revu (<http://www.bluebeam.com>) for each relevant section. For example, include electronic bookmarks separating "Light Fixtures" from "Panelboards".

- c. Electronically highlight all options for light fixtures, electrical equipment, etc. Manual highlighting and scanning of the documents is NOT acceptable and will NOT be reviewed.
- d. Provide only completed cutsheets for all fixture and equipment types. Blank cutsheets submitted with a schedule are NOT acceptable and will NOT be reviewed.
- e. At the time of submission, the electrical contractor shall provide a complete and comprehensive submission of all required specification sections/shop drawings at the same time. Exceptions may be given, with prior approval, for time-sensitive equipment.
- f. A maximum of one submittal per specification section is allowed. It is NOT acceptable to provide a product by product submittal. Single product by product submittals will NOT be reviewed.

B. SCHEDULING

1. GENERAL

- a. A minimum period of two weeks, exclusive of transmittal time, will be required each time Submittals are submitted or resubmitted for review. This time period shall be considered by the Contractor when scheduling submittal data.
- b. If the shop drawings are rejected twice, the contractor shall reimburse the engineer the sum of \$1,200.00 for the third review and any additional reviews required prior to commencement of the third review.

C. QUALITY ASSURANCE

1. PRE-SUBMITTAL PREPARATION

- a. Prior to submission of the Shop Drawings and Project Data, review and certify that they are in compliance with the Contract Documents. Verify all dimensional information to ensure proper clearance for installation of equipment.
- b. Shop drawings requiring the use of electronic documents (floor plans, Lighting plans, fire alarm plans, etc.) shall be requested via a request for information (RFI) through the general contractor. Electronic documents will be provided to the Architect for distribution. No direct vendor requests will be accepted.
- c. Contractor is completely responsible for the content of the submittal

2. SUBMITTAL REQUIREMENTS

- a. Certifications shall be written or in the form of rubber stamp impressions as follows:
 - i. I hereby certify that this Shop Drawing and/or Brochure has been checked prior to submittal and that it complies in all respects with the requirements of the Contract Drawings and Specifications for this Project.
(Name of Electrical Subcontractor)

Name_____.

Position_____Date_____.
- b. Brochures to be submitted shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional

information. Brochures submitted shall contain only information relevant to the particular equipment or materials to be furnished. The Contractor shall not submit catalogs that describe several different items in addition to those items to be used, unless all irrelevant information is marked out, or unless relevant information is clearly marked. Brochures from each manufacturer shall be identified and submitted separately.

- c. Shop Drawings shall be done in an easily legible scale and shall contain sufficient plans, elevations, sections, and isometrics to clearly describe the equipment or apparatus, and its location. Drawings shall be prepared by an Engineer/Draftsman skilled in this type of work. Shop Drawings shall be drawn to at least 1/4" = 1'0" scale.

- d. Observe the following rules when submitting the Shop Drawings and Brochures.

- i. Each Shop Drawing shall indicate in the lower right hand corner, and each Brochure shall indicate on the front cover the following: Title of the sheet or brochure, name and location of the building; names of the Architect and Electrical Engineer, Contractor, Subcontractors, Manufacturer, Supplier/Vendor, etc., date of submittal, and the date of correction and revision. Unless the above information is included the submittal will be returned for resubmittal.

- 1. Submittal Identification shall include the following:

- a. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted.

- b. Original submittal numbers shall have the following format: "XXX-Y;" where "XXX" is the originally assigned submittal number and "Y" is a sequential letter assigned for resubmittals (for example, A, B, or C being the first, second, and third resubmittals, respectively). Submittal 25B, for example, is the second resubmittal of Submittal 25.

- e. SPECIFICATION section and paragraph to which submittal applies.

D. POST-SUBMITTAL

- 1. Check all materials and equipment after arrival on the job site and verify compliance with the Contract Documents.

1.3 PROVIDE SUBMITTALS AS REQUESTED FOR EACH OF THE SECTIONS LISTED BELOW:

A. 26 0533 Electrical Boxes and Fittings

- 1. Submit manufacturer's data including specifications, installation instruction and general recommendations for each type of floor box used on project.

B. 26 0553 Electrical Identification

- 1. Submit manufacturer's data on each type of electrical identification products

- a. Submit one sample of each component of the electrical identification system as follows: Wire/cable tape marker, Tags, Engraved, plastic laminate labels, Arc-flash hazard labels
- C. 26 0943 Lighting Control Equipment
 - 1. Submit manufacturer's data on lighting control equipment including, but not limited to published catalog data sheets, rough-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
 - 2. Meet with the electrical engineer at their office prior to preparation of shop drawings to discuss and verify specific programming and zoning requirements of system(s).
 - 3. Meet with the lighting representative/manufacturer of the approved and accepted lighting control equipment to verify and understand specific installation requirements associated with that system.
 - 4. Submit detailed drawings and documentation of lighting control components and interconnection including, but not necessarily limited to:
 - a. Electronic controllers
 - b. Control stations
 - c. Photo sensors
 - d. Occupancy sensors
 - e. Network wiring details
 - f. Input and output wiring details
 - g. Lighting control panel load schedules
 - h. Provide a complete sequencing and programming schedules for all devices, zones and scenes.
 - i. Wallstations layouts
 - j. Accurately scaled equipment layouts, wire/cable routing and connections to control wiring and electrical power feeders.
- D. 26 2726 Wiring Devices
 - 1. Submit manufacturer's data on electrical wiring devices.
- E. 26 5100 Interior and Exterior Building Lighting
 - 1. Submit manufacturer's data on interior and exterior building lighting fixtures.
 - 2. Submit dimensioned drawings of lighting fixtures. Submit fixture shop drawings in PDF format with separate sheet for each fixture, assembled in luminaire "type" alphabetical order, with proposed fixture catalog number and accessories clearly indicated on each sheet.
 - 3. When applicable submit standard color samples with the shop drawings. If standard colors are not acceptable, a color sample will be provided to the fixture manufacturer. Return of the shop drawings will be delayed until color samples are provided.
 - 4. Submit ballast and driver manufacturer cut sheets.
 - 5. Submit a list of all lamps used on projects.

- a. Stock of all spare items shall be delivered as directed to Owner's storage space. All components shall be labeled to match construction document nomenclature.
- F. 27 1500 Canyons School District – Network Cabling Global Specification
 - 1. See district specifications for exact submittal requirements.
 - 2. Provide proof of RCDD certification and connectivity manufacturer certification.
 - 3. Provide submittals for all racks/cabinets; patch panels, devices, cabling, firestopping solutions, tray, non-continuous cable support devices, grounding equipment, and miscellaneous equipment to be used on project. Where multiple part numbers are listed on a datasheet/cutsheet, highlight or circle applicable part.
 - 4. Provide color samples of all available standard color faceplates to architect.
 - 5. Provide proposed labeling scheme for approval by owner/engineer.
 - 6. Provide catalog cutsheets of all test equipment that will be used.
- G. 27 5123 - Intercommunication Systems– Update System and Programming as required
 - 1. Submit manufacturer's data on intercom system devcies including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
 - 2. Provide shop drop drawings updating existing system.
- H.
- I. 28 1600 Security Systems– Update System and Programming as required
 - 1. Submit manufacturer's data on security system devcies including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
 - 2. Provide shop drop drawings updating existing system.
- J. 28 3111 Fire Alarm and Detection System – Update System and Programming as required:
 - 1. Submit manufacturer's data on fire alarm and detection systems including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
 - 2. Provide shop drawings showing equipment/device locations and connecting wiring of entire fire alarm and detection system. Include wiring diagrams and riser diagrams of panel. Provide dimensioned drawing of Fire Alarm Control Panel and Building Graphic. Shop drawings shall be prepared by an individual with a minimum NICET Level IV (Fire Protection Engineering/Fire Alarm Systems) certification. The individuals name and certification number shall be indicated on submittal design drawings.
 - 3. Submit a written statement to the Architect and the state and local Fire Marshal's Office that each device of the fire alarm system will be installed, inspected and tested in accordance with applicable requirements of NFPA Standard 72.
 - 4. Submit a complete set of documents to the Office of the State Fire Marshal containing the following information:

- a. A complete set of shop drawings indicating:
 - i. Location of all alarm-initiating and alarm-signaling devices.
 - ii. Point-to-point wiring diagrams for all alarm-initiating and alarm-signaling devices.
- b. Wiring diagrams for:
 - i. Alarm control panels.
 - ii. Auxiliary function relays and solenoids.
 - iii. Remote signaling equipment.
 - iv. Standby battery calculations, including voltage drop calculation.
- c. A complete equipment list identifying:
 - i. Type
 - ii. Model
 - iii. Manufacturer
 - iv. Manufacturer catalog data sheets
 - v. UL Listing and/or FM approval showing compatibility of device with Fire Alarm Control Panel (FACP)
- d. A complete zone list identifying all:
 - i. Alarm-initiating and alarm-signaling devices.
 - ii. Remote signaling and auxiliary function zones.
 - iii. Specific devices associated with each zone.
- e. Sample "System Record Document".
- f. Fire Alarm Key Plan Drawing showing the location of all device addresses and/or zones.

1.4 OPERATION & MAINTENANCE MANUALS

- A. Provide operating instruction and maintenance data books for all equipment and materials furnished under this Division.
- B. Submit four copies of operating and maintenance data books for review at least four weeks before final review of the project. Assemble all data in a completely indexed volume or volumes and identify the size, model, and features indicated for each item. The binder (sized to the material) shall be a 2" slide lock unit (Wilson-Jones WLJ36544B). The cover shall be engraved with the job title in 1/2" high letters and the name and address of the Contractor in 1/4" high letters. Provide the same information in 1/8" letters on the spine.
- C. Include complete cleaning and servicing data compiled in clearly and easily understandable form. Show serial numbers of each piece of equipment, complete lists of replacement parts, motor ratings, etc. Each unit shall have its own individual sheet. (Example: If two items of equipment A and D appear on the same sheet, an individual sheet shall be provided for each unit specified).
- D. Include the following information where applicable.
 - 1. Identifying name and mark number.

2. Certified outline Drawings and Shop Drawings.
 3. Parts lists.
 4. Performance curves and data.
 5. Wiring diagrams.
 6. Light fixture schedule with the lamps and ballast data used on the project for all fixtures
 7. Manufacturer's recommended operating and maintenance instructions.
 8. Vendor's name and address for each item.
- E. The engineer will review the manuals and when approved, will forward the manuals on to the architect. If the manuals are rejected twice, the contractor shall reimburse the engineer the sum of \$1,200.00 for each review afterwards.
- F. Provide high quality video and audio recording for all training sessions. All trainings shall be recorded by utilizing a pro-grade digital camera system. Utilize camera tripod and record audio directly at the presenter. Smartphone recordings are not allowed.
- G. Provide Operation and Maintenance Manual information for each section listed below in addition to the general requirements listed above.
1. 26 0943 Lighting Control Equipment
 - a. Record Drawings
 - i. A complete set of 'as-builts' drawings showing installed wiring, specific interconnections between all equipment, and internal wiring of this equipment shall be included in the operating and maintenance manuals upon complete of the system.
 - ii. Provide a DIGITAL COPY to the owner containing the information specified below. The DIGITAL COPY shall include all information required to allow the Owner to change the schedules themselves. The DIGITAL COPY shall contain a minimum of following:
 1. CAD drawing files of 'as-built' lighting control components and point to point connections.
 2. General configuration programming.
 3. Job specific configuration programming to include schedule.
 4. Tutorial file on complete programming of lighting control system.
 2. 26 0943 Lighting Control Equipment
 - a. Record Drawings
 - i. A complete set of 'as-builts' drawings showing installed wiring, specific interconnections between all equipment, and internal wiring of this equipment shall be included in the operating and maintenance manuals upon complete of the system.
 - ii. Provide a DIGITAL COPY to the owner containing the information specified below. The DIGITAL COPY shall include all information required to allow the Owner to

change the schedules themselves. The DIGITAL COPY shall contain a minimum of following:

1. CAD drawing files of 'as-built' lighting control components and point to point connections.
 2. General configuration programming.
 3. Job specific configuration programming to include schedule.
 4. Tutorial file on complete programming of lighting control system.
3. 26 5100 Interior and Exterior Building Lighting
 - a. The supply two complete manuals consisting of, as a minimum, general system arrangement, lighting cutsheets, schematic of System components and options, factory test reports, trouble-shooting data, parts lists, preventative maintenance information, and warranty contact information.
4. 27 1500 Canyons School District – Network Cabling Global Specification
 - a. Adhere to district specific requirements outlines within specifications.
 - b. Test Results as outlined in Section 27 1500
 - c. Manual shall include all service, installation, programming and warranty, including test results for each cable.
 - d. Provide laminated plans (minimum size 11 x 17) of all telecommunications record drawings (including riser diagrams) in each and every EF, ER and TR.
 - e. Record Drawings
 - i. The Owner shall provide electronic (DWG) format of telephone/data system drawings that as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.
 - ii. Provide a complete set of "as built" drawings in paper and electronic (DWG and PDF) formats showing cabinets, racks, patch panels, wiring, specific interconnections between all equipment and internal wiring of equipment within 30 working days of completion. Drawings are to include all labeling information used in denoting equipment used in the installation. Labeling, icons, and drawing conventions used shall be consistent throughout all documentation provided.
5. 27 5123 Intercommunications System
 - a. Provide updated programming and as-built drawings.
6. 28 1600 Security Systems
 - a. Provide updated programming and as-built drawings.

7. 28 3111 Fire Alarm and Detection System
- a. Manual Requirements
- i. Operating and maintenance manuals shall be submitted prior to testing of the system. Manuals shall include all service, installation, and programming information.
- b. Record Drawings
- i. A complete updated set of CAD "as-built" drawings showing installed wiring, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system. Vendor shall not request drawings from the Engineer. Vendor shall request current architectural drawings from the Architect and include all cost with bid.
- ii. A building map shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building fire alarm map adjacent to the fire alarm panel and all remote operating panels. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD fire alarm drawing. Edges of the sign shall be colored to match the building interior. The building map shall indicate the various devices and wiring by the use of different colors (minimum of five colors).
- iii. Provide a DIGITAL COPY to the Owner containing the information specified below. The DIGITAL COPY shall include all information required to allow the Owner to change the fire alarm program themselves. The DIGITAL COPY shall contain a minimum of the following:
1. CAD drawing files of building fire alarm map.
 2. CAD drawing files of as-built fire alarm components and point to point connections.
 3. General configuration programming.
 4. Job specific configuration programming.
- c. Final Submittal to the Office of the Fire Marshal
- i. Record of Completion: Provide a completed System Record of Completion (NFPA 72-Figure 4.5.2.1) in accordance with Section 4.5.3.
- ii. Operation Instructions and A-Built Drawings: Provide one set of instructions on operation of the Fire Alarm System and one set of As-Built drawings. Demonstrate compliance of installation of the System Record Documents at or near the fire alarm control unit.
- iii. Fire Alarm Key Plan Drawing: Demonstrate compliance of installation of the fire alarm key plan drawing at the FACP.

- iv. TUTORIAL FILE ON COMPLETE PROGRAMMING OF
FIRE ALARM SYSTEM

END OF SECTION 26 0502

SECTION 26 0507 - ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-23 section making reference to electrical connections.

1.2 DESCRIPTION OF WORK:

- A. Extent of electrical connection for equipment includes final electrical connection of all equipment having electrical requirements. Make final connections for all owner furnished equipment. See other applicable portions of specification for building temperature control wiring requirements.
- B. Refer to Division-23 sections for motor starters and controls furnished integrally with equipment; not work of this section.
- C. Refer to Division-23 section for control system wiring; not work of this section.
- D. Refer to sections of other Divisions for specific individual equipment power requirements.

1.3 QUALITY ASSURANCE:

- A. NEC COMPLIANCE: Comply with applicable portions of NEC as to type products used and installation of electrical power connections.
- B. UL LABELS: Provide electrical connection products and materials that have been UL-listed and labeled.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, raceways, conductors, cords, cord caps, wiring devices, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories as needed to complete splices, terminations, and connections as required. Crimp on or slip-on type splicing materials (insulation displacement type) designed to be used without wire stripping are not acceptable. See Section 26 0532, Conduit Raceways; Section 26 2726 Wiring Devices; and Section 26 0519 Conductors and Cables for additional requirements. Provide final connections for equipment consistent with the following:
 - 1. Permanently installed fixed equipment - flexible seal-tite conduit from branch circuit terminal equipment, or raceway; to equipment, control cabinet, terminal junction box or wiring terminals. Totally enclose all wiring in raceway.
 - 2. Movable and/or portable equipment - wiring device, cord cap, and multi-conductor cord suitable for the equipment and in accordance with NEC requirements (Article 400).
 - 3. Other methods as required by the National Electrical Code and/or as required by special equipment or field conditions.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL CONNECTIONS:

- A. Make electrical connections in accordance with connector manufacturer's written instructions and with recognized industry practices, and complying with requirements of NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.
- B. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams.
- C. Coordinate installation of electrical connections for equipment with equipment installation work.
- D. Verify all electrical loads (voltage, phase, horse power, full load amperes, number and point of connections, minimum circuit ampacity, etc.) for equipment furnished under other Divisions of this specification, by reviewing respective shop drawings furnished under each division. Meet with each subcontractor furnishing equipment requiring electrical service and review equipment electrical characteristics. Report any variances from electrical characteristics noted on the electrical drawings to Architect before proceeding with rough-work. In summary, it is not in the Electrical Engineers scope to review the shop drawings from other trades/divisions.
- E. Obtain and review the equipment shop drawings to determine particular final connection requirements before rough-in begins for each equipment item.
- F. Refer to basic materials and methods Section 26 0553 Electrical Identification, Conductors, for identification of electrical power supply conductor terminations.

END OF SECTION 26 0507

SECTION 26 0519 - CONDUCTORS AND CABLES (600V AND BELOW)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to conductors and cables specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of electrical conductor and electrical cable work is indicated by drawings and schedules.
- B. Types of conductors and cables in this section include the following:
 - 1. Copper Conductors (600V)
- C. Applications for conductors and cables required for project include:
 - 1. Branch Circuits
 - 2. 0-10V Class 1 Circuits

1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to construction and installation of electrical conductors and cable. Comply with UL standards and provide electrical conductors and cables that have been UL-listed and labeled.
- B. Comply with applicable portions of NEMA/Insulated Cable Engineers Association standards pertaining to materials, construction and testing of conductors and cable.
- C. Comply with applicable portions of ANSI/ASTM and IEEE standards pertaining to construction of conductors and cable.

1.4 SUBMITTALS:

- A. Not Required.

PART 2 - PRODUCTS

2.1 COPPER AND ALUMINUM CONDUCTORS (600V):

- A. Provide factory-fabricated conductors of sizes, ratings, materials, and types indicated for each service. Where not indicated provide proper selection to comply with project's installation requirements and NEC standards. Provide conductors in accordance with the following:
 - 1. Branch Circuit Conductors and All Conductors #3 AWG and Smaller - Copper conductor, with THHN/THWN insulation. Size all conductors in accordance with NEC; minimum size to be #12 AWG.
- B. Provide a maximum of three phase conductors in any one conduit or as approved by electrical engineer. Where phase conductors share a common neutral they must have a means to simultaneously disconnect all ungrounded conductors at the point where the branch circuits originate. The ungrounded and neutral conductors of a multi-wire branch

circuit must be grouped together by wire ties at the point of origination.

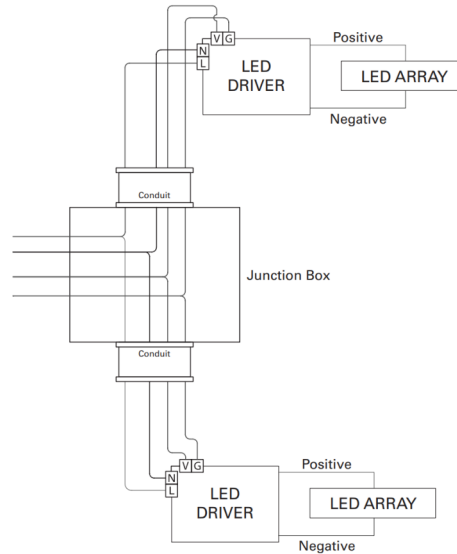
- C. Provide neutral and ground wire as specified elsewhere in documents.
- D. Provide separate neutral conductor for all single phase branch circuits installed. No shared neutrals are allowed. Neutral conductor shall be the same size as the phase conductor.
- E. Applicable to Existing Circuits Which are Modified As a Result of the Project: Where phase conductors share a common neutral they must have a means to simultaneously disconnect all ungrounded conductors at the point where the branch circuits originate. The ungrounded and neutral conductors of a multi-wire branch circuit must be grouped together by wire ties at the point of origination.
- F. Applicable to New Circuits As a Result of the Project: Provide a maximum of three phase conductors in any one conduit or as approved by electrical engineer. Provide separate neutral conductor for all single phase branch circuits installed. No shared neutrals are allowed. Neutral conductor shall be the same size as the phase conductor.

2.2 COPPER LOW VOLTAGE CONDUCTORS (0-10V CIRCUITS):

A. 0-10V Class 1 Circuits:

1. General:

- a. Provide Class 1 circuits for all 0-10V dimming installations. Class 1 circuits shall be permitted to be installed with other circuits as specified in NEC 725.48 (A) and (B):
 - i. Class 1 circuits shall be permitted to occupy the same cable, cable tray, enclosure, or raceway without regard to whether the individual circuits are alternating or direct current, provided all conductors are insulated for the maximum voltage of any conductors in the cable, cable tray, enclosure or raceway.
 - ii. Class 1 circuits shall be permitted to be installed with power supply conductors as specified:
 - 1. Class 1 and power supply circuits shall be permitted to occupy the same cable, enclosure, or raceway only when functionally associated.
 - iii. Utilize purple and grey copper conductors, with THHN/THWN insulation.



PART 3 - EXECUTION

3.1 INSTALLATION:

- A. General: Install electric conductors and cables as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standards of Installation", and in accordance with recognized industry practices.
- B. Coordinate installation work with electrical raceway and equipment installation work, as necessary for proper interface.
- C. Cables may be pulled by direct attachment to conductors or by use of basket weave pulling grip applied over cables. Attachment to pulling device shall be made through approved swivel connection. Nonmetallic jacketed cables of small size may be pulled directly by conductors by forming them into a loop that pull wires can be attached; remove insulation from conductors before forming the loop. Larger sizes of cable may be pulled by using basket weave pulling grip, provided the pulling force does not exceed limits recommended by manufacturer; if pulling more than one cable, bind them together with friction tape before applying the grip. For long pulls requiring heavy pulling force, use pulling eyes attached to conductors.
- D. Do not exceed manufacturer's recommendations for maximum allowable pulling tension, side wall pressure, and minimum allowable bending radius. In all cases, pulling tension applied to the conductors shall be limited to 0.008 lbs. per circular mil of conductor cross-section area.
- E. Pull in cable from the end having the sharpest bend; i.e. bend shall be closest to reel. Keep pulling tension to minimum by liberal use of lubricant, and turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one in pullhole during this operation.
- F. For training of cables, minimum bend radius to inner surface of cable shall be 12 times cable diameter.
- G. Where cable is pulled under tension over sheaves, conduit bends, or other curved surfaces, make minimum bend radius 50% greater than specified above for training.
- H. Use only wire and cable pulling compound recommended by the specific cable manufacturer, and that is listed by UL.
- I. Seal all cable ends unless splicing is to be done immediately. Conduit bodies shall not

contain splices.

- J. Follow manufacturer's instructions for splicing and cable terminations.

3.2 AFTER INSTALLATION TEST FOR CABLE 600 VOLTS AND BELOW:

- A. Subsequent to wire and cable connections, energize circuitry and demonstrate functioning in accordance with requirements.

3.3 IDENTIFICATION OF FEEDERS: Refer to Section 26 0553 for requirements.

END OF SECTION 26 0519

SECTION 26 0526 - GROUNDING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. Provide grounding as specified herein, and as indicated on drawings.
- B. Provide grounding and bonding of all electrical and communication apparatus, machinery, appliances, building components, and items required by the NEC to provide a permanent, continuous, low impedance, grounding system.
- C. Unless otherwise indicated, ground the complete electrical installation including the system neutral, metallic conduits and raceways, boxes, fittings, devices, cabinets, and equipment in accordance with all code requirements.
- D. Ground each separately derived system, as described in NEC Section 250-30, unless otherwise indicated.
- E. Types of grounding in this section include the following:
 - 1. Enclosures
 - 2. Systems
 - 3. Equipment
 - 4. Other items indicated on drawings
- F. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.

1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to electrical grounding and ground fault protection systems. Comply with applicable ANSI and IEEE requirements. Provide products that have been UL listed and labeled.
- B. Resistance from the service entrance ground bus, through the grounding electrode to earth, shall not exceed 5 ohms.

1.4 SUBMITTALS:

- A. Not Required.

PART 2 – PRODUCTS

2.1 MATERIALS AND COMPONENTS:

- A. GENERAL: Except as otherwise indicated, provide each electrical grounding system as specified herein, and as shown on drawings, including but not necessarily limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, and other items and accessories needed for complete installation. Where materials or components are not otherwise indicated,

comply with NEC, NEMA and established industry standards for applications indicated.

- B. ELECTRICAL GROUNDING CONDUCTORS: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC. Provide with green insulation.

PART 3 - EXECUTION

3.1 INSTALLATION OF GROUNDING SYSTEMS:

- A. Install electrical grounding systems in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding devices comply with requirements.
- B. Install clamp-on connectors only on thoroughly cleaned and metal contact surfaces, to ensure electrical conductivity and circuit integrity.
- C. Provide grounding for the entire raceway, enclosure, equipment and device system in accordance with NEC. All non-metallic raceways shall include copper grounding conductor sized in accordance with NEC. Include copper grounding conductor in all raceway installed in suspended slabs.
- D. Provide service entrance grounding by means of ground rods (quantity of two, driven exterior to building), by means of bonding to water main, and by means of bonding to building structural steel. In addition, provide a grounding electrode for not less than 30 lineal feet in concrete footing or foundation that is in direct contact with earth. Size electrode in accordance with NEC, but in no case, smaller than No. 4 AWG bare copper. Support electrode so as to be below finished grade near the bottom of the trench, and approximately three inches from the bottom or sides of the concrete. Locate a point of connection for inspection.
- E. Provide grounding conductors for dimming systems in accordance with manufacturer's requirement.

END OF SECTION 26 0526

SECTION 26 0529 - SUPPORTING DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification section, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is a part of each Division-26, 27 and 28 section making reference to supports, anchors, sleeves, and seals, specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of supports, anchors, and sleeves is indicated by drawings and schedules and/or specified in other Division-26 sections. See Section 260532, Raceways, for additional requirements.
- B. Work of this section includes supports, anchors, sleeves and seals required for a complete raceway support system, including but not limited to: clevis hangers, riser clamps, C-clamps, beam clamps, one and two hole conduit straps, offset conduit clamps, expansion anchors, toggle bolts, threaded rods, U-channel strut systems, threaded rods and all associated accessories.

1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to construction and installation of electrical supporting devices. Comply with applicable requirements of ANSI/NEMA Std. Pub No. FB 1, "Fittings and Supports for Conduit and Cable Assemblies". Provide electrical components that are UL-listed and labeled.

PART 2 - PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES:

A. GENERAL:

- 1. Provide supporting devices; complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation; and as herein specified. See drawings for additional requirements.

PART 3 - EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES:

- A. Install hangers, anchors, sleeves, and seals as required, in accordance with manufacturer's written instructions and with recognized industry practices to ensure supporting devices comply with requirements. Comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.
- B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- C. Install hangers, supports, clamps and attachments to support piping properly from building structures. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. For pre-and post tensioned

construction, use pre-set inserts for support of all electrical work. Do not use toggle bolts, moly bolts, wood plugs or screws in sheetrock or plaster as support for any equipment or raceway.

D. Independent support wires are not allowed as indicated as per NEC 300.11(B).

E. RACEWAYS:

1. Support raceways that are rigidly attached to structure at intervals not to exceed 8 feet on center, minimum of two straps per 10 foot length of raceway, and within 12" of each junction box, coupling, outlet or fitting. Support raceway at each 90° degree bend. Support raceway (as it is installed) in accordance with the following:

<u>NUMBER OF RUNS</u>	<u>3/4" TO 1-1/4" Ø</u>	<u>1-1/2" & LARGER Ø</u>
1	Full straps, clamps or hangers.	Hanger
2	Full straps, clamps or hangers.	Mounting Channel
3 or more	Mounting Channel	Mounting Channel

2. Support suspended raceways on trapeze hanger systems; or individually by means of threaded rod and straps, clamps, or hangers suitable for the application. Do not use "tie wire" as a portion of any raceway support system; do not support raceway from ceiling support wires.

F. FLOOR MOUNTED EQUIPMENT:

1. Provide rigid attachment of all floor mounted equipment to the floor slab or structural system. Provide 5/8" bolts or expansion anchors at each 90 degree corner and at intervals not to exceed 48" on center along entire perimeter of the equipment. Provide rigid attachment for all floor mounted switchboards, panelboards, power and control equipment, motor control centers, dimmer cabinets, transformers (provide neoprene vibrations isolators at anchor points), oil switches, battery packs and racks, and similar equipment furnished under Division 26, 27 and 28.

END OF SECTION 26 0529

SECTION 26 0532 - CONDUIT RACEWAY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to electrical raceways and specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of raceways is indicated by drawings and schedules.
- B. Division-26 is responsible to provide conduit and rough-in for all thermostat controls located within walls. Coordinate with the Controls Contractor and verify exact location of all thermostats. Obtain and review submittals of Temperature Control Equipment from Controls Contractor and Divisions 21-23.
- C. Types of raceways in this section include the following:
 - 1. Electrical Metallic Tubing
 - 2. Flexible Metal Conduit
 - 3. Intermediate Metal Conduit
 - 4. Liquid-tight Flexible Metal Conduit
 - 5. Rigid Metal Conduit
 - 6. Rigid Non-metallic Conduit

1.3 QUALITY ASSURANCE:

- A. MANUFACTURERS: Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.
- B. STANDARDS: Comply with applicable portions of NEMA standards pertaining to raceways. Comply with applicable portions of UL safety standards pertaining to electrical raceway systems; and provide products and components that have been UL-listed and labeled. Comply with NEC requirements as applicable to construction and installation of raceway systems.

1.4 SUBMITTALS:

- A. Not Required.

PART 2 – PRODUCTS

2.1 METAL CONDUIT AND TUBING:

- A. GENERAL:
 - 1. Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) as indicated; with minimum trade size of 3/4".
- B. RIGID METAL CONDUIT (RMC): FS WW-C-0581 and ANSI C80.1.

- C. INTERMEDIATE STEEL CONDUIT (IMC): FS WW-C-581.
- D. PVC EXTERNALLY COATED RIGID STEEL CONDUIT: ANSI C80.1 and NEMA Std. Pub. No. RN 1.
- E. ALUMINUM CONDUIT: Not acceptable.
- F. ELECTRICAL NON-METALLIC TUBING (ENT) SYSTEM: Not acceptable.
- G. MC CABLE: Only acceptable as indicated below.
 - 1. The use of MC or MC-PCS cable is only acceptable for light fixture whips utilizing 0-10V control schemes, not longer than 72" in length, located above removable grid ceilings. All MC cable shall be provided with anti-short fittings.
 - a. Acceptable Manufacturers
 - i. AFC – MC Luminary Cable
 - ii. Encore – MC-LED Lighting Cable
 - iii. Southwire – MC-PCS Duo
- H. RIGID AND INTERMEDIATE STEEL CONDUIT FITTINGS:
 - 1. Provide fully threaded malleable steel couplings; raintight and concrete tight where required by application. Provide double locknuts and metal bushings at all conduit terminations. Install OZ Type B bushings on conduits 1-1/4" and larger.
- I. ELECTRICAL METALLIC TUBING (EMT): FS WW-C-563 and ANSI C80.3.
- J. EMT FITTINGS:
 - 1. Provide insulated throat nylon bushings with non-indenter type malleable steel fittings at all conduit terminations. Install OZ Type B bushings on conduits 1" larger. Cast or indenter type fittings are not acceptable.
- K. FLEXIBLE METAL CONDUIT: FS WW-C-566, of the following type;
 - 1. Zinc-coated steel.
- L. FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 1, and Style A.
- M. LIQUID TIGHT FLEXIBLE METAL CONDUIT:
 - 1. Provide liquid-tight, flexible metal conduit; constructed of single strip, flexible continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coated with liquid-tight jacket of flexible polyvinyl chloride (PVC).
- N. LIQUID-TIGHT FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 3, Style G.
- O. EXPANSION FITTINGS: OZ Type AX, or equivalent to suit application.

2.2 NON-METALLIC CONDUIT AND DUCTS:

- A. GENERAL:
 - 1. Provide non-metallic conduit, ducts and fittings of types, sizes and weights as indicated; with minimum trade size of 3/4".
- B. PVC AND ABS PLASTIC UTILITIES DUCT FITTINGS:
- C. ANSI/NEMA TC 9, match to duct type and material.
- D. HDPE CONDUIT: Not acceptable.

2.3 CONDUIT; TUBING; AND DUCT ACCESSORIES:

- A. Provide conduit, tubing and duct accessories of types and sizes, and materials, complying with manufacturer's published product information, that mate and match conduit and tubing. Provide manufactured spacers in all duct bank runs.

2.4 SEALING BUSHINGS:

- A. Provide OZ Type FSK, WSK, or CSMI as required by application. Provide OZ type CSB internal sealing bushings.

2.5 CABLE SUPPORTS:

- A. Provide OZ cable supports for vertical risers, type as required by application.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL RACEWAYS:

- A. Install electrical raceways where indicated; in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and in accordance with the following:
 - 1. BRANCH CIRCUITS, SIGNAL AND CONTROL CIRCUITS, AND INDIVIDUAL EQUIPMENT CIRCUITS RATED LESS THAN 100 AMPS:
 - a. Install in electric metallic tubing (EMT). Below concrete slab-on-grade or in earth fill, install in non-metallic plastic duct. In areas exposed to weather, moisture, or physical damage, install in RMC or IMC. In suspended slabs, install in EMT (NOT APPROVED).
- B. Coordinate with other work including metal and concrete deck work, as necessary to interface installation of electrical raceways and components.
- C. Install raceway in accordance with the following:
 - 1. Provide a minimum of 12" clearance measured from outside of insulation from flues, steam and hot water piping, etc. Avoid installing raceways in immediate vicinity of boilers and similar heat emitting equipment. Conceal raceways in finished walls, ceilings and floor (other than slab-on-grade), except in mechanical, electrical and/or communication rooms, conceal all conduit and connections to motors, equipment, and surface mounted cabinets unless exposed work is indicated on the drawings. Run concealed conduits in as direct a line as possible with gradual bends. Where conduit is exposed in mechanical spaces, etc., install parallel with or at right angles to building or room structural lines. Do not install lighting raceway until piping and duct work locations have been determined in order to avoid fixtures being obstructed by overhead equipment.
 - 2. PVC conduit may be utilized within CMU and Block type walls. At the point exiting or offsetting from wall transition to EMT and metal electrical box as required.
 - 3. The required raceway size, for any given installation, shall remain the same throughout the entire length of the run. At no point shall any conduit be reduced in size.
 - 4. Where cutting raceway is necessary, remove all inside and outside burrs; make cuts smooth and square with raceway. Paint all field threads (or portions of

- raceway where corrosion protection has been damaged) with primer and enamel finish coat to match adjacent raceway surface.
5. Provide a minimum of 1 ½" from nearest surface of the roof decking to raceway.
 6. In open gymnasiums, auditoriums, etc; all conduit shall be installed in straight lines parallel to, or at right angles to, the structure or adjacent building elements. Separations between conduits and fastenings of conduits shall be neat and consistent. Conduit shall be installed as tight to the bottom of structural elements when parallel to joists as code will allow. Overall installation shall be accomplished in an aesthetic and workmanlike manner. No conduits shall be allowed to run perpendicular to the bottom chord and at the bottom of the joists.
 7. Provide conduit from device to device in open and/or exposed ceilings. Ceilings with clouds are considered open/exposed ceiling. No exposed cables shall be seen from below.
 8. Provide a maximum of three phase conductors in any one conduit or as approved by electrical engineer. Where phase conductors share a common neutral they must have a means to simultaneously disconnect all ungrounded conductors at the point where the branch circuits originate. The ungrounded and neutral conductors of a multi-wire branch circuit must be grouped together by wire ties at the point of origination.
 9. Provide neutral and ground wire as specified elsewhere in documents.
 10. Provide separate neutral conductor for all single phase branch circuits installed. No shared neutrals are allowed. Neutral conductor shall be the same size as the phase conductor.
- D. Comply with NEC for requirements for installation of pull boxes in long runs.
- E. Cap open ends of conduits and protect other raceways as required against accumulation of dirt and debris. Pull a mandrel and swab through all conduit before installing conductors. Install a 200 lb. nylon pull cord in each empty conduit run.
- F. Replace all crushed, wrinkled or deformed raceway before installing conductors.
- G. Do not use flame type devices as a heat application to bend PVC conduit. Use a heating device that supplies uniform heat over the entire area without scorching the conduit.
- H. Provide rigid metal conduit (RMC) for all bends greater than 22 degrees in buried conduit. Provide protective coating for RMC bend as specified herein.
- I. Where raceways penetrate building, area ways, manholes or vault walls and floors below grade, install rigid metal conduit (RMC) for a minimum distance of 10 feet on the exterior side of the floor or wall measured from interior face. Provide OZ, Type FSK, WSK or CSMI sealing bushings (with external membrane clamps as applicable) for all conduit penetrations entering walls or slabs below grade. Provide segmented type CSB internal sealing bushings in all raceways penetrating building walls and slabs below grade, and in all above grade raceway penetrations susceptible to moisture migration into building through raceway.
- J. Install liquid-tight flexible conduit for connection of motors, transformers, and other electrical equipment where subject to movement and vibration.
- K. Install spare 3/4" conduits (capped) from each branch panelboard into the ceiling and floor space. Run five into the ceiling space and five into the floor space. Where the floor is not accessible run six conduits into the ceiling space. Run conduits the required distance necessary to reach accessible ceiling space.
- L. Provide OZ expansion fittings on all conduits crossing building expansion joints, both in slab and suspended.

- M. Provide OZ cable supports in all vertical risers in accordance with NEC 300-19; type as required by application.
- N. Complete installation of electrical raceways before starting installation of cables/conductors within raceways.
- O. Raceway installation below grade:
 - 1. Apply protective coating to metallic raceways in direct contact with earth or fill of any type; consisting of spirally wrapped PVC tape (1/2" minimum overlap of scotch wrap tape or equal); or factory applied vinyl cladding (minimum thickness .020 inches). Completely wrap and tape all field joints.
 - 2. Burial depths must comply with NEC Section 300-5 but in no case be less than 24", unless noted otherwise on drawings.
- P. Raceway installation below slab-on-grade, or below grade:
 - 1. For slab-on-grade construction, install runs of rigid plastic conduit (PVC) below slab. All raceway shall be located at top of sub-grade and a minimum of 6" below bottom of slab. Stake down conduits as required to keep conduits from floating or moving. Coordinate strictly with other trades at grade level structural members for correct installation. Install RMC (with protective coating) for raceways passing vertically through slab-on-grade. Slope raceways as required to drain away from electrical enclosures and to avoid collection of moisture in raceway low points.
 - 2. Apply protective coating to metallic raceways in direct contact with earth or fill of any type; consisting of spirally wrapped PVC tape (1/2" minimum overlap of scotch wrap tape or equal); or factory applied vinyl cladding (minimum thickness .020 inches). Completely wrap and tape all field joints.
 - 3. Mark all buried conduits that do not require concrete encasement by placing yellow plastic marker tape (minimum 6" wide) along entire length of run 12" below final grade. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16", install a single line marker.
 - 4. Burial depths must comply with NEC Section 300-5 but in no case be less than 24", unless noted otherwise on drawings.
 - 5. Do not locate utility feeds under any structure. Verify all utility power paths with RMP prior to any rough-in. Utility burial depths must comply with RMP requirements or AHJ, but in no case be less than 48" minimum, unless noted otherwise on drawings, diagrams etc.
- Q. Raceway installation in suspended slabs:
 - 1. No conduit can be installed in suspended slabs.
- R. Raceway installation in hazardous locations:
 - 1. Install RMC in all hazardous locations as defined by NEC. Provide suitable fittings, seal-offs, boxes, etc. to comply with requirements.
 - 2. Engage at least five full threads on all fittings. Provide inspection fittings with explosion proof drains to prevent water accumulation in conduit runs. Install seal-offs for arcing or high temperature equipment, at housing with splices or taps and where conduits enter or leave the hazardous area. Provide seal-offs of the appropriate type for vertical or horizontal installation. Ground all metallic parts.
- S. Electrical Identification: Refer to Section 260553 for requirements.

END OF SECTION 26 0532

BLANK PAGE

SECTION 26 0533 - ELECTRICAL BOXES AND FITTINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is a part of each Division-26, 27 and 28 section making reference to electrical wiring boxes and fittings specified herein. See Section 260532, Raceways, for additional requirements.

1.2 DESCRIPTION OF WORK:

- A. The extent of electrical box and electrical fitting work is indicated by drawings and schedules.
- B. Types of electrical boxes and fittings in this section include the following:
 - 1. Outlet Boxes
 - 2. Junction Boxes
 - 3. Pull Boxes
 - 4. Floor Boxes
 - 5. Conduit Bodies
 - 6. Bushings
 - 7. Locknuts
 - 8. Knockout Closures
 - 9. Miscellaneous Boxes and Fittings

1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to construction and installation of electrical boxes and fittings. Comply with ANSI C 134,1 (NEMA Standards Pub No. OS 1) as applicable to sheet-steel outlet boxes, device boxes, covers and box supports. Provide electrical boxes and fittings that have been UL-listed and labeled.

1.4 SUBMITTALS:

- A. Submit manufacturer's data including specifications, installation instruction and general recommendations for each type of floor box used on project.

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS:

- A. INTERIOR OUTLET BOXES:
 - 1. Provide one piece, galvanized flat rolled sheet steel interior outlet wiring boxes with accessory rings, of types, shapes and sizes, including box depths, to suit each respective location and installation, construct with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box and covers and wiring devices; minimum size 4"x4"x2-1/8".

2. Provide an 'FS' box, with no knockouts when surface mounted in a finished, non-utility space. Surface mounting is only acceptable when approved by the Architect.
- B. INTERIOR OUTLET BOX ACCESSORIES:
1. Provide outlet box accessories as required for each installation, including mounting brackets, hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, that are compatible with outlet boxes being used and fulfilling requirements of individual wiring applications.
- C. WEATHERPROOF OUTLET BOXES:
1. Provide corrosion-resistant cast-metal weatherproof outlet wiring boxes, of types, shapes and sizes (including depth) required, with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitably configured for each application, with face plate gaskets and corrosion-resistant fasteners.
- D. JUNCTION AND PULL BOXES:
1. Provide code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
- E. CONDUIT BODIES:
1. Provide galvanized cast-metal conduit bodies, of types, shapes and sizes to suit respective locations and installation, construct with threaded-conduit-entrance ends, removable covers, and corrosion-resistant screws.
- F. BUSHINGS, KNOCKOUT CLOSURES AND LOCKNUTS:
1. Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable steel conduit bushings and offset connectors, of types and sizes to suit respective uses and installation.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS:

A. GENERAL:

1. Install electrical boxes and fittings where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
2. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.
3. Provide coverplates for all boxes. See Section 262726, Wiring Devices.
4. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.
5. Provide knockout closures to cap unused knockout holes where blanks have been removed.
6. Install boxes and conduit bodies to ensure ready accessibility of electrical wiring. Do not install boxes above ducts or behind equipment. Install recessed boxes with face of box or ring flush with adjacent surface. Seal between switch, receptacle and other outlet box openings and adjacent surfaces with plaster, grout, or similar suitable material.

7. Fasten boxes rigidly to substrates or structural surfaces, or solidly embed electrical boxes in concrete or masonry. Use bar hangers for stud construction. Use of nails for securing boxes is prohibited. Set boxes on opposite sides of common wall with minimum 10" of conduit between them. Set boxes on opposite sides of fire resistant walls with minimum of 24" separation.
8. Provide a minimum of 1 ½" from the nearest surface of the roof decking to the installed boxes.
9. Provide electrical connections for installed boxes.

END OF SECTION 26 0533

BLANK PAGE

SECTION 26 0553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Requirements of the following Division 26 Sections apply to this section:
 - 1. "Basic Electrical Requirements".
 - 2. "Basic Electrical Materials and Methods".

1.2 SUMMARY

- A. This section includes identification of electrical materials, equipment and installations. It includes requirements for electrical identification components including but not limited to the following:
 - 1. Buried electrical line warnings.
 - 2. Identification labels for raceways, cables and conductors.
 - 3. Operational instruction signs.
 - 4. Warning and caution signs.
 - 5. Equipment labels and signs.
 - 6. Arc-flash hazard labels
- B. Related Sections: The following sections contain requirements that relate to this section:
- C. Division 9 Section "Painting" for related identification requirements.
- D. Refer to other Division 26 sections for additional specific electrical identification associated with specific items.

1.3 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code"

1.4 SUBMITTALS: Refer to Section 26 0503 for requirements.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. American Labelmark Co.
 - 2. Calpico, Inc.
 - 3. Cole-Flex Corp.
 - 4. Emed Co., Inc.
 - 5. George-Ingraham Corp.
 - 6. Ideal Industries, Inc.
 - 7. Kraftbilt
 - 8. LEM Products, Inc.

9. Markal Corp
10. National Band and Tag Co.
11. Panduit Corp.
12. Radar Engineers Div., EPIC Corp.
13. Seton Name Plate Co.
14. Standard Signs, Inc.
15. W.H Brady, Co.

2.2 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Colored Conduit Systems for raceway identification:
 1. Factory-painted conduit and/or factory-painted couplings and fittings
- B. Colored paint for raceway identification:
 1. Use [Kwal Paint](#) colors as specified in Part 3 – Execution.
- C. Color Adhesive Marking Tape for Raceways, Wires and Cables:
 1. Self-adhesive vinyl tape not less than 3 mills thick by 1" to 2" in width.
- D. Underground Line Detectable Marking Tape:
 1. Permanent, bright colored, continuous-printed, acid- and alkali-resistant plastic tape specifically compounded for direct-burial service. Not less than 6" wide by 4 mills thick.
 2. With metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep.
 3. Printed legend indicative of general type of underground line below.
- E. Wire/Cable Designation Tape Markers:
 1. Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with pre-printed numbers and letters.
- F. Brass or Aluminum Tags:
 1. Metal tags with stamped legend, punched for fastener.
 2. Dimensions: 2" X 2" 19 gage.
- G. Engraved, Plastic Laminated Labels, Signs and Instruction Plates:
 1. Engraving stock plastic laminate, 1/16" minimum thickness for signs up to 20 sq. in. or 8" in length; 1/8 " thick for larger sizes. Engraved legend in 1/4" high white letters on black face and punched for mechanical fasteners.
- H. Arc-flash Hazard Labels:
 1. ANSI Z535.4 Safety Label.
 2. Adhesive backed polyester with self-laminating flap. Chemical, abrasion and heat resistant.
 3. Dimensions: 5" x 3.5"
 4. Information contained: Arc-flash boundary; Voltage; Flash Hazard Category; Incident Energy (arc rating); checkboxes for the required Personal Protective Equipment (PPE) and the date that the calculations were performed.
- I. Equipment Labels:
 1. Adhesive backed polyester with self-laminating flap. Chemical, abrasion and heat resistant.

2. Dimensions: minimum 5" x 2"
3. Conductor-Identification-Means Labels:
 - a. Information contained: the method utilized for identifying ungrounded conductors within switchboards, distribution panels and branch circuit panels.
4. Available-Fault-Current Labels:
 - a. Information contained: maximum available fault current at the respective piece of equipment, and date of calculation of fault current.
5. Source-of-Supply Labels:
 - a. Information contained: indicate the device or equipment where the power supply originates.
- J. Baked Enamel Warning and Caution Signs for Interior Use:
 1. Preprinted aluminum signs, punched for fasteners, with colors legend and size appropriate to location.
- K. Fasteners for Plastic-Laminated and Metal Signs:
 1. Self-tapping stainless steel screws or # 10/32 stainless steel machine screws with nuts, flat and lock washers.
- L. Cable Ties:
 1. Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18" minimum width, 50-lb. Minimum tensile strength, and suitable for a temperature range from minus 40° F. to 185° F. Provide ties for specified colors when used for color coding.
- M. Colored Support Wires:
 1. When electrical equipment/wiring is supported by wires within the ceiling cavity, these wires shall be independent of the ceiling support assembly and shall be distinguishable by painting entire length in bright yellow.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Lettering and Graphics:
 1. Coordinate names, abbreviations, colors and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering and colors as approved in submittals and as required by code.
- B. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.
- C. Sequence of Work:
 1. Where identification is to be applied to surfaces that require a finish, install identification after completion of finish work.
- D. Conduit Identification:
 1. Identify Raceways of Certain Systems with Color Coding. Acceptable means of color identification are as follows:
 - a. Factory-painted conduit.
 - b. Band exposed or accessible raceways of the following systems for identification. Bands shall be pre-tensioned, snap-around colored plastic

sleeves, colored adhesive marking tape, or a combination of the two. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side. Install bands at changes in direction, at penetrations of walls and floors, and at 40-foot maximum intervals in straight runs. Apply the following colors:

- i. Fire Alarm System: Red
- ii. Sound/IC: Yellow
- iii. Data: Blue
- iv. MATV: Black
- v. Security: Orange
- vi. Legally Required Emergency Systems: Red with Black Stripe (Per NEC 700.10(A))

2. Identify Junction, Pull and Connection Boxes.

- a. Code-required caution sign for boxes shall be pressured-sensitive, self-adhesive label indication system voltage in black, preprinted on orange background. Install on outside of box cover. Also label box covers on outside of cover with identity of contained circuits. Use pressure-sensitive plastic labels at exposed locations and similar labels or plasticized card stock tags at concealed boxes.

3. Label and paint the covers of the systems junction boxes as follows:

<u>SYSTEM</u>	<u>COLOR (ALL COLORS ARE KWAL PAINT)</u>	
Fire Alarm	Red Alert	AC118R
Sound/IC	Competition Yellow	7225A
Security	Fiesta Orange	AC107Y
Data	Neon Blue	7076A
MATV	Flat Black	
Legally Required EM System	Red/Black Stripe	

E. Underground Electrical Line Identification.

- 1. During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground line detectable marking tape, located directly above line at 6 to 8 inches below finished grade. Where multiple lines are installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.
- 2. Install detectable marking tape for all underground wiring, both direct-buried and in raceway.
- 3. Provide red marker dye applied to concrete encased ductbank.

F. Conductor Color Coding.

- 1. Provide color coding for secondary service, feeder and branch circuit conductors throughout the project secondary electrical system as follows:

<u>CONDUCTOR</u>	<u>208Y / 120V System</u>	<u>480Y / 277V System</u>
Phase A	Black	Brown

Phase B	Red	Orange
Phase C	Blue	Yellow
Shared/Single Neutral	White	Gray
Neutral A (dedicated)	White w/Black Stripe	Gray w/Black Stripe
Neutral B (dedicated)	White w/Red Stripe	Gray w/Orange Stipe
Neutral C (dedicated)	White w/Blue Stripe	Gray w/Yellow Stipe
Equipment Ground	Green	Green
Isolated Ground	Green w/Yellow Strip	Green w/Yellow Stripe

2. Switch legs, travelers and other wiring for branch circuits shall be of colors other than those listed above.
 3. Use conductors with color factory applied the entire length of the conductors except as follows:
 - a. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
 - b. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.
 - c. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.
- G. Power Circuit Identification.
1. Securely fasten identifying metal tags or aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms with 1/4-inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-lb monofilament line or one-piece self-locking nylon cable ties.
 2. Tag or label conductors as follows:
 - a. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicting source and circuit numbers.
 - b. Multiple Circuits: Where multiple branch circuits or control wiring or communications/ signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by mean of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs,

- and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.
3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.
- H. Apply warning, caution and instruction signs and stencils as follows:
1. Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items. Warning and caution signs shall be furnished and installed on, but not be limited to the following equipment and locations:
 - a. Entrances to rooms and other guarded locations that contain exposed live parts 600 volts or less; signs shall forbid unqualified personnel to enter.
 - b. Switch and Overcurrent device enclosures with splices, taps and feed-through conductors. Provide warning label on the enclosures that identifies the nearest disconnecting means for any feed-through conductors.
 - c. Entrances to buildings, vaults, rooms or enclosures containing exposed live parts or exposed conductors operating at over 600 volts: DANGER-HIGH VOLTAGE-KEEP OUT.
 - d. Metal-enclosed switchgear, unit substations, transformers, enclosures, pull boxes, connection boxes and similar equipment operating at over 600 volts shall have appropriate caution signs and warning labels.
 - e. Indoor and Outdoor substations operating over 600 volts. Provide warning signs, instructional signs and single-line diagrams in accordance with NEC 225.70.
 - I. Emergency Operating Signs: Install engraved laminated signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.
 - J. Install equipment/system circuit/device identification as follows:
 1. Apply equipment identification labels of engraved plastic-laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/4"-high lettering on 1-inch-high label (1 1/2-inch-high where two lines are required) white lettering in black field. White lettering in red field for Emergency Power Systems. Text shall match terminology and numbering of the Contract Documents and shop drawings. Apply labels for each unit of the following categories of electrical equipment.
 - a. Each service disconnect, to identify it as a service disconnect.
 - b. Panelboards (exterior and interior), electrical cabinets, and enclosures. For subpanels, identify feeder circuit served from.
 - c. Switches in fusible panelboards shall be labeled. Main switches shall be identified.
 - d. Access doors and panels for concealed electrical items.

- e. Electrical switchgear and switchboards.
 - f. Motor control centers.
 - g. Motor starters, including circuit origination, HP, heater size, FLA, and mechanical equipment designation.
 - h. Disconnect switches.
 - i. Pushbutton stations.
 - j. Power transfer equipment.
 - k. Contactors.
 - l. Dimmers.
 - m. Control devices.
 - n. Transformers.
 - o. Power generating units, to include transfer switches.
 - p. Telephone switching equipment.
 - q. Clock/program master equipment.
 - r. Call system master station.
 - s. TV/audio monitoring master station.
 - t. Fire alarm master station or control panel.
 - u. Busduct – Label all cable tap boxes, bus plug-in units, etc. with plastic laminate labels designating load served.
 - v. Variable frequency drives.
 - w. Lighting Control Equipment.
 - x. Uninterruptable Power Supply.
- K. Post Conductor-Identification-Means labels at locations of switchboards, distribution panels and branch circuit panels. The labels shall identify the color-coding used on ungrounded conductors for each voltage system used on the premises.
- L. Apply Available-Fault-Current labels at the service entrance equipment.
- M. Apply Source-of-Supply labels on the exterior covers of equipment (except in single- or two-family dwellings) as follows:
- 1. Each switchboard supplied by a feeder.
 - 2. Each branch circuit panelboard supplied by a feeder.
 - 3. Each disconnect switch serving elevators, escalators, moving walks, chairlifts, platform lifts and dumbwaiters.
 - 4. Each dry type transformer (or primary-side disconnect switch at transformer). If the primary-side disconnect is remote from the transformer, both the remote disconnect and the transformer shall be labeled, and the transformer label shall also indicate the location of the disconnect.
 - 5. Each feeder disconnect, branch circuit disconnect, panelboard or switchboard in a remote building or structure.
 - 6. Each on-site emergency power source, with sign placed at service entrance equipment to comply with NEC 700.
- N. The label shall identify the device or equipment where the power supply originates, and the system voltage, phase or line and system at all termination, connection and splice points. For example: Feeder Power Supply for Panel "XX" Originates at Panel "XX" (or Switchboard "XX", Transformer "XX", Switch "XX", etc.); 120/208 volts, 3-phase, Phase Color Identification (or 120/240, 277/480, etc.).

- O. Install Arc-flash hazard labels on the following equipment:
 - 1. Each piece of service entrance equipment.
 - 2. Each power distribution switchboard or panel.
 - 3. Each individually mounted circuit breaker.
 - 4. Each branch circuit panelboard.
 - 5. Each motor control center.
 - 6. Each individually mounted motor starter.
 - 7. Each meter socket enclosure.
- P. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere.
- Q. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
- R. Engrave all receptacle plates other than those serving 120 volt, single phase devices. State voltage and amperage characteristics: Example; "208V 30A".
- S. Mark each device box (for each type of wiring device) with a permanent ink felt tip marker, indicating the circuit that the device is connected to: Example; "CKT A-1"
- T. Label circuit breaker feeding fire alarm panel "Fire Alarm Circuit". Using plastic laminate label, white lettering on a red background.

END OF SECTION 26 0553

SECTION 26 0943 - LIGHTING CONTROL EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. Provide a lighting control system, including all system components, wiring, and any ancillary equipment necessary for a complete and working system. The system shall include all necessary components to achieve control and monitoring of all lighting fixtures, supporting both relay-switched and dimmed lighting solutions and controlled receptacles.
- B. Electrical drawings show general zoning intent and lighting control narrative.
- C. Energy Code: The system shall comply with latest edition of IECC energy code.
- D. Types of lighting control equipment specified in this section, includes the following:
 - 1. Low voltage relay control panels
 - 2. Occupancy sensors
 - 3. Daylight sensors
 - 4. Wallstations/Switches
 - 5. Lighting Load Controllers (Room Controllers)
 - 6. Emergency Lighting Control Units/Generator Transfer Devices
- E. Requirements are indicated elsewhere in these specifications for work including but not limited to raceways, electrical boxes and fittings required for installation of lighting control equipment, not work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years. To ensure a uniform installation and single responsibility, all switching and dimming equipment described herein shall be supplied by a single manufacturer.
- B. Installer: Qualified with at least 3 years of successful installation experience on projects with lighting control equipment installation work similar to that required for project.
- C. NEC Compliance: The control system shall comply with all applicable National Electrical Codes regarding electrical wiring standards.
- D. NEMA Compliance: The control system shall comply with all applicable portions of the NEMA Standard regarding the types of electrical equipment enclosure.

- E. Codes and Standards: Provide units that meet the requirements of IEEE Std. 2000.1.1999.
- F. Independent Testing Laboratory: Provide units that have been tested and listed under UL 916 energy management equipment.
- G. Component Pre-testing: All control equipment shall undergo strict inspection standards. The equipment shall be previously tested and burned-in at the factory prior to installation.

1.4 SUBMITTALS:

- A. Refer to Section 26 0502 for electrical submittal requirements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide lighting control equipment of one of the following;
 - 1. Cooper Controls
 - 2. Acuity nLight Controls
 - 3. Hubbell Building Automation
 - 4. Leviton Lighting Controls
- B. The lighting controls as shown are based upon Cooper lighting controls. Prior approval and commitment to being able to provide similar and equal system is required before bidding this project. Any system different from Cooper Controls that requires additional relays, etc. not shown on plans due to lack of separation of relays and dimming zones must be accounted for and provided in the bid and must function as similar to that which is required in final installation.
- C. Manufacturer's representative for division 26 and bidding controls shall be accountable for the comprehensive lighting controls package's finalization in alignment with the design intent depicted in the drawings and complying with IECC 2021 requirements. The lighting representative is required to develop detailed shop drawings demonstrating the lighting control system's topology and the essential connections necessary for its proper functioning. Lighting control devices shown are to provide general intent only. Manufacturer representatives to provide all additional devices and modify device locations as required to meet IECC 2021 requirements.

2.2 SYSTEM DESCRIPTION:

- A. The lighting control system shall provide seamless control and monitoring of all lighting included in the scope of work regardless of whether it is relay switched or dimmed.
- B. The lighting control system shall consist of low voltage relay control panels with programmable switch inputs, the panel shall be microprocessor controlled with a touchscreen interface display. The touchscreen shall provide relay status information viewable through a protected windowed enclosure. All local programming shall be permissible through the self-prompting touchscreen.
- C. Programmable intelligence shall include:
 - 1. Time of day control (64 time-of-day/holiday schedules)

2. 32 holiday dates
 3. Timed inputs (adjustable from 1 to 99 minutes)
 4. Timed override (from touchscreen, adjustable from 1 to 999 minutes, then resumes normal schedule)
 5. Pre-set controls
 6. Auto daylight savings adjust
 7. Low voltage Dimming/Central Dimming Controls:
 - a. 0-10V dimming capability
 - b. Daylighting control via 0-10V dimming relays and programming
 - c. DMX or other dimming protocols as indicated on plans
 8. Astronomical clock with offsets
 9. Local control (from touchscreen and local switch)
 10. Digital wallstations/switches
 11. Flash warning of impending off for occupants
 12. Network override
- D. The controller shall permit lighting to be overridden on for after-hours use or cleaning. The controller shall provide priority and masking choices to allow for customizing the functions of switch inputs, thereby enabling wallstations/switches to function differently at different times of day. These overrides shall be digital, network or hard-wired inputs.
- E. The lighting control system shall be fully programmable through PC programming software. Programming shall be permitted through a direct RS-232 connection, modem or TCP/IP.
1. Shall include with user-friendly software suitable for operation on computer workstations which serve as central control stations for the selection and operation of lighting scenes.
 2. All software shall be programed by the vendor and delivered ready to use. This program shall include preparation of all graphics, and displays required as a part of this project.
- F. The control system shall provide networking between lighting control panels. The network shall support up to a maximum of 254 control panels. Panels shall permit data sharing for global controls. All inputs shall be transferable over the network to create any switching pattern.
- G. The lighting control system shall log all control events. Log reports shall be available through the integral touchscreen or enterprise software.
- H. All lighting programing shall meet the requirements of the IECC 2018 or current energy code applied to the project.

2.3 EQUIPMENT:

- A. Room Controllers:
1. The room controller shall provide the following functionality;
 - a. Provide interface with room occupancy sensor to provide lighting and receptacle control and be programmable as either manual on/automatic

- off. Provide interface with room wallstations to provide multi-level switching and/or variable dimming. Provide interface with daylight sensors to provide daylighting controls of lighting fixture via multi-level (step dimming) and/or variable dimming.
2. The room controller shall be a fully functional lighting control system to match the room lighting and control requirements. The controller shall provide the following features:
 - a. Separate compartments for line voltage, emergency voltage and low voltage connections.
 - b. Breakouts for direct conduit connections.
 - c. Dual voltage (120/277 VAC)
 - d. Low voltage connections using standard RJ-45 connectors.
 - e. Zero cross circuitry for each load.
 - f. Relay and 0-10V dimming zone configuration to match room requirements.
 - g. The ability to be independently program or be re-programmed on site and without the need to replace or send the device to the manufacturer for re-programming.
 3. Emergency Lighting: When the room controller is provided with emergency relay, the controller shall be UL 924 Listed and monitor the normal power circuit. The UL 924 relay will track the normal power operation. Upon loss of normal power the emergency lighting will be forced on to full bright (if dimming) until normal power is restored. The following features shall be included:
 - a. 120/277 VAC
 - b. Push-to-test
 4. Daylight sensors shall work with the room controller to provide automatic daylight dimming capabilities for loads connected to the room controller. The daylight sensor shall include the following features:
 - a. An additional photodiode that measures only the visible spectrum.
 - b. The sensor shall have three light level ranges;
 - i. Low (3-300 LUX), high (30-3000 LUX) and direct sun (300-30,000 LUX).
 - c. The sensor shall provide the capability of controlling multiple (up to three) daylight zones for dimming daylight harvesting.
 - d. The sensor shall include an internal photodiode that measures light in a 60 degree angle cutting off the unwanted light from the interior of the room.
 5. Ceiling Mounted Occupancy Sensors: Sensors shall utilize dual-technology (ultrasonic and infrared technologies) and have the following additional features:
 - a. Sensor shall be class 2, low voltage; capable of mounting in the ceiling for maximum coverage.
 - b. Sensor shall have automatic self-adjustment algorithm that adjusts timer and sensitivity settings to maximize performance and minimize energy usage.
 - c. Sensor shall have 360 degree field of view.
 - d. Sensor shall incorporate non-volatile memory such that all settings and parameters are saved in protected memory.
 - e. Sensor shall have time delays from 10 to 30 minutes.

- f. Sensor shall provide a visual means of indication that motion is being detected via an LED.
 - g. Sensors shall have readily accessible, user adjustable settings for time delay and sensitivity.
 - h. Provide internal additional isolated relay with NO, NC and common outputs for use with HVAC control, data logging and other control options.
- 6. Wallstations: Provide low voltage push-button type switches up to 8 button configurations to match requirements of lighting control within the room. Provide factory engraved labeling for individual push buttons. Provide in a color to match wiring devices and coverplates to match devices and plates in Wiring Devices (Section 26 2726). Wallstation shall connect to the room controller via the room controller local network. Wallstations that require user interface to allow for raise/lower control of dimming, loads shall include a slider function or similar. All wallstations shall have the ability to be independently program or be re-programmed on site and without the need to replace or send the device to the manufacturer for re-programming.
- B. Emergency Power Control (CEPC)/ Emergency Lighting Control Units (ELCU)/Generator Transfer Devices (Required when not built into Room Controller, Relay Panel, etc):
 - 1. The Emergency Power Control (CEPC)/Lighting Control Unit (ELCU) shall provide all required functionality to allow any standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building. The unit shall be installed flush to the ceiling so that test switch & LED's are in plain view of room occupants as required by some local electrical codes.
 - 2. The device shall automatically illuminate connected emergency loads upon utility power interruption, regardless of room switch position. (NEC 700.24)
 - 3. Local room switch or lighting control shall turn both regular & emergency luminaires on at the same time (no dedicated emergency room switch required).
 - 4. The emergency lighting control unit shall allow control of emergency lighting fixtures in tandem with normal lighting in an area while ensuring that emergency lighting will turn on immediately to full brightness upon loss of normal power supplying the control device. Emergency lighting operation shall be independent for each controlled area and shall not require a generalized power failure for proper operation.
 - 5. The unit shall be compatible with 2-wire, 3-wire, 0-10V, & DALI dimming systems & ballasts.
 - 6. The device shall be self-contained, measure 1.70" x 2.97" x 1.64," and provide integral one half inch pip nipple mount with snap in locking feature for mounting into a standard junction box KO.
 - 7. The device shall have normally closed dry contacts capable of switching 20 amp emergency ballast loads @ 120-277 VAC, 60 Hz, or 10 amp tungsten loads @ 120 VAC, 60 Hz.

8. The device shall have universal rated voltage inputs provided for normal power sense and normal switched power at 120-277 VAC, 60 Hz.
9. The device shall have an integral momentary test switch. Pressing and holding this switch shall instantly force the unit into emergency mode and turn on emergency lighting. Releasing the test switch shall immediately return the unit to normal operation.
10. The unit shall provide dedicated leads and 24 VDC source for connection to remote test switch, fire alarm system, or other external system capable of providing a normally closed dry contact closure. Breaking contact between the terminals shall force and hold the emergency lighting on until the terminals are again closed. An integral LED indicator shall indicate the unit's current remote activation status.
11. The device shall provide separate LEDs to indicate the presence of normal and emergency power sources. The LEDs shall indicate the unit's current operational mode (normal or emergency).
12. The device's normal power input lead shall be connected to the line side of the control device such that any upstream fault causing a loss of power, including the tripping of the branch circuit breaker, will force the unit into the emergency mode and turn on the emergency lighting.
13. The unit shall automatically switch emergency lighting on and off as normal lighting is switched. When normal power is not available, the unit shall force and hold emergency lighting on regardless of the state of any external control device until normal power is restored.
14. The unit shall utilize zero crossing circuitry to protect relay contacts from the damaging effects of inrush current generated by switching electronic ballast loads.
15. The unit shall have UL 94-V0 or UL 94-5VA flame rating & be approved for installation above the suspended ceiling.
16. To ensure quality and reliability, the unit shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.
17. The device shall not generate any objectionable electrical or mechanical noise.
18. The unit shall be UL and cUL listed and labeled for connection to both normal and emergency lighting power sources.

PART 3 - EXECUTION:

3.1 INSTALLATION OF LIGHTING CONTROL EQUIPMENT:

- A. Install lighting control system components and ancillary equipment as indicated, in accordance with equipment manufacturers written instructions, and with recognized industry practices, to ensure that lighting control equipment complies with requirements.

- B. Comply with Requirements of NEC, and applicable portions of NECA's 'Standard of Installation' pertaining to general electrical installation practices.
- C. Coordinate with other electrical work, including raceways, electrical boxes and fittings, as necessary to interface installation of lighting control equipment work with other work.
- D. Electrical Identification: Refer to Section 26 0553 for requirements.

3.2 FIELD QUALITY CONTROL:

- A. Upon completion of installation and after circuitry has been energized, demonstrate capability and compliance of system with requirements.
- B. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

3.3 PRODUCT SUPPORT AND SERVICES:

- A. System Start-Up: Provide a factory authorized technician to verify the installation, test the system, and train the owner on proper operation and maintenance of the system. Before requesting start-up services, the installing contractor shall verify that:
 - 1. The control system has been fully installed in accordance with manufacturer's installation instructions.
 - 2. Low voltage wiring for overrides and sensors is completed.
 - 3. Accurate 'as-built' load schedules have been prepared for each lighting control panel.
 - 4. Proper notification of the impending start-up has been provided to the owner's representative.
 - 5. Programming of all wallstations/switches, relays, groups of relays and interfaces with building automation shall be completed by factory authorized technician, prior to final and training.
- B. Factory support: Factory telephone support shall be available at no cost to the owner during the warranty period. Factory assistance shall consist of assistance in solving programming or other application issues pertaining to the control equipment. The factory shall provide a toll free number for technical support.

3.4 PROGRAMMING:

- A. Program of all lighting control systems as directed by the electrical engineer and/or owner. Meet with the electrical engineer at their office prior to preparation of shop drawings to discuss specific programming and zoning requirements of system(s). Each networked or standalone system shall be programmed to revert back to its normal "ON" position one hour after selecting a scene or raising or lowering a lighting zone.
- B. All lighting programming shall meet the requirements of the IECC 2021 or current energy code applied to the project.

3.5 COMMISSIONING:

- A. A lighting control system requires at least one site visit for proper commissioning. If multiple site visits are required, the first ensures that the contractor is trained to install the system correctly. On the second, the factory trained engineer will start up the system, ensure that it is operating according to specification, and perform initial programming.

The third visit is for the purposes of refining the programming, and training the owner/end user on the system.

- B. Provide factory-certified field service engineer to ensure proper system installation and operation under following parameters:
1. Certified by the equipment manufacturer on the system installed.
 2. Site visit activities:
 - a. Verify connection of power feeds and load circuits.
 - b. Verify connection of controls.
 - c. Verify system operation control by control, circuit by circuit.
 - d. Obtain sign-off on system functions.
 - e. Demonstrate system capabilities, operation and maintenance and educate Owner's representative on the foregoing.
 3. At least three site visits to accomplish the following tasks:
 - a. Prior to wiring:
 - i. Review and provide installer with instructions to correct any errors in the following areas:
 1. Low voltage wiring requirements
 2. Separation of high and low voltage wiring runs
 3. Wire labeling
 4. Load schedule information
 5. Switching cabinet locations and installation
 6. Physical locations and network addresses of controls
 7. Ethernet connectivity
 8. Computer-to-network connections
 9. Load circuit wiring
 10. Connections to other systems and equipment
 11. Placement and adjustment of Occupancy Sensors
 12. Placement and adjustment of Photocells

b. After system installation:

- i. Check and approve or provide correction instructions on the following:
 1. Connections of power feeds and load circuits
 2. Connections and locations of controls
 3. Connections of low voltage inputs
 4. Connections of the data network
- ii. Turn on system control processor and upload any pre-programmed system configuration
- iii. Verify cabinet address(es)
- iv. Upload pre-programmed system configuration and information to switching and/or dimming cabinets
- v. Check load currents and remove bypass jumpers
- vi. Verify that each system control is operating to specification
- vii. Verify that each system circuit is operational according to specification
- viii. Verify that manufacturers' interfacing equipment is operating to specification
- ix. Verify that any computers and software supplied by the manufacturer are performing to specifications
- x. Verify that any remote WAN (Wide Area Network) connections are operating properly
- xi. Have an owner's representative sign off on the above-listed system functions

c. Before project completion and hand-off:

- i. Demonstrate system capabilities and functions to owner's representative
- ii. Train owner's representative on the proper operation, adjustment, and maintenance of the system.

- C. Notification: Upon completion of the installation, the contractor shall notify the manufacturer that the system is ready for formal checkout. Notification shall be given in writing a minimum of 21 days prior to the time factory-trained personnel are required on site. Each field installed RJ45 connection must be tested prior to system interconnection. A test report must be furnished to manufacturer prior to scheduling commissioning activity. Manufacturer shall have the option to waive formal turn-on.

- D. Turn-On: Upon completion of all line, load and interconnection wiring, and after all fixtures are installed and lamped, Manufacturer's Certified Technician shall completely check the installation prior to energizing the system. Each installed relay system shall be tested for proper ON/OFF operations, and proper LED illumination. Each installed control cabinet shall be tested verifying that each controlled load adjusts to the selected setting and that all switch LED's illuminate properly.
- E. Provide written commissioning report including space/room names and numbers indicating list of all lighting equipment and devices tested and verifying proper operation of the system. Report shall include corrections, programming information/file, warranties, and owner's representative sign off on the above-listed system functions
- F. At the time of checkout and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

3.6 RETRO-COMMISSIONING:

- A. During the one year warranty period, provide retro-commissioning services at three month, six month, nine month, and one year marks. Provide at least 4 hours of commissioning service for each of the four retro-commissioning periods. This will include meeting with the Owner to receive feedback on the system and making changes to the system including programming, task tuning.

3.7 MAINTENANCE:

- A. Enable the end user to order new equipment for system expansion, replacements, and spare parts.
- B. Make new replacement parts available for a minimum of ten years from the date of manufacture.
- C. Manufacturing shall provide telephone technical support by factory personnel 24 hours a day, 7 days a week. Project cost overruns and delays can occur without this service. Answering services can add to frustration and delay the resolution of any problems or issues. Manufacturers who do not offer factory-direct technical support on a 24/7 basis should not be acceptable on this project.
- D. Provide factory-direct technical support hotline 24 hours per day, 7 days per week.
- E. Offer renewable annual service contracts, to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of system commissioning.

3.8 WARRANTY:

- A. Manufacturer shall provide a one (1) year limited warranty on lighting control system. A ten (10) year limited warranty shall be provided on the lighting control relays.

3.9 AS-BUILT DRAWINGS:

- A. A complete set of 'as-builts' drawings showing installed wiring, specific interconnections between all equipment, and internal wiring of this equipment shall be included in the operating and maintenance manuals upon complete of the system.
- B. Provide a CD or USB storage (media) device to the owner containing the information

specified below. The media shall include all information required to allow the Owner to change the schedules themselves. The media shall contain a minimum of following:

1. CAD drawing files of 'as-built' lighting control components and point to point connections.
2. General configuration programming.
3. Job specific configuration programming to include schedule.
4. Tutorial file on complete programming of lighting control system.

3.10 TRAINING:

- A. Provide a CD or USB device to the owner containing the information specified below. The media shall include all information required to allow the Owner to change the schedules themselves. The media shall contain a minimum of following:
 1. CAD drawing files of 'as-built' lighting control components and point to point connections.
 2. General configuration programming.
 3. Job specific configuration programming to include schedule.
- B. Tutorial file on complete programming of lighting control system

END OF SECTION 26 0943

BLANK PAGE

SECTION 26 2726 - WIRING DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to wiring devices specified herein.

1.2 DESCRIPTION OF WORK:

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems that are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this section include the following:
 - 1. Receptacles
 - 2. Switches
 - 3. Flat Panel Display Wall Box

1.3 QUALITY ASSURANCE:

- A. Comply with NEC and NEMA standards as applicable to construction and installation of electrical wiring devices. Provide electrical wiring devices that have been UL listed and labeled.

1.4 SUBMITTALS:

- A. Refer to Section 260502 for electrical submittal requirements.

PART 2 - PRODUCTS

2.1 FABRICATED WIRING DEVICES:

A. GENERAL:

- 1. Provide factory-fabricated wiring devices, in types, and electrical ratings for applications indicated and complying with NEMA Stds. Pub No. WD 1.
- B. Provide wiring devices (of proper voltage rating) as follows:

	<u>RECEPTACLE</u>	<u>SWITCHES</u>			
<u>MFGR</u>		<u>1-POLE</u>	<u>3-WAY</u>	<u>4-WAY</u>	<u>W-PILOT</u>
Hubbell	BR20XTR	HBL 1221	HBL 1223	HBL 1224	HBL 1221-PL
Bryant		1221	1223	1224	1221-PL
Pass Seymour	TR63X	20AC1	20AC3	20AC4	20AC1-RPL
Leviton	TWR20-X	1221	1223	1224	

Cooper	TR5362	1221	1273	1224	1221-PL
--------	--------	------	------	------	---------

C. Provide devices in colors selected by Architect. Provide red devices on all emergency circuits.

D. SURGE PROTECTIVE (SPD) RECEPTACLES:

1. Provide SPD receptacles having 4 series parallel 130V MOV's capable of a minimum of 140 joules suppression. Provide units with visual (and audible) surge status indicators to monitor condition of surge circuit; visual indicator to be "on" when power present and suppression circuit is fully functional. (Audible indicator shall sound a "beep" alarm approximately every 30 seconds if suppression circuit has been damaged.) Provide NEMA 5-20R, 20 amp, 125V receptacle of one of the following manufacturers:

	<u>MANUFACTURER</u>	
<u>SPECIFICATION GRADE</u>	<u>HUBBELL</u>	<u>PASS SEYMOUR</u>
Duplex Recept-Visual only	5350	5352 XXXSP
Duplex Recept-Visual/Audible	5352	5362 XXXSP
Single Recept-Visual only	5351	N/A
Duplex Recept-Isol Gnd, Visual/Audible	IG5352S	IG5362 XXXSP
Single Recept-Isol Gnd, Visual only	IG5351S	N/A
<u>HOSPITAL GRADE</u>	<u>HUBBELL</u>	<u>PASS SEYMOUR</u>
Duplex Recept-Visual/Audible	8300HS	8300 XXXSP
Single Recept-Visual only	8310HS	N/A
Duplex Recept-Isol Gnd, Visual/Audible	IG8300HS	IG8300 XXXSP
Single Recept-Isol Gnd, Visual only	IG8310HS	N/A

2. Provide (1) SPD receptacle in all Flat Panel Display Wall Boxes ('DP' symbol)
3. Color of devices selected by Architect. Provide red devices on all emergency circuits.

E. GROUND-FAULT INTERRUPTER:

1. Provide general-duty, duplex receptacle, ground-fault circuit interrupters; feed-thru types, capable of protecting connected downstream receptacles on single circuit; grounding type UL-rated Class A, Group A, 20-amperes rating; 120-volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 milliamperes ground-fault trip level; color as selected by Architect. Provide Hospital grade where required elsewhere by specification or drawings. Provide units of one of the following:
 - a. P&S/Sierra
 - b. Hubbell
 - c. Leviton
 - d. Square D

F. USB RECEPTACLE

1. Provide duplex receptacle with two (2) USB 3.0 amps, 5VDC, 2.0 Type A charging ports.
2. Provide products of one of the following:
 - a. Bryant – USB20-X
 - b. Cooper – TR7736-X
 - c. Hubbell – USB20X2-X
 - d. Legrand – TR5362USB-X
 - e. Leviton – T5832-X

G. TAMPER RESISTANT RECEPTACLES:

1. Provide tamper resistant receptacles in the following areas; Dwelling units, child care facilities, guest rooms, guest suites, elementary schools and pediatric locations within healthcare facilities.
2. Provide products of one of the following:
 - a. Leviton-TWR20-X
 - b. Hubbell – BR20XTR
 - c. Pass Seymour – TR63X
 - d. Cooper – TR5362

2.2 FLAT PANEL DISPLAY WALL BOX:

- A. Provide a factory assembled display wall box made of 14 gauge steel. Wall box shall have provisions for a UL Listed single gang box for mounting of duplex receptacle and additional back box with a minimum of (1) 1 ¼" conduit opening to allow for low voltage terminations. Coordinate low voltage plate configuration with drawings. Provide device manufactured by one of the following:

1. Stud Walls:
 - a. FSR Metal Products – PWB-100
 - b. FSR Metal Products – PWB-FR-450 (Use at fire rated walls)
2. Masonry Walls
 - a. FSR Metal Products – PWB-CMU8

B.

2.3 WIRING DEVICE ACCESSORIES:

A. WALL PLATES:

1. Provide stainless steel cover plates in all finished areas. Provide galvanized steel plates in unfinished areas. Provide blank coverplates for all empty outlet boxes.

PART 3 – EXECUTION

3.1 GENERAL

- A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation" and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical box and wiring work, as necessary to interface installation of wiring devices with other work. Install devices in boxes such that front of device is flush and square with coverplate. Drawings are small scale and, unless dimensioned, indicate approximate locations only of outlets, devices, equipment, etc. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned and coordinate with other work. Verify all dimensioned items on job site. Consult architectural cabinet, millwork, and equipment shop drawings before beginning rough-in of electrical work. Adjust locations of all electrical outlets as required to accommodate work in area, and to avoid conflicts with wainscoat, back splash, tackboards, and other items.
- C. Where stranded conductors have been utilized, provide solid pigtails to terminate at device.
- D. Provide receptacles in surface raceway at 12" on center unless indicated otherwise.
- E. Install wiring devices only in electrical boxes that are clean; free from excess building materials, dirt, and debris.
- F. Install blank plates on all boxes without devices.
- G. Delay installation of wiring devices until wiring work and painting is completed. Provide separate neutral conductor from panel to each GFI receptacle.
- H. Install GFI receptacles for all receptacles installed in the following locations:
 - 1. Restrooms, locker rooms, kitchens, within 6 feet of any sink, or when serving vending machines and electric drinking fountains.
 - 2. Indoor wet locations, non-dwelling garages, elevator rooms and pits.
 - 3. Outdoors, and on rooftops.
 - 4. Dwelling unit garages, crawlspaces and unfinished basements, accessory buildings, boathouses, and receptacles for boat hoists.
 - 5. Label all receptacles (non-GFI), protected downstream of a GFI receptacle or protected by GFI circuit breaker, with an indication that it is protected.
- I. Where light switches or wall box dimmers are specified, provide a separate neutral for each phase of the branch circuits that switches or dimmers are connected.
- J. Electrical Identification: Refer to Section 260553 for requirements.

3.2 PROTECTION OF WALL PLATES AND RECEPTACLES:

- A. At time of substantial completion, replace those items, that have been damaged, including those stained, burned and scored.

3.3 GROUNDING:

- A. Provide electrically continuous, tight grounding connections for wiring devices, unless otherwise indicated.

3.4 TESTING:

- A. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections. After energizing circuitry, test wiring devices to demonstrate compliance with requirements.

END OF SECTION 26 2726

BLANK PAGE

SECTION 26 2815 - OVERCURRENT PROTECTIVE DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to overcurrent protective devices specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of overcurrent protective device work is indicated by drawings and schedules and specified herein. Overcurrent protective devices specified herein are for installation as individual components in separate enclosures; and for installation as integral components of switchboard and panelboards. See Section 262413, Switchgear and Switchboards, and Section 262416, Panelboards.
- B. Contractor shall verify type and cost of all overcurrent protective devices required within existing gear and panelboards. Contractor shall include the necessary cost to provide devices within their bid.
- C. Types of overcurrent protective devices in this section include the following for operation at 600 Volts and below:
 - 1. Molded case thermal circuit breakers
- D. Refer to other Division-26 sections for cable/wire and connector work required in conjunction with overcurrent protective devices.

1.3 QUALITY ASSURANCE

- A. Comply with NEC requirements and NEMA and ANSI standards as applicable to construction and installation of overcurrent devices.

1.4 SUBMITTALS: Refer to Section 26 0503 for requirements.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide products of one of the following (main and branch device manufacturer must be same as panelboard and/or switchboard manufacturer):
- B. PROVIDE CIRCUIT BREAKERS WITHIN EXISTING GEAR:
 - 1. General Electric Co.
- C. MOLDED CASE THERMAL TRIP CIRCUIT BREAKERS:
 - 1. Provide factory-assembled, molded case circuit breaker for power distribution panelboards and switchboards; and for individual mounting, as indicated. Provide breakers of amperage, voltage, and RMS interrupting rating shown, with permanent thermal trip and adjustable instantaneous magnetic trip in each pole. Series rated systems are not acceptable. Construct with overcenter, trip-free,

toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Construct breakers for mounting and operating in any physical position and in an ambient temperature of 40 degrees C. Provide with mechanical screw type removable connector lugs, AL/CU rated, of proper size to accommodate conductors specified.

2. Circuit breakers 15 amps through 599 amps shall be molded case thermal trip circuit breakers.

PART 3 – EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES:

- A. Install overcurrent protective devices as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.
- B. Coordinate with work as necessary to interface installations of overcurrent protective devices with other work.
- C. Install fuses in overcurrent protective devices. For motor circuits, fuse sizes shown on drawings are for general guidance only. Size fuses in accordance with fuse manufacturer's recommendation for given motor nameplate ampere rating. Test operation. If nuisance tripping occurs, increase fuse size and disconnect device (if necessary) as required to provide nuisance free tripping. Adjust fuse size properly for ambient temperature, frequent starting and stopping of motor loads, and for loads with long start times. Include all costs in bid.
- D. Electrical Identification: Refer to Section 260553 for requirements.

3.2 FIELD QUALITY CONTROL

- A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION 26 2815

SECTION 26 2816 - MOTOR AND CIRCUIT DISCONNECTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to motor and circuit disconnect switches specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of motor and circuit disconnect switch work is indicated by drawings and schedule. Work includes complete installations and electrical connections.

1.3 QUALITY ASSURANCE:

- A. Provide motor and circuit disconnect switches which have been UL listed and labeled. Comply with applicable requirements of NEMA Standards Pub. No. KS 1, and NEC.

1.4 SUBMITTALS:

- A. **PRODUCT DATA:** Submit manufacturer's data including specifications, installation and general recommendations, for each type of motor and circuit disconnect switch required.
- B. **SHOP DRAWINGS:** Submit dimensioned drawings of electrical motor and circuit disconnect switches which have rating of 100 amperes and larger.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. **MANUFACTURER:** Subject to compliance with requirements, provide products of one of the following (for each type of switch):
 - 1. General Electric Company
 - 2. Square D Company
 - 3. Siemens Energy & Automation, Inc.
 - 1. Cutler Hammer Products, Eaton Corp

2.2 FABRICATED SWITCHES:

- A. **GENERAL:** Provide disconnect and safety switches as indicated herein. Provide:
 - 1. General duty switches on 240 Volt rated circuits.
 - 2. Heavy duty switches on 480 volt rated circuits.
 - 3. HP rated switches on all motor circuits.
- B. **GENERAL DUTY SWITCHES:** Provide general-duty type, sheet-steel enclosed switches, fusible or non-fusible as indicated of types, sizes and electrical characteristics

indicated; rated 240 volts, 60 hertz; incorporating spring assisted, quick-make, quick-break mechanisms. Provide single phase or three phase and with solid neutral as required by application. Equip with operating handle which is capable of being padlocked in OFF position. Provide NEMA 1 or NEMA 3R as required by application, unless noted. Provide fusible switches with Class R rejection fuse clip kits.

- C. **HEAVY-DUTY SWITCHES:** Provide heavy-duty type, sheet-steel enclosed safety switches, fusible or non-fusible as indicated, of types, sizes and electrical characteristics indicated; rated 600 volts, 60 hertz; incorporating quick-make, quick-break type mechanisms. Provide single phase or 3 phase, and with solid neutral as required by application. Equip with operating handle which is capable of being padlocked in OFF position. Provide NEMA 1 or NEMA 3R as required by application unless noted. Provide fusible switches with Class R rejection fuse clip kits.
- D. **FUSES:** Provide fuses for switches, as required of classes, types and ratings needed to fulfill electrical requirements for service indicated. Provide spare fuses amounting to one spare fuse for each 10 installed but not less than three of any one type and size. See Section 262815 Overcurrent Protective Devices for fuse types.

PART 3 - EXECUTION

3.1 INSTALLATION OF MOTOR AND CIRCUIT DISCONNECT SWITCHES:

- A. Install motor and circuit disconnect switches where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation" and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate motor and circuit disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.
- C. Install disconnect switches used with motor driven appliances, and motors and controllers within sight of controller position.
- D. For disconnect switches serving motors controlled by variable frequency drives, provide late-make, early-break auxiliary contacts on each disconnect switch. Provide Heavy-Duty switch. Wire auxiliary contact to VFD safety contact, such that disconnecting the motor will shut down the drive first, and closing the switch will start the drive only after power is applied to the motor.
- E. For disconnect switches serving elevators with auxiliary power hydraulic units, provide auxiliary contacts on each disconnect switch. Wire auxiliary contact to auxiliary power such that disconnecting the motor will disconnect the auxiliary power.

END OF SECTION 26 2816

SECTION 26 4119 - DEMOLITION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Special Provisions, Division 1 and Division-2 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to demolition.

1.2 DESCRIPTION OF WORK:

- A. Extent of major items of demolition work is indicated by drawings. Other demolition work shall be performed as required to maintain system operation.
- B. The intent of the drawings is to indicate major items affected and not to show every device, outlet, fixture, etc. affected by demolition work.
- C. The drawings do not necessarily reflect as-built conditions. The contractor shall visit the jobsite prior to bidding to determine the overall scope of demolition work.
- D. Refer to sections of other Divisions for applicable requirements affecting demolition work.
- E. Refer to Section 260500 for requirements with regard to power outages affecting the operation of existing electrical systems.

1.3 QUALITY ASSURANCE:

A. NEC COMPLIANCE:

- 1. Comply with applicable portions of NEC as to methods used for demolition work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL:

- A. Demolition work shall be laid out in advance to eliminate unnecessary cutting, drilling, channeling, etc. Where such cutting, drilling, or channeling becomes necessary, perform with care, use skilled mechanics of the trades involved. Repair damage to building and equipment. Cutting work of other Contractors shall be done only with the consent of that Contractor. Cutting of structural members shall not be permitted.

3.2 PATCHING AND REPAIR

- A. The Contractor is responsible for all demolition, patching and repair of all finished interior surfaces pertaining to the installation of this particular phase of work. All surfaces shall be finished (painted, etc.) to match the adjacent materials, finishes and colors.
- B. Hard surfaces: Whenever demolition or excavation is required for the installation of the electrical system, it shall be the responsibility of this contractor to make repairs and/or replacements of hard finish surfaces such as concrete, asphalt, roofing, etc.
- C. The method of patching and repair shall follow good construction practices and all finished surfaces shall match materials and finish wherein the demolition occurred.

3.3 EXISTING EQUIPMENT

- A. The following is a part of this project and all costs pertaining thereto shall be included in the base bid.
- B. The new electrical equipment and apparatus shall be coordinated and connected into the existing system as required. Auxiliary systems shall comply, unless otherwise specified.
- C. The existing electrical devices, conduit and/or equipment that for any reason obstructs construction shall be relocated. Provide conduit, wiring, junction boxes, etc. as required to extend existing circuits and systems to relocated devices or equipment.
- D. The new fixtures indicated for existing outlets shall be installed in accordance with the fixture specifications.
- E. When installing equipment in the existing building, it shall be concealed.
- F. All existing electrical equipment and systems in portions of the building not being remodeled shall be kept operational, in service and in working condition throughout the entire construction period. Restore any circuits and systems interrupted. Provide temporary panels, temporary wiring and conduit, etc. as required.
- G. Maintain circuit integrity and continuity of all existing circuits and systems that interfere with or are interrupted by remodel work unless those circuits are to be abandoned completely. Maintain all circuits and systems in operation during construction. Provide temporary panels, temporary wiring and conduit, etc. as required.
- H. Existing raceways may be used where possible in place, except as noted. All circuits, conduit and wire that are not used in the remodeled area shall be removed back to the panelboard, where it shall be labeled a spare with circuit number indicated. Re-used raceway shall meet all requirements for new installations.
- I. The existing light fixtures that are not used in the remodeled area shall be carefully removed, and turned over to the owner or properly disposed of. Those fixtures indicated for re-use shall be thoroughly cleaned, repaired as required, re-lamped and installed as indicated.
- J. Move and adjust existing lighting as required for demolition and construction.
- K. Obtain permission from the Architect and Owner's representative before penetrating any ceiling, floor, and wall surfaces.
- L. Any and all equipment having electrical connections that require disconnecting and reconnection at the same or another location throughout the course of construction shall be included as part of this contract.

END OF SECTION 26 4119

SECTION 26 5100 - INTERIOR AND EXTERIOR BUILDING LIGHTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. Types of lighting fixtures in this section are indicated by schedule and include the following:
 - 1. LED (Light Emitting Diode)

1.3 QUALITY ASSURANCE:

- A. Comply with NEC, NEMA and ANSI 132,1 as applicable to installation and construction of lighting fixtures. Provide lighting fixtures that have been UL-listed and labeled.
- B. Components and fixtures shall be listed and approved for the intended use by a National Recognized Testing Laboratory (NRTL) including: UL, ETL, and CSA or equivalent
- C. All led products shall comply with the latest version of Illuminating Engineer Society (IES) publications LM-79 and LM-80.

1.4 SUBMITTALS:

- A. Refer to Section 260502 for electrical submittal requirements.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide products of one of the following (for each type of fixture):
 - 1. LED:
 - a. Cree
 - b. Nichia
 - c. Samsung
 - d. Philips Lumiled
 - e. Osram
 - f. Xicato

2.2 INTERIOR AND EXTERIOR LIGHTING FIXTURES:

A. GENERAL:

- 1. Provide lighting fixtures, of sizes, types and ratings indicated complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, ballasts,

LED drivers, starters, and wiring. Label each fixture with manufacturer's name and catalog number. Provide all enclosed fixtures with positive latch mechanisms; spring tension clips not acceptable. Provide all exterior fixtures with damp or wet location label as required by application.

B. SUPPORT REQUIREMENTS:

1. Provide all pendant and stem hung fixtures with flexible ball joint hangers at all points of support. Equip hooks used to hang fixtures with safety latches. Provide all detachable fixture parts, luminous ceiling accessories, louvers, diffusers, lenses, and reflectors with locking catches, screws, safety chain, or safety cable.

C. LIGHT EMITTING DIODE (LED) LUMINAIRES:

1. LED luminaires that can be serviced in place shall have a disconnecting means internal to the luminaires to disconnect simultaneously from the source of supply all conductors of the driver, including the grounded conductor. Disconnects shall not be required under the following exceptions:
 - a. Luminaires located in hazardous locations.
 - b. Luminaires used for egress lighting.
 - c. Cord-and-plug luminaires.
 - d. In industrial establishments with restricted public access where conditions of maintenance and supervision ensure that only qualified persons service the installation.
 - e. Where more than one luminaire is installed in a space and where disconnecting the supply conductors to the luminaire will not leave the space in total darkness.
 - f. Provide LED luminaires which are tested in accordance with IES LM-79, diodes tested in accordance with IES LM-80, and provide a minimum R9 rating of ≥ 50 (unless specified differently), a CRI rating of $\geq$ than 80 and L70 (6K) = 50,000 hours (IES TM-21). Provide with 0-10V dimming drivers as standard.
 - g. The fixture manufacturer(s) shall warrant the luminaires, in their entirety, to be free from defects in material or workmanship for at least 5 years from date of manufacture. Provide warranty in accordance with other sections of this specification and include a certificate of warranty from the fixture manufacturer with extended warranty information and proper forms and procedure description.

D. DIFFUSERS:

1. Where plastic diffusers are specified, provide 100 percent virgin acrylic compound; minimum thickness, .125 inches.

PART 3 - EXECUTION

3.1 INSTALLATION OF LIGHTING FIXTURES

- A. Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standards of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.
- B. Coordinate with other work as appropriate to properly interface installation of lighting fixtures with other work. Consult architectural reflected ceiling plan for exact location of all

lighting fixtures.

- C. Provide all necessary supports, brackets, and miscellaneous equipment for mounting of fixtures. Support all ceiling mounted fixtures from the building structure; independent of the ceiling system, unless noted. Support each recessed fixture (fluorescent incandescent, and/or HID) from the building structure with #12 ga. steel wire attached to each corner (in addition to supports normally provided for attachment to the ceiling system). Provide backing supports above (or behind) sheetrock, plaster and similar ceiling and wall materials. Support surface mounted ceiling fixtures from channel. Support ceiling mounted outlet boxes independent of the raceway system, and capable of supporting 200 pounds. Feed each recessed fixture directly from an outlet box with flex conduit as required; do not loop from fixture to fixture. See plans for additional details.
- D. **FIXTURE WHIPS:**
 - 1. Provide each lay-in light fixture with at least 36" (Not to exceed 72") of 3/8" steel flexible conduit.
 - 2. With-in spaces utilizing 0-10v control schemes ie: Room Controllers, the fixture whip shall be comprised of a MC-PCS Cable (see Section 26 0532 Conduit raceways) with at least 36" and not to exceed 72" in length located above removable grid ceilings.
- E. Coordinate lighting in mechanical room with duct and equipment locations to avoid obstruction of illumination.
- F. Provide gypsum board protection as required, (acceptable to fire official having jurisdiction) to ensure fire rating of each ceiling that the fixtures are installed in.
- G. **COORDINATION MEETINGS:**
 - 1. Meet at least twice with the architect and ceiling installer. Hold first meeting before submittal of shop drawings to coordinate each light fixture mounting condition with ceiling type. During second meeting, coordinate fixture layout in each area.
 - a. Coordinate mounting height of pendant and wall mounted fixtures.
 - b. Coordinate conduit layout in all open ceiling spaces e.g. Gym, Commons, Auditorium, etc. with architect prior to rough-in.
 - 2. Meet at least twice with the AV/Intercom systems Installer. Hold first meeting before submittal of shop drawings to coordinate each AV equipment, speaker mounting condition with ceiling type. During second meeting, coordinate AV equipment, speaker layout in each area.
 - 3. Meet at least once with the mechanical installer prior to fabrication and installation of duct work. Coordinate depth and location of all fixtures and duct work in all areas.
- H. **ADJUST AND CLEAN:**
 - 1. Clean lighting fixtures of dirt and debris upon completion of installation.
 - 2. Protect installed fixtures from damage during remainder of construction period. Repair all nicks and scratches to appearance of original finish.

3.2 FIELD QUALITY CONTROL:

- A. Upon completion of installation of lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements.
- B. Where possible, correct malfunctioning units at site, then retest to demonstrate

compliance; otherwise remove and replace with new units, and proceed with retesting.

- C. At the time of Substantial Completion, replace lamps in interior lighting fixtures that are observed to be noticeably dimmed after the Contractor's use and testing, as judged by Architect/Engineer.

D. GROUNDING:

- 1. Provide equipment grounding connections for each lighting fixture.

END OF SECTION 26 5100



INFORMATION TECHNOLOGIES
8/31/2018



Canyons School District

Network Cabling Global Specification

Information Technologies

**Final Draft
Wednesday August 31, 2018**



Scot McCombs
Director of IT

Table of Contents



	1
I. GENERAL	<u>44</u>
A. Purpose	<u>44</u>
B. Scope of Work - Typical	<u>44</u>
C. Applicable Regulatory References	<u>55</u>
D. Substitution Policy	<u>99</u>
E. Contractor Qualifications	<u>99</u>
F. Warranty	<u>1111</u>
II. Installation and Maintenance Guidelines	<u>1414</u>
A. Maintenance of Patch Fields	<u>1414</u>
B. Cable Pulling and Termination	<u>1414</u>
III. Cabling Systems and Associated Infrastructure	<u>1717</u>
A. Cabling Subsystem I – Horizontal Cabling System	<u>1717</u>
C. Cabling Subsystems II - Intrabuilding Backbone Fiber	<u>2424</u>
D. Cable Pathways	<u>2828</u>
E. 19" Racks and Rack-mount Cable Managers	<u>2929</u>
F. Cable Accessories	<u>3333</u>
G. Communications Grounding Network	<u>3333</u>
H. Communications Entrance Facilities	<u>3636</u>
IV. Network Labeling	<u>3636</u>
A. General Requirements	<u>3636</u>
V. Testing and Acceptance	<u>3737</u>
A. General	<u>3737</u>
a. Copper Link Testing	<u>3737</u>
b. Fiber Testing	<u>3838</u>
c. System Documentation	<u>3838</u>
d. Test Results	<u>3939</u>
Appendix A – Materials List	<u>4141</u>



INFORMATION TECHNOLOGIES
8/31/2018



I. GENERAL

A. Purpose

1. The purpose of this document is to provide a standard defining the structured communications cabling systems to be installed within Canyons School District facilities. It is geared toward leveraging our legacy cabling infrastructure while upgrading to more recent technologies in new installations. The goal is to accomplish this in the most economic and systematic fashion possible, and in a manner compliant with the latest codes, cabling standards and industry best practices.
2. Within this document, the facilities owner is Canyons School District, and shall be referred to as such, or as "Canyons School District" or simply as "Information Technologies". Bidding low-voltage installers shall be referred to as "Contractor".
3. This specification defines quality standards and practices common to all Canyons School District Information Technologies enterprise network cabling upgrades and greenfield (new) projects.
4. In addition to this global cabling standard, individual projects will also have associated documentation such as Requests for Proposals (RFP), facility drawings, project schedules and requirements pertaining to that particular job. Such collateral will be referred to in this document as "Project Specific Documentation" or simply "Construction Documents". Any conflict between this general specification and any project specific documentation shall be brought to the attention of Canyons School District Information Technologies and must be resolved in writing by Canyons Schools.
5. It is the responsibility of the installing contractor to evaluate these general recommendations and adapt them effectively to actual projects. Contractor is responsible for identifying and bringing to the attention of Canyons School District Information Technologies any design directions that may be improved. All such changes shall be approved in writing from Information Technologies.
6. Note that while many portions of this global specification are addressed to "The Contractor", these requirements apply equally to anyone doing the network cabling and infrastructure work within Canyons School District, whether those persons are outside contractors or persons directly employed by Information Technologies.

B. Scope of Work - Typical

1. Contractor shall be solely responsible for all parts, labor, testing, documentation and all other associated processes and physical apparatus necessary to turn over the completed system fully warranted and operational for acceptance by Canyons School District Information Technologies
2. This specification includes structured cabling design considerations, product specifications and installation guidelines for low-voltage network systems and associated infrastructure including, but not limited to:



- a. Cabling Sub-system 1 – Horizontal Copper
 - b. Cabling Sub-system 2 - Intra-building Fiber Backbone Cabling
 - c. Telecommunications Pathways
 - d. Communications Racks
 - e. Communications Grounding Systems
 - f. Cabling Labeling and Administration
3. In addition to systems specifications, this document also addresses applicable codes and standards, contractor qualifications and requirements, system warranties and system testing and acceptance.
 4. Products to be used in Canyons School District Information Technologies telecommunications infrastructure are listed in "Appendix A" at the end of this document. All approved 'equivalents' must match performance specifications.

C. Applicable Regulatory References

1. Contractor is responsible for knowledge and application of current versions of all applicable standards and codes. In cases where listed standards and codes have been updated, Contractor shall adhere to the most recent revisions, including all relevant changes or addenda at the time of installation.
2. ANSI/TIA:
 - a. ANSI/TIA-526-7-A (July 2015) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 - b. TIA-526.2-A (July 2015) Effective Transmitter Output Power Coupled into Single-Mode Fiber Optic Cable - Adoption of IEC 61280-1-1 ed. 2 Part 1-1: Test Procedures for General Communication Subsystems – Transmitter Output Optical Power Measurement for Single-Mode Optical Fibre Cable
 - c. ANSI/TIA-4994 (March 2015) Standard for Sustainable Information Communications Technology
 - d. ANSI/TIA-526-14-C (April 2015) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
 - e. ANSI/TIA-568.0-D (September 2015) Generic Telecommunications Cabling for Customer Premises (supersedes TIA-568-C.0 and TIA-568-C-1)
 - f. ANSI/TIA-568-C.2 (August 2009) Balance Twisted Pair Communications and Components Standards
 - g. TIA-568-C.2-1 (July 2016) Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Addendum 1: Specifications for 100 Next Generation Cabling
 - h. TIA-568-C.2-2 (November 2014) Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Addendum 2: Additional Considerations for Category 6A Patch Cord Testing



- i. TIA-568-C.3 (June 2008) Optical Fiber Cabling Components Standard (will be superseded by ANSI/TIA-568.3-D after default ballot)
- j. TIA-568-C.3-1 (October 2011) Optical Fiber Cabling Component Standard- Addendum 1, Addition of OM4 Cabled Optical Fiber and array connectors (will be superseded by ANSI/TIA-568.3-D after default ballot)
- k. ANSI/TIA-568-C.4 (July 2011) Broadband Coaxial Cabling Components Standard
- l. ANSI/TIA-568.1-D (September 2015) Commercial Building Telecommunications Infrastructure Standard (supersedes ANSI/TIA-C.1)
- m. ANSI/TIA-569-D (April 2015) Telecommunications Pathways and Spaces
- n. ANSI/TIA-598-D (July 2014) Optical Fiber Cable Color Coding
- o. ANSI/TIA-570-C (August 2012) Residential Telecommunications Infrastructure Standard
- p. ANSI/TIA-606-C (June 2017) Administration Standard for Telecommunications Infrastructure
- q. ANSI/TIA-607-C (November 2015) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
- r. ANSI/TIA-758-B (March 2012) Customer-Owned Outside Plant Telecommunication Infrastructure Standard
- s. ANSI/TIA-862-B (February 2016) Structured Cabling Infrastructure Standard for Intelligent Building Systems
- t. ANSI/TIA-942-B (July 2017) Telecommunications Infrastructure Standard for Data Centers (will be superseded by ANSI/TIA-942-B after balloting)
- u. ANSI/TIA-1005-A (May 2012) Telecommunications Infrastructure Standard For Industrial Premises
- v. ANSI/TIA-1005-A-1 (January 2015) Telecommunications Infrastructure Standard For Industrial Premises, Addendum 1- M12-8 X-Coding Connector - Addendum to TIA-1005-A
- w. ANSI/TIA-1183 (August 2012) Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems
- x. ANSI/TIA-1183-1 (January 2016) Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems, Extending Frequency Capabilities to 2 GHz - Addendum to TIA-1183
- y. ANSI/TIA-1152 (September 2009) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
- z. ANSI/TIA-1179 (July 2010) Healthcare Facility Telecommunications Infrastructure Standard
- aa. ANSI/TIA-4966 (May 2014) Telecommunications Infrastructure Standard for Educational Facilities
- bb. TIA-455-104-B (February 2016) FOTP 104- Fiber Optic Cable Cyclic Flexing Test (supersedes TIA-455-104-A)
- cc. TIA/EIA-455-25-D (February 2016) FOTP-25 Impact Testing of Optical Fiber Cables



- dd. TIA-604-18 (November 2015) FOCIS 18 Fiber Optic Connector Intermateability Standard – Type MPO-16
- ee. TIA-604-5-E (November 2015) FOCIS 5 Fiber Optic Connector Intermateability Standard- Type MPO
- ff. TIA-5017 (March 2016) Telecommunications Physical Network Security Standard
- gg. TIA-TSB-155-A (Reaffirmed 10-6-2014) Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T
- hh. TSB-184-A (March 2017) Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling
- ii. TSB-4979 (August 2013) Practical Considerations for Implementation of Multimode Launch Conditions in the Field
- jj. TSB-190 (June 2011) Guidelines on Shared Pathways and Shared Sheaths
- kk. TIA-TSB-162-A (November 2013) Telecommunications Cabling Guidelines for Wireless Access Points
- ll. TSB-5018 (July 2016) Structured Cabling Infrastructure Guidelines to support Distributed Antenna Systems
- mm. TIA-492AAAD (October 2009) Detail specification for 850-nm laser-optimized, 50-um core diameter/125-um cladding diameter class la graded-index multimode optical fibers
- nn. TIA-455-243 (March 2010) FOTP-243 Polarization-mode Dispersion Measurement for Installed Single-mode Optical Fibers by Wavelength-scanning OTDR and States-of-Polarization Analysis
- oo. TSB-172-A (February 2013) Higher Data Rate Multimode Fiber Transmission Techniques

3. ISO/IEC

- a. ISO/IEC 11801 Edition 2.2: Information Technology – Generic Cabling For Customer Premises
- b. ISO/IEC 24702 Edition 1.0: Information Technology – Generic Cabling – Industrial Premises
- c. ISO/IEC 24764 Edition 1.0: Information Technology – Generic Cabling Systems For Data Centres
- d. ISO/IEC 14763-2 Edition 1.0: Implementation and Operation of Customer Premises Cabling – Part 2: Planning and Installation
- e. ISO/IEC 14763-3 Edition 1.1: Implementation and Operation of Customer Premises Cabling – Part 3: Testing of Optical Fiber Cabling

4. National Electric Codes

- a. National Electrical Safety Code (NESC) (IEEE C2-2012)
- b. ANSI/NFPA 70-2011, National Electrical Code© (NEC©)
- c. ANSI/IEEE C2-207, National Electrical Safety Code®
- d. National Electrical Code (NEC) (NFPA 70)

5. OSHA Standards and Regulations – all applicable



-
6. Local Codes and Standards – all applicable
 7. BICSI – Building Industry Consultative Services International
 - a. Telecommunications Distribution Methods Manual, 13th Edition
 - b. ANSI/BICSI 005-2013, Electronic Safety and Security (ESS) System Design and Implementation Best Practices
 - c. Information Transport Systems Installation Methods Manual (ITSIMM), 6th Edition
 - d. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
 - e. Network Systems and Commissioning (NSC) reference, 1st Edition
 - f. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
 - g. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
 - h. AV Design Reference Manual, 1st Edition
 - i. Network Design Reference Manual, 7th Edition
 - j. Outside Plant Design Reference Manual, 5th Edition
 - k. Wireless Design Reference Manual, 3rd Edition
 - l. Electronic Safety and Security Design Reference Manual, 3rd Edition
 - m. Commercial Installation On-the-Job Training Booklet
 - n. Telecommunications Project Management (TPM) reference, 1st Edition
 8. Anywhere cabling standards conflict with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either.
 9. Anywhere standards, codes, specifications or project documents conflict, Contractor shall default to the standards of the country where the installation is taking place, or default to the more stringent of either. Where such resolutions are not clear, it is the responsibility of the Contractor to bring this to the attention of the local Canyons School District project manager to receive clarification in writing.
 10. Knowledge and execution of applicable standards and codes is the sole responsibility of the Contractor.
 11. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor's expense.



D. Substitution Policy

1. This is a performance-based specification based on the experience of Canyons School District Information Technologies in providing exceptional solutions for all of our facilities and departments. As such, substitution of specified systems is discouraged, but allowed if Contractor strictly follows the Canyons Substitution Policy outlined below. The right to determine suitability, compatibility, or acceptability of product/service offerings belongs exclusively to Canyons School District.
2. Contractors offering product substitutions or equivalents are responsible for showing equal or superior mechanical and transmission performance specifications to those products listed herein.
3. The process for substituting products other than those specified is as follows:
 - a. Any Contractor wishing to offer structured cabling or associated infrastructure products other than those specified should submit a request for product substitution in writing at least ten (10) business days prior to the closing of the bid for which the substitution is requested.
 - b. Written requests for substitution should be accompanied by three samples of the substitution product along with associated drawings, specification sheets and engineering documents for evaluation by Canyons School District.
 - c. Any copper or fiber cabling products that carry signal shall be accompanied by third party laboratory performance test reports from an NRTL (Nationally Recognized Testing Laboratory) proving equivalency in transmission performance.
4. Equal product acceptance is exclusively at Canyons School District discretion.
5. Contractor shall assume all costs for removal and replacement of any substituted product installed without prior written approval. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

E. Contractor Qualifications

1. General
 - a. Contractor must have at least 5 years documented experience installing and testing structured cabling systems of similar type and size.
 - b. Contractor shall have offices and service personnel based within a fifty-mile radius of Canyons School District and be capable of same-day response to service calls.
 - c. Contractor shall employ at least one BICSI Registered Communication Distribution Designer (RCDD) to sign-off on all designs offered, including stamping the design with their current BICSI/RCDD stamp.
 - d. Contractor shall have the responsibility to obtain any of the necessary permits, licenses, and inspections required for the performance of data, voice, and fiber optic cable installations.
 - e. Contractor shall be a current Panduit ONESM Partner, Silver or above, Leviton/Berk-Tek Certified Installer, Siemon/Mohawk Certified Installer, or accepted substitute manufacturer (See Substitution Policy). A copy of the corporate manufacturer certification must be included with quote.



- f. At least 30 percent of the technicians on the job must have a current Panduit Certified Copper Technicians certificate, Leviton/Berk-Tek Certified Copper Technicians certificate, Siemon/Mohawk Certified Installer certificate, or accepted substitute manufacturer, to install copper distribution systems.
- g. At least 30 percent of the technicians installing any Fiber Distribution Systems must have a current Panduit Certified Fiber Technicians certificate, Leviton/Berk-Tek Certified Fiber Technicians certificate or accepted substitute manufacturer certificate, to install fiber distribution systems
- h. The Telecommunications contractor must provide a project manager to serve as the single point of contact to manage the installation, speak for the contractor and provide the following functions:
 - Initiate and coordinate tasks with the Canyons School District Information Technologies Project Manager and others as specified by the project schedule.
 - Provide day to day direction and-site supervision of Contractor personnel.
 - Ensure conformance with all contract and warranty provisions.
 - Participate in weekly site project meetings.
 - This individual will remain project manager for the duration of the project. The contractor may change Project Manager only with the written approval of Canyons School District Information Technologies.
- i. Contractor Project Manager must be manufacturer certified in the copper and fiber information distribution systems to be installed.

2. References

- a. Communications Contractor shall provide with bid, a list of three reference accounts where similar Data, Voice, Fiber Optic Cable, and related equipment installation work was performed within the last year (twelve month period).

3. Termination of Services

- a. Canyons School District Information Technologies reserves the right to terminate the Communication Contractor's services if at any time the Information Technologies Engineer determines the Communication Contractor is not fulfilling their responsibilities as defined within this document.
- b. Contractor's appearance and work ethics shall be of a professional manner, dress shall be commensurate with work being performed.
- c. Dress displaying lewd or controversial innuendos will strictly be prohibited.
- d. Conduct on Canyons School District Information Technologies property will be professional in nature.
- e. Any person in the Contractor's employ working on a Canyons School District Information Technologies project considered by Canyons School District Information Technologies to be incompetent or disorderly, or for any other reason unsatisfactory or undesirable to the Information Technologies, such person shall be removed from work on the Canyons School District Information Technologies project.
- f. Upon termination, the Communications Contractor shall be restricted from the premises and compensated for the percentage of work completed satisfactorily.



4. Other Contractor Responsibilities

- a. Confirmation of Pathway and Cable Manager Sizing:
 - Wherever cabling pathways or managers are installed, it is the Contractor's responsibility to confirm pathway or manager sizing to represent no more than 30% fill according to manufacturer's fill charts based on projected cable densities when racking systems and cabling pathways are fully populated.
 - Pathways overfilled upon installation will not be accepted and shall be remedied at Contractor expense.
- b. Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job. All work areas will be cleaned at the conclusion of the workday and no tools or materials shall be left in a manner as to pose a safety hazard.
- c. Contractor must remove all abandoned cable per Article 800 of the National Electrical Code and per TIA and BICSI standards, recycling these materials where possible. Removal of orphaned cable is mandatory. Contractors must consider this when placing bids.
- d. Contractor shall abide by the regulations set by local Canyons School District's Security Policy pertaining to access and conduct while on Canyons School District property.
- e. Contractor shall all obey all posted speed limits and parking regulations at the Canyons School District facilities where the work is being performed.

F. Warranty

1. General

- a. Contractor shall provide a minimum 3 year warranty on all copper and fiber permanent cabling links. A 25-year extended warranty is desired and will be considered as preferred. Costs to increase the warranty beyond 3 years should be included with ineligible costs, if part of an e-rate project.
- b. Upon acceptance of Warranty the contractor will mail a notification letter to the installer and a notification letter and warranty certificate to Canyons School District Information Technologies.

2. Contractor Warranty Obligations

- a. Installation firm (Contractor) must be a current Panduit ONESM Partner, Silver or above, Leviton/Berk-Tek Certified Installer, Siemon/Mohawk Certified Installer, or Canyons School approved equal manufacturer in good standing and shall include a copy of the company installation certification with the bid.
- b. Contractor shall name a supervisor to serve on site as a liaison responsible to inspect and assure all terminations are compliant to factory methods taught in Panduit Technician Certification Training, Leviton/Berk-Tek Technician Certification Training, Siemon/Mohawk MAC or Canyons School approved equal, and according to all Standards cited in the Regulatory References section of this document.
- c. Contractor liaison (project supervisor) shall have a current, up-to-date Panduit Certified Technician (PCT) certificate, Leviton/Berk-Tek Certified Technician certificate, Siemon/Mohawk, or Canyons School approved equal in both copper and fiber. Copies of the copper and fiber certificates of the Panduit,



- Leviton/Berk-Tek, or Canyons School approved equal liaison shall be submitted with the bid. These requirements are the same for accepted equivalent manufacturers. See "Substitution Policy" for mandatory procedure when offering substitutions.
- d. Fiber optic cabling system additions and upgrade to existing facilities (Brownfield) shall match the fiber type (OM/OS designation) of the system to which it is being installed. Contractor shall under no circumstances mix different OM/OS classes of cable or termination devices (connectors) within the same system.
 - e. All intra-building new fiber optic installations shall utilize an appropriate construction of OM3 or OM4 multi-mode fiber as specified herein.
 - f. All UTP cable pulled and terminated shall be Category 6a cable and connectivity whether new or legacy systems. The exception to this is the 25 pair Category 5E cable installed for building controls as specified in this document.
 - g. All UTP terminations within the Canyons School District Information Technologies greenfield (new) projects shall be terminated using the T568B pin-out (wire map). Legacy additions shall match the copper pin-out of the facility to which cabling is being added-to or upgraded.
 - h. Contractor shall install all racking and support structures according to cited Standards in such fashion as to maintain both cited industry standards as well as manufacturer recommendations for uniform support, protection, and segregation of different cable types,
 - i. Contractor is responsible for maintenance of maximum pulling tensions, minimum bend radius, and approved termination methods as well as adhering to industry accepted practices of good workmanship.
 - j. Contractor is responsible for understanding and submitting to Panduit or Leviton/Berk-Tek all documents required prior to project start to apply for the Panduit Certification PLUS or Pan/Gen system warranty, Leviton/Berk-Tek Limited Lifetime Warranty, or Siemon Premium Warranty. These include but are not limited to the project information form and SCS warranty agreement. These requirements are the same for accepted equivalent manufacturers. See "Substitution Policy" for mandatory procedure when offering substitutions.
 - k. Contractor is responsible for understanding and submitting to Panduit, Leviton/Berk-Tek, Siemon/Belden, or other, all documents required at project end. These include, but are not limited to: completed warranty forms, passing test reports and drawings of floor plans showing locations of links tested. These requirements are the same for accepted equivalent manufacturers. See "Substitution Policy" for mandatory procedure when offering substitutions.
 - l. Test results shall be delivered in the tester native format (not Excel) and represent the full test report, summaries shall not be accepted. Contact your Panduit, Leviton/Berk-Tek, Siemon/Belden, or Canyons School approved equal's representative for a current list of approved testers, test leads and latest operating systems.
 - m. The Communications Contractor will correct any problems and malfunctions that are warranty-related issues without additional charge to Canyons School District Information Technologies for the entire warranty period.
 - n. The warranty period shall commence following the final acceptance of the project by Canyons School District Information Technologies and written confirmation of Warranty from Panduit, Leviton/Berk-Tek, or Siemon/Belden. These requirements are the same for accepted equivalent manufacturers. See



INFORMATION TECHNOLOGIES
8/31/2018

"Substitution Policy" for mandatory procedure when offering substitutions.

END OF SUB-SECTION SECTION I



II. Installation and Maintenance Guidelines

A. Maintenance of Patch Fields

1. Any persons, whether with a Contractor or Canyons School District, adding or moving copper or fiber optic patch (equipment) cords shall do so in a neat, workmanlike fashion in keeping with the original system cable management design concept and according to all industry best practices as outlined in cabling standards and applicable BICSI publications referenced in this document.
2. Persons performing such moves, adds or changes (MACs) shall further adhere to the following:
 - a. Use existing cabling management pathways and take care to place cable like with like, maintaining original segregation strategies for separating fiber and copper cables as well as any separation necessary between different types of copper cables.
 - b. Cables shall be dressed neatly within patch management pathways with care taken to maintain minimum bend radius of not less than 1 times the cord outer diameter for copper and not less than a 1" bend radius for fiber jumpers as per ANSI/TIA 568-C.0.
 - c. All patch cords used shall be of same copper Category or fiber OM/OS designation as the media used in the permanent cabling links.
 - d. Patching in all cases shall be done using factory terminated cords manufactured for that purpose. Hand terminated patch cords will not be accepted.
 - e. All patch cords or jumpers must be completely contained within supplied cable management paths. Cables draped across the front of cabinets or racks will not be accepted and shall be remedied at Contractor's expense.
 - f. Any persons installing or moving fiber optic patch cords for any reason will clean the connector with lint-free wipes and 99% or higher isopropyl alcohol before replacing the connector in a patch or equipment port.
 - g. Any technicians, whether with Canyons School District or Contractors performing moves, adds or changes within patch field will label additions to the system according to the labeling conventions in place at that facility.
 - h. Any persons with Canyons School District or installing Contractor performing moves, adds or changes within patch field will record the move according to record system in place at that facility.

B. Cable Pulling and Termination

1. General
 - a. Contractor is responsible for installing systems according to all applicable codes and the standards cited in this document.
 - b. Contractor shall use grommets to protect the cable when passing through metal studs or any openings that can possibly cause damage to the cable.



-
- c. Do not deform the jacket of the cable. The jacket shall be continuous, free from pinholes, splits, blisters, burn holes or other imperfections.
 - d. Install proper cable supports, spaced less than 5 feet apart, and within manufacturer's requirements for fill ratio and load ratings.
 - e. Leave a pull string to the end of each conduit run. Replace pull string if it was used for a cable pull.
 - f. Note service loops may not touch the ceiling assembly and if so must be remedied at the Contractor expense.
 - g. Label every cable within 12 in. of the ends with self-laminating wire wrap cable appropriate to that cable size. Use a unique number for each cable segment as required by the project documentation and the labeling section of this document.
 - h. Dress the cables neatly with hook and loop cable ties in telecommunications rooms. Plastic ties are approved in pathways where cable bundles will not be reentered.
 - i. Contractor is responsible for using plenum-rated cable ties in plenum spaces.
 - j. Contractors installing cabling systems in Canyons School District facilities shall install plenum rated cable in all instances. Non-plenum cable is not allowed and shall be removed at Contractor's expense.
- a. Copper
- a. When making additions to legacy systems, Contractor shall match the cabling configuration (pinout) of the existing systems. Legacy systems at Canyons School District Information Technologies are in most cases T568B.
 - b. Within all new (greenfield) installations within Canyons School District facilities, contractor shall use copper pinout T568B.
 - c. All four pair Category 6a cable runs shall be kept to a maximum permanent link length of 83 meters when using a total 10 meters of 28 awg/small diameter patch cords.
 - d. Copper links that are 90 meters in permanent link, shall not exceed 6 meters (total) of patch cords when using 28 awg/small diameter patch cords.
 - e. Use low to moderate force when pulling cable. Maximum tensile load may not exceed 25' lbs. maximum pulling force per 4 pair cable.
 - f. No pathway, including conduits shall have greater than a 30% fill per manufacturer fill charts. Contractor is responsible for bringing to the attention of Canyons School District Information Technologies project manager any insufficiently sized conduit or cable pathways in project documentation.
 - g. Keep Category 6a cables as far away from potential sources of EMI (electrical cables, transformers, light fixtures, etc.) as required in cited TIA Standards.
 - h. All copper horizontal cabling shall have slack service loops no less than 12" at the work area (equipment outlet) and not less than 3 feet in the telecommunications room. Provide a 25' service loop for all cables for cameras.
 - i. Slack at the work area may be stored in the ceiling and in the telecommunications room may be wall



- mounted or contained in pathways or racking systems if done in a neat, workmanlike fashion.
- j. Service loops shall be stored in such fashion as to not violate bend radius, slack touching the drop ceiling is not allowed and must be remedied at Contractor expense.
 - k. Maintain the twists of the pairs all the way to the point of termination, or no more than 0.5" (one half inch) untwisted.
 - l. All UTP patching shall be accomplished using Category 6a rated modular patch panels as indicated elsewhere in this document.
 - m. All removed copper cable is to be disposed of in a Canyons School District Information Technologies recycling bin designated for "copper", or removed from the property to be disposed of by Contractor if this is the instructions in the project documentation.
- b. Fiber
- a. When making additions to legacy systems, Contractor shall match the fiber type and fiber connectors used within that system.
 - b. Within all new (greenfield) fiber installations within Canyons School District Information Technologies, contractor shall use Panduit OptiCam, Leviton FastCam, Siemon/Belden or Canyons School approved equal LC connectors as specified in the fiber section of this document.
 - c. When installing fiber cable, Contractor shall maintain a minimum bend radius, both under pulling load and installed, per requirements outlined within TIA standards, or manufacturer's recommendations, whichever is the most stringent.
 - d. Fiber terminations shall be done according to recommendations of TIA, manufacturer's requirements and accepted industry best practices.
 - e. All unjacketed fiber shall be contained within appropriate fiber enclosures. Exposed tight-buffered or loose-tube strands will not be tolerated and shall be remedied at Contractor's expense.
 - f. Contractor shall use fusion splices when terminating loose-tube fiber.
 - g. Contractor shall perform test setup and testing according to guidelines in the "Testing and Acceptance" section of this document.
 - h. All fiber backbone links will extend from each IDF directly to the MDF (Home Run) except where agreed to by exception with Canyons School District Director of IT.

END OF SUB-SECTION SECTION II



III. Cabling Systems and Associated Infrastructure

A. Cabling Subsystem I – Horizontal Cabling System

1. Slack (Service Loops) in Horizontal UTP Cable

- a. Contractor shall provide a minimum 12" slack or service loop at the equipment outlet (work area) on each terminated copper horizontal permanent link. Work area slack shall be contained within boxes behind the faceplate only if this may be done easily without violating cable bend radius.
- b. Where there is not sufficient space in the work area box, Contractor may pull work area slack into the ceiling space and properly store service loop with appropriately rated hook and loop cable ties. Cable slack shall in no instances touch the ceiling grid or associated drop ceiling components or fixtures.
- c. Contractor shall provide a minimum of 10 feet slack or service loop in the horizontal telecommunications room on each terminated copper horizontal permanent link, to be stored on the wall backboard using appropriate mounting fixtures built to that purpose (i.e. D-rings).
- d. Contractor should consult project-specific documentation or their Canyons Schools project liaison for other mounting methods where wall mount is not an option.

2. Metal Conduit

- a. Cable in horizontal runs in classrooms shall be routed and contained in metal conduit.
- b. No conduits shall have greater than a 30% fill per manufacturer fill charts. Contractor shall size conduit large enough to accommodate 50% growth. (i.e., conduit for 4 cables shall be sized to accommodate 6 cables) Contractor is responsible for bringing to the attention of Canyons School District Information Technologies project manager any insufficiently sized conduit or cable pathways in project documentation.

3. Electrical Boxes

- a. Contractor shall size work area boxes to accommodate no less than 12" cable slack on each terminated Category 6a UTP cable run.
- b. Contractor shall use double-gang boxes behind single-gang faceplates if necessary for storing 12" cable slack (service loop) without violating minimum bend radius of 4X cable outer diameter.
- c. In work areas where slack storage in cable box violates cable bend radius, Contractor should pull slack into ceiling and affix with plenum rated hook and loop (re-enterable) cable ties. If drop ceiling is present. Cable shall under no circumstances be laid upon drop ceiling.

4. Copper Jacks – Category 6A

- a. Category 6a, eight-position copper jacks shall be Panduit Mini-Com® TX6A™ 10Gig UTP, Leviton/Berk-Tek, or Canyons School approved equal Jack Modules.



- b. Category 6a jacks at the work area shall be color black unless otherwise indicated in project-specific documentation.
- c. Category 6a jacks shall further meet the following requirements:
 - Exceed ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA standards
 - Meet requirements of IEEE 802.3af and IEEE 802.3at for PoE applications
 - Be 100% tested to ensure NEXT and RL performance and be individually serialized for traceability.
 - Color-coded, keyed jack modules mechanically and visually distinguish connections to prevent unintentional mating with unlike keyed or non-keyed modular plugs accommodating more discrete networks.
 - Include MaTriX split foil tape to suppress the effects of alien crosstalk, allowing 10 Gb/s transmission even in high density 48-port, 1RU patch panels.
 - Utilize patent-pending enhanced Giga-TX™ Technology for jack terminations which optimizes performance by maintaining cable pair geometry and eliminating conductor untwist.
 - Meets ANSI/TIA-1096-A contacts plated with 50 microinches of gold for superior performance.
 - Rated for 2500 cycles with IEEE 802.3af / 802.3at and proposed 802.3bt type 3 and type 4
 - Require no punch down tool required; termination tool (EGJT) ensures conductors are fully terminated by utilizing a smooth forward motion without impact on critical internal components for maximum reliability.
 - Have available a high-volume “gun-style” optional termination tool (TGJT) that reduces termination time by 25% and is ideal for high volume installations.
 - Have guaranteed ability to be re-terminated a minimum of twenty times without measurable degradation of performance.
 - Employ a blue termination cap to designate Category 6A performance at a glance and provides positive strain relief; help control cable bend radius and securely retain terminated cable.
 - Have range to terminate 4-pair, 22 – 26 AWG, 100 ohm, solid or stranded twisted pair cable.
 - Utilize a universal termination cap is color-coded for T568A and T568B wiring schemes for flexibility across installations.
 - Accept 6 and 8-position modular plugs without damage to conductor pins.
 - Identified options that include optional labels and icons.
 - Be compatible with Mini-Com® Modular Patch Panels, Faceplates, and Surface Mount Boxes.
 - Have available optional RJ45 blockout device that blocks out unauthorized access to jack modules and potentially harmful foreign objects, saving time and money associated with data security breaches, network downtime, repair, and hardware replacement
 - Have an optional dust cap keeps out dust and debris while not in use



- d. See Appendix A for part numbers.

5. Flush Mount Equipment Outlets (Faceplates)

- a. When adding horizontal cabling to existing facilities Brownfield within Canyons School District, Contractor shall match the existing cable plant in regards to color of existing raceway and faceplates.
- b. Unless otherwise instructed on project-specific documentation, all Canyons greenfield (new) projects shall use Panduit Mini-Com® Classic Series sloped faceplates, Leviton faceplates with label cover, of international white (IW) color, or a Canyons School District approved equal.
- c. Plastic sloped faceplates shall be in 4 or 6-hole single-gang configuration, or double-gang 8 hole configurations as needed for the number of cables at that workstation.
- d. Plastic faceplates for greenfield applications shall further have the following properties:
 - Accept Mini-Com® or Leviton Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
 - Include label/label covers for easy port identification.
 - Replacement label/label covers available.
 - Optional icons available.
- e. Some greenfield projects for Canyons School District will require Panduit Mini-Com® or Leviton stainless steel faceplates with label fields, in single-gang 4-hole or double-gang 8-hole configurations, (or Canyons approved equivalent). See project-specific documentation or consult the Canyons project liaison if clarification on faceplate type is needed.
- f. Stainless faceplates, where used, shall meet the following criteria:
 - Accept Mini-Com®, Leviton Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
 - Include label/label covers for easy port identification.
 - Replacement label/label covers available.
 - Impact-resistant 304 stainless steel suitable for light industrial environments.
- g. Contractor shall use blank inserts to reserve space on any unused positions (holes) in plastic or stainless plates.
- h. See Appendix A for part numbers.

6. Horizontal Copper Cable

- a. Inside 4 pair horizontal cable for Canyons School District facilities shall be CAT6a high-performance, jacketed, plenum rated General Cable, or Canyon School approved equivalent. Jacket colors shall be as follows: green to security cameras, gray to non-networked infrastructure [e.g., lighting controls, motion/fire sensors], blue to all network data drops, and yellow to A/V controllers and devices.



- b. In addition, inside 4 pair Category 6a UTP copper cable must meet the following mechanical and performance criteria:
- UL Listed CMP-LP, UL Limited Power (LP) Certified
 - Meet TIA TSB-184-A/ IEEE P802.3bt "LP" rating for Limited Power cable requirements
 - Exceeds requirements of ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA channel standards.
 - Exceeds requirements of ANSI/TIA-568-C.2 and IEC 61156-5 Category 6A component standards.
 - Meets requirements of IEEE 802.3af and IEEE 802.3at for PoE applications.
 - Meets requirements of ANSI/TIA 862
 - Meets requirements of ICEA S-116-732
 - Third party tested to comply with ANSI/TIA-568-C.2.
 - Cable diameter: Plenum 0.250 in nominal.
 - Installation temperature range: (0°C to 60°C).
 - Operating temperature range: (-20°C to 90°C).
 - Include Encapsulated Isolation Wrap to suppress the effect of alien crosstalk allowing 10 Gb/s transmission, while minimizing cable diameter.
 - Descending length cable markings enable easy identification of remaining cable which reduces installation time and cable scrap.
- c. Outside run 4 pair horizontal cable for Canyons School District facilities shall be high-performance, black jacketed, General Cable CAT6a OSP cable constructed for wet or outside-plant applications, or Canyon School approved equivalent.
- d. In addition, outside run 4 pair Category 6a UTP copper cable must meet the following mechanical and performance criteria:
- Outdoor horizontal cable drops shall use 23 AWG category 6A 4-pair UTP outdoor cable.
 - Cable jacketing shall be black.
 - Cable shall be intended for outdoor installation in buried conduit or as aerial cable.
 - Installation temperature range (-30 to +60C)
 - Operation temperature range (-45 to +80C)
 - The cable core shall be Gel-filled construction to prevent moisture migration in underground and wet applications.
 - OSP type cables shall have a nominal diameter less than or equal to .365"
- e. See Appendix A at the end of this document for cable part numbers.

7. Distributor I (Horizontal Patch Panels)

- a. Canyons School District Information Technologies copper patch panels in the horizontal patch fields shall be flat 1 RU or 2 RU Panduit modular Mini-Com® or Leviton Modular Faceplate Patch Panels, or approved equivalent as needed to accommodate UTP cable quantity.
- b. Modular patch panels shall be standard density of 24 ports per rack unit.
- c. Contractor shall populate modular panels with black Panduit or Leviton Category 6a jacks, or approved equivalent as described elsewhere in this document. See Appendix A for part numbers on jacks to go with modular patch panels.
- d. Contractor shall pair modular patch panels in alternating fashion with workgroup switches allowing for use of 12" Category 6a patch cords for one-to-one switch patching, eliminating the need for horizontal cable managers between the switches and patch fields. See illustration below for example of one-to-one switch patching strategy.



Example of one-to-one switch patching

- e. Patch Panels shall further meet the following criteria:
 - Have release snap feature on faceplate to allow front access to installed modules.
 - Accept Mini-Com®, Leviton or Canyons School approved equal Modules for UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
 - Be available in label versions available for easy port identification, with replacement label/label covers available.
 - Mount to standard EIA 19" racks or 23" racks with optional extender brackets.



- Be available in angled patch panels to facilitate proper bend radius control and minimize the need for horizontal cable managers.

f. For detailed part numbers see "Appendix A" at the end of this document.

8. Copper Patch Cords

- a. Copper patching of Category 6a links in Canyons School District facilities shall use blue Panduit 28 awg "small diameter" slim patch cords, Leviton High-Flex HD6, or Canyons School approved equal.
- b. Security camera patch cables shall be green. If other color patch cords are needed to designate particular applications, see Appendix A for instructions on changing patch cord colors.
- c. In telecommunications rooms utilizing individual workgroup switches, Contractor shall alternate patch panels with switches, using 12" patch cord lengths in "one-to-one" switch patching strategy as indicated in the patch panel section of this specification (above).
- d. Core (chassis) switches shall utilize whatever length patch cords necessary for an efficient and neat, workmanlike installation.
- e. Small diameter patch cords shall have the following characteristics:
 - Cable diameter not more than 0.185 in. (4.7mm) nominal.
 - Category 6A/Class EA channel and component performance.
 - Exceeds all ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA electrical performance requirements for all frequencies from 1 to 500 MHz
 - FCC and ANSI compliance: Meets ANSI/TIA/EIA-1096-A; contacts plated with 50 micro inches of gold for superior performance.
 - IEC compliance: Meets IEC 60603-7
 - PoE compliance: Meets IEEE 802.3af and IEEE 802.3at for PoE applications in bundle sizes up to 48 cables.
 - Operating temperature: 14°F to 140°F (-10°C to 60°C).
 - Storage temperature: -40°F to 158°F (-40°C to 70°C).
 - Plug housing: UL94V-0 rated clear Polycarbonate.
 - Contacts: Gold plated phosphor bronze.
 - RoHS compliance: Compliant.
 - Flammability rating: CM/LSZH dual rated.
- f. Note: These patch cords utilize 28 AWG conductors which do not meet the 22 to 26 AWG conductor size of patch cable referenced in ANSI/TIA-568-C.2, resulting in an increased attenuation de-rating value of 1.9. These patch cords support 96-meter channels that include 90-meter permanent links. And 6 meters of patch cord, or supports 93-meter channels with 10 meters of patch cords included in the channel.
- g. See Appendix A for part numbers.



9. Surface Mount Raceway

- a. On brownfield installations, Contractor shall match raceway to that already installed in the facility unless instructed otherwise in project-specific documentation.
- b. On greenfield installations where environment (cinder block walls) or project documentation requires cable to be surface-mounted in the work area; horizontal cable shall be routed through Panduit LD10 International White (color), Leviton plastic latching-duct raceway or Canyons approved equivalent.
- c. Areas requiring power and data be run through single raceway with partition (separator), Contractor shall utilize Panduit LDP10, Leviton, or Canyons School approved equal raceway or T-70 raceway system as needed to accommodate all cable **with not more than a 30% fill according to manufacturer fill tables.**
- d. **No raceway shall have greater than 30% fill upon installation, providing room for at least 50% growth in additional cables: i.e., a work area requiring 4 cables, raceway shall be sized to hold 6.**
- e. Contractor is responsible that raceway installation includes all associated fittings, drop ceiling fittings, couplers and 1" control-bend-radius fittings where appropriate.
- f. Contractor shall not rely on the pressure sensitive adhesive foam to mount raceway, but rather use adhesive to hold raceway in place while screwing down the raceway to the structure beneath using anchors appropriate to the wall type at intervals not to exceed 2 ft (24 inches).
- g. Standard LD-10 Panduit, Leviton or Canyons School approved equal raceway shall have the following features:
 - For routing data and low voltage cabling.
 - One-piece hinged design allows cables to be laid in.
 - Factory applied adhesive backing speeds installation.
 - FT4 rated.
 - Terminates using surface mount outlet box solutions, Panduit Mini-Com, Leviton or Canyons School approved equal surface mount boxes.
- h. Installations requiring raceway shall use the same faceplates used in flush-mount applications as specified in this document, mounted on Panduit "JB1", Leviton surface boxes, or Canyons approved equivalent. Contractor shall not rely on adhesive-backing to hold surface boxes in place, but must use appropriate wall anchors for firm, permanent installation.
- i. Some Canyons facilities may require metallic raceway systems. Consult project-specific documentation or the Canyons School District project liaison if clarification on raceway type is needed.
- j. See Appendix A at the end of this document for part numbers.



C. Cabling Subsystems II - Intrabuilding Backbone Fiber

1. Fiber Cable

- a. On additions to existing Canyons School District fiber cable plant (brownfield projects), Contractor shall match existing fiber and connector types.
- b. In new (greenfield) Canyons School District projects, backbone fiber running between telecommunications rooms on the same floor, or between floors in the same building shall be General Cable indoor/outdoor, Berk-Tek, plenum-rated, armored, 50 micron cable of 12 or 24 strand count, or Canyons approved equal. See "Substitution Policy" for mandatory process if offering equivalents.
- c. Contractor shall install OM4 version of cable described for all telecommunications spaces that are spaced 300 meters or closer for use with 10G Ethernet. Note this will be almost all instances in Canyons School facilities.
- d. Fiber optic cable shall further have the following features:
 - Product Construction: Fiber: 4–144 fibers, 900 µm tight buffer, Color-coding per TIA/EIA 598 B.
 - Overall Strength Member: Water-swallowable aramid fiber yarn
 - Inner Jacket: Flame-retardant compound.
 - Armor: Interlock aluminum.
 - Outer Jacket: Flame-retardant compound, UV-resistant black jacket, Sequential footage markings/
 - Features: Interlock armor provides outstanding mechanical protection, Interlock armor is flexible and easy to use tight buffer provides individual fiber protection, sub-units are numbered for identification.
 - Performance: Temperature: Storage -40°C (-40°F) to +70°C (+158°F), Installation 0°C (+32°F) to +50°C (+122°F), Operating -20°C (-4°F) to +70°C (+158°F).
 - Minimum Bend Radius: 20 X OD—Installation, 10 X OD—In-Service.
 - Maximum Crush Resistance: 1,500 lbs/in (2,627 N/cm).
 - Applications: Harsh premises environments requiring heavy-duty protection, outdoor use in ducts and underground conduits.
 - ETL Type OFCP for installation in any premises location when installed in accordance with NEC article 770.154 and 770.179.
 - Compliances: ETL Listed Type OFCP, CSA FT6, TIA 568 C.3, ICEA S-104-696, GR-409, RoHS Compliant Directive 2002/95/EC.



- e. Contractor shall bond to ground armor from fiber backbones at both ends as indicated in the grounding section of this document; using armored cable grounding kits listed in the Appendix A grounding section.
- f. See Appendix A for all fiber cable part numbers.

2. LC Fiber Connectors

- a. All tight-buffered indoor fiber trunks shall be terminated using Panduit LC OptiCam®, Leviton FastCam Fiber Optic Connectors or Canyons approved equal.
- b. LC cam connectors shall further have the following properties:
 - Be a TIA/EIA-604 FOCIS-10 compatible connector that exceed exceeds TIA/EIA-568-B.3 requirements.
 - Have connector backbone and boot colors that follow TIA/EIA-568-C.3 suggested color identification scheme.
 - Have insertion loss: 0.3dB average (multimode and singlemode).
 - Have return loss: >26dB (10Gig multimode), >20dB (multimode), >50dB (singlemode).
 - Be a spring-loaded "Senior" rear pivot latch LC connector.
 - Be a pre-polished cam style termination for in less than half the time of field polish connectors.
 - Have patented re-termination capability provides yield rates approaching 100%.
 - Feature a factory pre-polished fiber end face eliminates time-consuming field polishing to reduce installation costs, labor, scrap and the number of tools required.
 - Be cam activated, with fiber and buffer clamp mechanisms that provide superior fiber and buffer retention with less sensitivity to fiber tensile loading.
 - Utilize OptiCam® or FastCam Termination Tools that simplifies tooling and termination, and virtually eliminates operator error by providing a visual indication of proper termination after the cam step has been completed.
 - Have a range of cable retention boot assemblies that consistently provide higher than industry standard cable retention.
 - Include a non-optical disconnect that maintains data transmission under tensile loads for jacketed cable.
 - Have ability to accept 900µm tight-buffered fiber with included boot(s), and accept 1.6mm – 2.0mm and 3.0mm jacketed cable with available OptiCam® Cable Retention Boot Assemblies (ten per package).
- c. See Appendix A for part numbers on LC fiber connectors.

3. Fiber Enclosures

- a. Fiber cable terminations shall be contained in 1 RU, or 2 RU Panduit FCE series, Leviton rack mount fiber enclosures, or Canyons approved equal.
- b. Contractor shall select enclosure size as needed for the number of fibers projected to be in that telecommunication space when fully populated. The average horizontal telecom room (Distributor 1) will



-
- not require more than one single RU fiber enclosure, which will house up 48 OM3 fiber strands.
- c. Contractor shall fill any unused enclosure space with a blank fiber adapter panel (FAP).
 - d. FCE enclosures shall further have the following properties:
 - Be able to hold Panduit QuickNet™ Fiber Optic Cassettes, Opticom® Fiber Adapter Panels, or splice modules, Leviton or Canyons School approved equal.
 - Have a slide-out, tilt-down drawer to provide full front access to all fibers and cables.
 - Employ integral bend radius control and cable management appliances for fiber optic patch cords.
 - Have rear cable management for proper slacking/spooling of trunk cable break-outs and interconnect cables.
 - Have multiple trunk cable entry locations and include fiber optic cable routing kit (grommets, cable ties, spools, strain relief bracket, and ID/caution labels) for different installation configurations.
 - e. See Appendix A for part numbers.
4. Fiber Adapter Panels
- a. FCE fiber enclosures shall be populated with OM3 fiber adapter panels containing 6 duplex fiber adapters.
 - b. Contractor is responsible to blank out any enclosure spaces where adapter panels are not used.
 - c. Adapter panels shall further have the following features:
 - Loaded with TIA/EIA-604 FOCIS-10 compatible adapters.
 - Exceed TIA/EIA-568-B.3 requirements.
 - Adapter housing colors follow TIA/EIA-568-C.3 suggested color identification scheme.
 - Snap quickly into the front of all Opticom® components
 - LC fiber adapter panels are Sr/Jr. to conserve enclosure space.
 - Accept FOCIS-10 compatible senior LC connectors at either end and FOCIS-10 junior LC connectors at the inside end for behind the wall applications.
 - Both ends accept FOCIS-10 compatible senior LC connectors.
 - Junior end also accepts FOCIS-10 compatible junior (fixed ferrule/springless) LC connectors.
 - Choice of phosphor bronze or zirconia ceramic split sleeves to fit specific network requirements; zirconia ceramic split sleeves are recommended for OM4/OM4 multimode and OS1/OS2 single mode applications.
 - Every adapter is laser marked with Q.C. number to assure 100% traceability.
 - LC adapters are also available in QuickNet™ Fiber Optic Cassettes, Leviton Opt-X fiber modules



and cassettes or Canyons School approved equal.

- d. See Appendix A for fiber adapter panels and blank adapter panels.

5. Fiber Patch Cords

- a. Fiber patch fields within Canyons School District facilities shall utilize Leviton, Panduit "push/pull" fiber jumpers (fiber patch cords) or Canyons School approved equal that have the following properties:
 - Push-Pull LC Duplex Fiber Optic Patch Cords shall feature the push-pull strain relief boot and duplex clip, to allow users easy accessibility in tight areas when deploying very high density LC patch fields.
 - Jumpers shall be available in OM3, OM4 and single-mode and be available in in riser (OFNR), plenum (OFNP), and low smoke zero halogen (LSZH) rated jacket materials.
- b. See Appendix A for part numbers.

6. Category 5E, 25-Pair Building Controls Backbone Cable

- a. One gray jacketed, plenum rated, 25 pair Cat 5e cable shall be installed from the MDF to reach every individual IDF to serve as backbone for building controls.
- b. 25 Pair 5E cable shall be General Cable or Canyons approved equivalent and shall meet the following mechanical and performance criteria:
 - Conductors: • 25 pairs of 24 AWG solid bare annealed copper.
 - Insulation: Non-Plenum: Polyolefin Plenum rated Fluoropolymer,
 - Color Code: Standard except no bandmarking; only solid colors.
 - Rip Cord: Applied longitudinally under jacket.
 - Jacket: Plenum: Low-smoke, flame-retardant PVC.
 - Separator: Plenum: Core filler.
 - Nominal Cable Diameter: .5".
 - Nominal Cable Weight (lbs/1000 ft): 160 lbs.
 - Temperature Rating Centigrade (Installed): 0 to +60.
 - Temperature Rating Centigrade (Operation): -20 to +75.
- c. 25 pair 5E control backbone shall be terminated on wall mount 100 Pr 110 blocks with C5 clips at the MDF end and on a 24-port patch panel in the IDF end.
- d. The patch panel in the IDF end is to be installed below the fiber enclosure at the top of the rack with one available rack unit reserved below it.
- e. 5E patching in the IDF shall use white jacketed small diameter Panduit, Leviton 5E patch cords or Canyons approved equivalent.



- f. Copper backbone must likewise be installed in satellite buildings. Consult project-specific documentation or Canyons project liaison if clarification is needed.
- g. See Appendix A for complete part numbers for fiber and copper backbone cable and termination hardware.

D. Cable Pathways

7. J-Hooks

- a. Bundles of 120 Category 6a cables or less may be required to be routed above ceilings using J-hooks. Check project documentation for clarification.
- b. J-hook systems used by Canyons School District Information Technologies shall be Panduit "J-Pro" series, Leviton or School approved equivalent.
- c. Contractor installing J-hook systems shall space them no more than 5 feet apart as per TIA 569-C standard.
- d. Contractor is responsible for proper sizing of J-hook systems based upon cable count and manufacturers recommendations for fill, with new J-hooks to have not more than 30% fill per manufacturer's fill charts based upon projected worst case future bundle size.
- e. If J-hooks are deemed too small by above criteria, Contractor shall bring this to the attention of Canyons School District for resolution in writing. J-hook pathways that will not have sufficient capacity should be replaced in the design with the proper sized basket tray for future cable additions and flexibility.
- f. J-hook systems used by Canyons School District Information Technologies shall have the following properties:
 - Patented design provides complete horizontal and vertical 1" bend radius control that helps prevent degradation of cable performance.
 - UL 2043 and CAN/ULC S102.2 listed and suitable for use in air handling spaces.
 - Pre-riveted assemblies allow for attachment to walls, ceilings, beams, threaded rods, drop wires and underfloor supports to meet requirements of a variety of applications.
 - Wide cable support base prevents pinch points that could cause damage to cables.
 - Cable tie channel allows user to easily install 3/4" (19.1mm) Tak-Ty ® Cable Ties to retain cable bundle.
 - Durable non-metallic J Hook materials provide the ability to manage and support a large number of cables.
 - Material: Black Nylon 6.6 J Hook with metal attachments.
- g. See Appendix A for part numbers.



E. 19" Racks and Rack-mount Cable Managers

1. Four-Post Communications Racks

- a. Contractor shall mount IT equipment and patching systems on threaded rail 7 foot, 4-post racks, unless forced to use 2-post due to telecommunications room space constraints.
- b. All racks shall utilize threaded hole rails. Cage nut rails are banned within Canyons facilities and will not be accepted.
- c. 4-post racks shall be of 30", 36", or 41.5" depth as needed by mounted equipment. Contractor is responsible for confirming proper depth to be used.
- d. 4-post racks shall be the 4 Post Cable Management Rack System or Canyons School District approved equivalent, and must have the following features:
 - Independent adjustable front and rear mounting rails can be adjusted while the rack is secured to the floor.
 - Printed rack space identification on all equipment rails allows for quick location of rack spaces, speeding installation of rack mount items (shipped numbers up per TIA-606B specifications; can be set to number down by flipping the rails).
 - Rack is UL listed for 2,500 lbs. load rating.
 - Rear rail construction provides a clear ventilation path for side ventilated switches.
 - Multiple mounting holes in top flanges for securing ladder rack.
 - Weld nut construction eliminates the need for a second wrench increasing speed and ease of assembly.
 - Multiple mounting locations for vertical power strips on any of the four posts or on the adjustable mounting rails.
 - PatchRunner™ and NetRunner™ Vertical Cable Managers mount directly to the 4 post rack at any of the four corners to provide a flexible end-to-end cable management solution.
 - Paint piercing washers included to electrically bond rack for simplified grounding.
- e. See Appendix A for part numbers.

2. Two-post Communications Racks

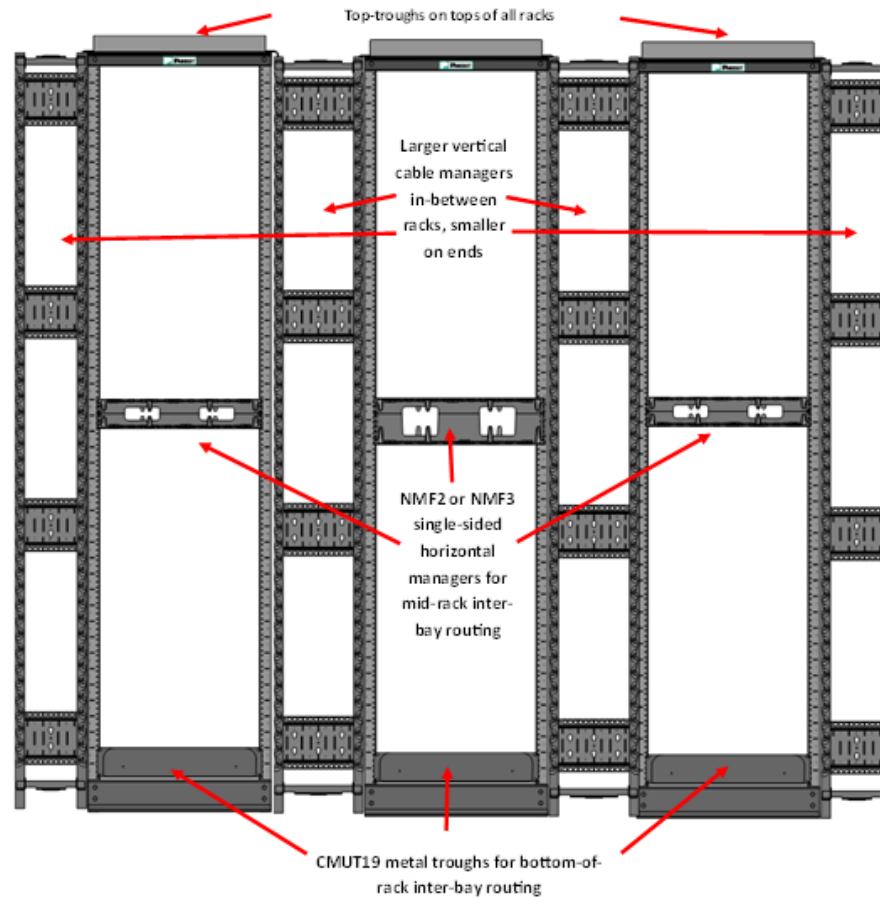
- a. Contractors may use 19", 2-post communications racks only in telecommunication rack spaces too small to use 4-post racks. Prior notification must be given to the CSD Director of IT.
- b. 2-post racks, when necessary, will be Panduit or Leviton black-powdered aluminum (or Canyons approved equivalent) and have the following properties:
 - 19" EIA rack, aluminum.
 - Dimensions: 96.0"H x 20.3"W x 3.0"D (2134mm x 514mm x 76mm).



-
- Rack units numbering up from bottom to allow quick and easy location of rack mount items
 - UL listed for 1,000 lbs. load rating.
 - Double-sided #12-24 EIA universal mounting hole spacing with 24 #12-24 mounting screws included.
 - Accepts all Panduit or Leviton cable management and patch panel products in addition to any industry standard 19" components or Canyons School approved equal.
 - Includes paint piercing washers for assembly to assure electrical continuity between components as per TIA 607-B Bonding and Grounding Standard.
- c. In telecommunications rooms with multi-bay rack rows configured such that patching will take place between racks, Contractor is responsible to include in design interbay routing pathways at the top, middle and bottom of each bay to provide efficient and neat interbay routing.
- d. Interbay routing shall be provided in the form of top troughs, interbay mid-rack path and flanged shelf at the bottom. (See "Illustration of Interbay Routing" below).

Illustration of Inter-bay Routing in Rack Systems

(Note: Doors left off vertical and horizontal managers for clarity)



- e. For bottom-of-rack interbay routing where cable quantities exceed capacity of CMUT19 troughs, Contractor shall substitute 4RU trough CMLT19.
- f. All racks shall be outfitted with a vertical grounding busbar along one rail, with all equipment bonded to ground according to TIA 607-B Bonding and Grounding Standard. See Bonding and Grounding section of this document for details.
- g. See Appendix A for part numbers.

3. Rack-mounted Cable Management – Vertical Managers

- a. Vertical cable managers shall be PatchRunner™ high capacity vertical Cable management system in sizes 6" wide, 8" wide, 10" wide and 12" wide, Leviton vertical cable management systems or Canyons School approved equivalent.
- b. Contractor will use double-sided (front and back) vertical managers on fronts of 4-post racks.
- c. All vertical cable managers shall have metal dual hinged doors.



- d. Contractor shall choose vertical cable manager width according to manufacturer's fill tables to not represent more than a 35% fill at installation based on projected worst-case density when racks are fully populated.
- e. Vertical cable managers shall have the following features:
 - High density minimizes area required for network layout, freeing up valuable floor space.
 - Allows mounting of many standard EIA 19" accessories, such as patch panels, vertically in the manager.
 - Ventilated sidewalls provide maximum airflow for equipment cooling.
 - Snap on finger sections can be removed to improve airflow, and breakaway fingers allow routing of large cable bundles.
 - Large finger spacing accommodates up to 48 Cat6A cables.
 - Optional sure-close dual hinged metal doors provide easy access to vertical pathway and provide visual and audible feedback on closure.
 - Available in 7-foot version.
- f. See Appendix A for part numbers.

4. Rack-mounted Cable Management – Horizontal Managers

- a. One-to-one switch patching strategy largely eliminates the need for horizontal cable managers, but there still may be instances requiring them. One example is in the network core where chassis switches are used.
- b. For these areas requiring horizontal cable managers, Contractor shall use double-sided NetManager™ high capacity horizontal cable managers, Leviton horizontal cable managers or Canyons approved equal having the following features:
 - Innovative inset fingers slope inward toward back of managers offering unobstructed access to network cabling for easier moves, adds, and changes.
 - Large front finger openings easily accommodate Category 6a and 10 G/b E cables, speeding installation and reducing maintenance costs.
 - Rear cable management finger spacing utilizes open D-rings for greater accessibility.
 - Can be used to create large capacity horizontal pathways for routing cable.
 - Patented front and rear dual hinged cover allows cable access without removing cover.
 - Curved surfaces maintain cable bend radius.
 - Pass-through holes allow for front to rear cabling.
 - Built in cable retainers hold cable in place for easy moves, adds, and changes.
 - Mount to 19" EIA racks and cabinets.



- Covers, #12-24 and M6 mounting screws included.
 - Design fits flush to the front of the NetRunner ® High Capacity WMPVHCF45E and WMPVHC45E Vertical Managers or Leviton vertical cable managers.
- c. See Appendix A for part numbers.

F. Cable Accessories

1. Cable Ties

- a. Cable bundles on racks and in pathways shall be bundled with re-enterable hook and loop cable ties that come in continuous rolls.
- b. Contractor is responsible for using plenum hook and loop ties in air-return spaces.
- c. See Appendix A for part numbers.

2. Physical Security Devices

- a. Some portions of Canyons School District networks require additional physical security devices. These take three forms:
- b. Devices that block-out copper and fiber ports in patch fields and faceplates that require a special tool for removal.
- c. Devices that lock-in copper patch cords and require a special tool for removal of those patch cords.
- d. Devices that temporarily or permanently block USB ports on laptops and computers.
- e. Areas where such devices are required will be called out in the project documentation.
- f. See Appendix A for part numbers.

G. Communications Grounding Network

1. General

- a. Contractor is responsible for bonding to ground all newly placed equipment and installed racks or cabinets per the TIA 607-B Standard.

2. Room Busbars

- a. All Telecommunications spaces and distributor rooms shall have installed an appropriately sized wall-mount busbar with BICSI hole spacing that bonds to the building bonding backbone.
- b. See Appendix A for appropriate room telecommunications grounding busbar.

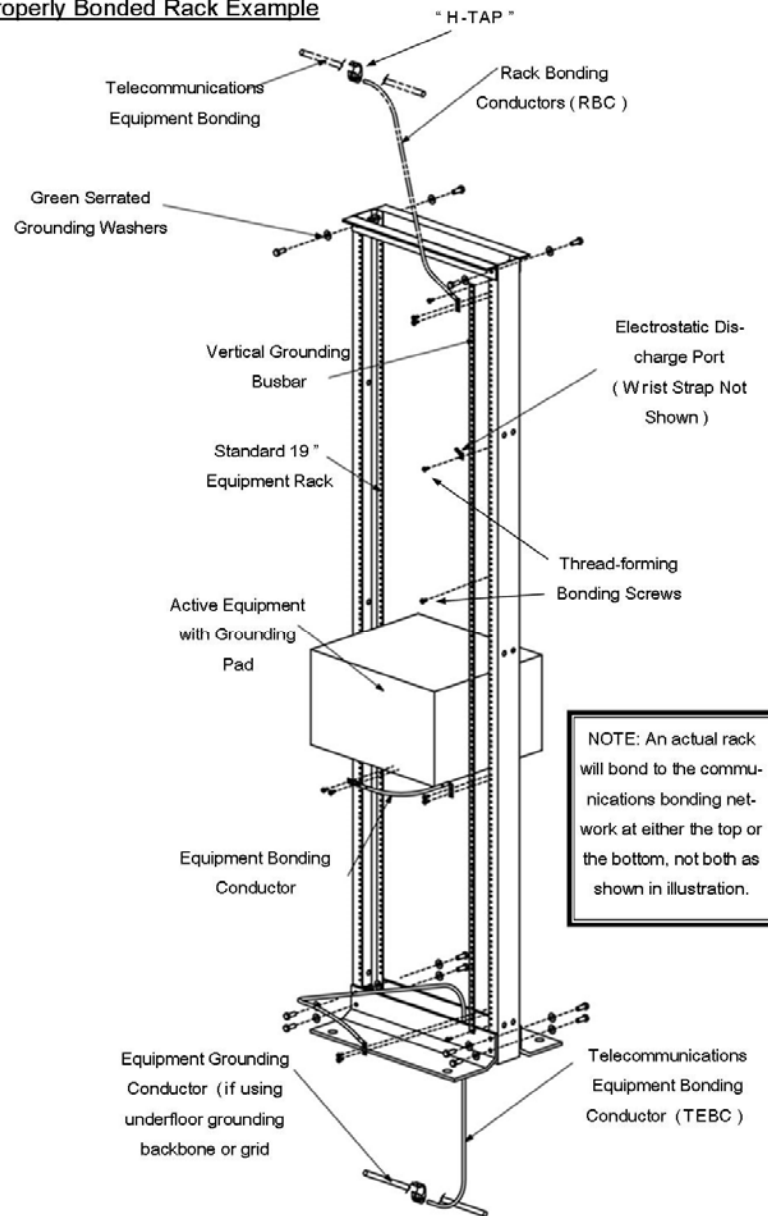
3. Rack and Equipment Grounding

- a. Contractor is responsible for properly grounding all network equipment, racks and cabinets and bonding



- them to the wall mounted busbars as described in the **TIA 607-C** standard.
- b. All newly installed racks and cabinets shall have installed a vertical busbar mounted along one equipment rail to serve as a clean, low-resistance bonding place for any equipment not equipped with a designated grounding pad.
 - c. Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar through the use of a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.
 - d. Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with an EBC (equipment bonding conductor) kit built to that purpose.
 - e. Contractor shall take care to clean (wire brush, scotchbrite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.
 - f. All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and shall be removed and replaced at Contractor's expense.
 - g. Every rack or cabinet shall have an individual bonding conductor into the grounding network, serially connecting (daisy chaining) of racks is expressly forbidden and will not be accepted.
 - h. Rack Bonding Conductors (RBC) may tap into an overhead or under floor aisle ground, or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing 5 racks or less.
 - i. A minimum of every other rack or cabinet shall be outfitted with a properly installed and bonded ESD (electro-static discharge) port along with a wrist strap and lead to be used by any technicians servicing network equipment. On four post racks and cabinets, these ESC ports and straps shall be provided on front and back to be accessible and able to reach any active equipment needing servicing.
 - j. Armored cables shall be properly bonded to the earthing system on both ends with a kit built to that purpose.
 - k. For examples of rack grounding, refer to the illustration below:

Properly Bonded Rack Example



END OF SUB-SECTION SECTION III



H. Communications Entrance Facilities

1. General

- a. All entrance facilities shall be installed, grounded and bonded per applicable building, fire and electrical codes
- b. A minimum of qty 1 (one) 4" metal conduit shall extend from the Canyons School District owned handhole/vault at the property line to the MDF.
- c. A minimum of qty 1 (one) 4" conduit (item b – above) shall contain qty 3 (three) 1.25" innerduct from the handhole to the MDF.
- d. All innerduct shall contain a secured pull string/tape.

IV. Network Labeling

A. General Requirements

1. When labeling any Canyons School District Information Technologies network system, whether existing or new, Contractor shall always adhere to the following requirements:
 - a. Contractor shall, wherever possible pre-print labels using Panduit Easy-Mark software and laser jet printer, Leviton or Canyons approved equivalent.
 - b. The Panduit PanTher (LS8E) hand-held thermal transfer printer, Leviton or Canyons approved equivalent shall be used on site to print labels that were unanticipated, or that become damaged in application.
 - c. This labeling strategy shall, at a minimum, clearly identify all components of the system: racks, cables, panels and outlets, grounding, pathways and spaces like telecommunications rooms.
 - d. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure.
 - e. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
 - f. All label printing will be machine generated by either hand-held labeling systems or computer generated using programs and materials built specifically for communications labeling.
 - g. Hand written labels will not be accepted and must be remedied at Contractors expense.
 - h. Cabling system labels shall utilize materials designed to outlast the cabling elements to which they attach. Office quality labels will not be accepted.
 - i. Cable labels shall be self-laminating, appropriately sized to the outside diameter of the cable and placed within view at the termination point on each end.
 - j. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.
 - k. Machine-generated labels shall be installed behind the clear lens or cover on any device that provides such an option.



- l. All labels will be permanently affixed to installed cables, patch panels, racks, cabinets, and enclosures.
- m. Labels shall be legible and placed in a position that insures ease or visibility. Label type must be as listed in Appendix A - Materials section at the end of this document.
- n. Conduit shall be marked indicating the identification of the cable within.
- o. All cabling added to existing "legacy" installations shall follow the labeling convention in place at that location.
- p. All labeling of installed cabling in new (greenfield) projects shall satisfy all requirements of TIA 606-B, or be modified as indicated in the project specific documentation.

END OF SUB-SECTION IV

V. Testing and Acceptance

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions.
2. All copper pairs or optical fibers of each installed cable shall be tested and verified prior to system acceptance.
3. Any defect in the cabling system performance or installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors or fibers in all cables installed.
4. All cables shall be tested in accordance with this document, the ANSI/TIA Standards, the PANDUIT® Certification Plus or PanGen™ System Warranty, Leviton/Berk-Tek Limited Lifetime Warranty, or Canyons School approved equal guidelines and best industry practice.
5. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

a. Copper Link Testing

1. All twisted-pair copper cable links shall be tested for compliance to the requirements in ANSI/TIA 1152 and ANSI/TIA 568-C.2 for the appropriate Category of cabling installed using a test unit meeting a minimum IEC IIIe level of accuracy.
2. All testers used must have been factory calibrated by the manufacturer within one year of use or according to factory calibration recommendations, whichever is the more stringent.
3. Contractor shall set references according to manufacturer's recommendation prior to each day's testing and reset references anytime tester is left unused for more than two hours.



4. For warranty purposes, Contractor shall perform the appropriate Permanent Link test. Channel Link testing is rendered void by the movement of patch cords and can be run but not used for final acceptance criteria.

b.Fiber Testing

1. All installed fiber shall be tested for link-loss in accordance with ANSI/TIA-C.0 and shall be within limits specified within ANSI/TIA-C.3, or as spelled out in the project documentation.
2. For horizontal cabling system using multimode optical fiber, attenuation shall be measured in one direction at either 850 nanometer (nm) or 1300 nm using an LED light source and power meter.
3. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.
4. Backbone single-mode fiber cabling shall be tested at the 1310 and 1550 wavelengths in both directions.
5. Test set-up and performance shall be conducted in accordance with ANSI/568-C.0 standard, Method B.
6. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. Only basic link-loss testing with a power meter is required. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above.
7. The values for calculating loss shall be those defined in the ANSI/TIA 568-C.3 Standard. If the link loss requirements defined within the standard are in conflict with those referenced in the project documentation, Contractor shall immediately bring this to the attention of Information Technologies for resolution.

c.System Documentation

1. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to Canyons Schools for approval. Documentation shall include the items detailed in the sub-sections below.
2. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase.
3. Contractor shall submit with drawings a diagram of each telecommunications room with indicating which cabling drops will terminate in which rooms (classrooms). This is both to give an idea of contractor cable plant design, as well as to facilitate future troubleshooting.



4. At the request of the Information Technologies Engineer, the telecommunications contractor shall provide copies of the original test results in tester native format, not spreadsheet.
5. Information Technologies may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by Information Technologies, including a 100% re-test. This re-test shall be at no additional cost to the Canyons School District Information Technologies.

d. Test Results

1. Documentation shall be provided in electronic format within three weeks after the completion of the project. The media shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year).
2. The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crewmember name(s). Documentation shall also include test equipment name, manufacturer, model number, serial number, software version and last factory calibration date.
3. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation.
4. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
5. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form.
6. The media shall contain the electronic equivalent of the test results as defined by the specification along with the software necessary to view and evaluate the test reports.
7. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.
8. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations.



-
9. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The School District will provide floor plans in paper and electronic (DWG, AutoCAD) formats on which as-built construction information can be added.
 10. These documents will be modified accordingly by the Telecommunications Contractor to denote as-built information as defined above and returned to the Canyons School District.
 11. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD) form.

END OF SUB-SECTION V



Appendix A – Materials List

Manufacturer	Part Number	Description
COPPER DISTRIBUTION		
General Cable	7141819	CAT6A GenSPEED® 10 UTP plenum (CMP), 4-pair, UTP copper cable, 0.25 OD – blue
General Cable	2131752E	25 pair, plenum rated, Category 5E cable – gray.
General Cable	8136100	CAT6A GenSPEED® Outside Plant Cable
Panduit	CJ6X88TGBL	Category 6A, RJ45, 8-position, 8-wire, 10 Gb/s UTP Mini-Com® universal jack module has TG-style termination – color black. For other standard colors, replace suffix “BL” with IW (Off White) with EI (Electric Ivory), WH (White), AW (Arctic White), IG (International Gray), OR (Orange), RD (Red), BU (Blue), GR (Green), YL (Yellow), or VL (Violet). Canyons School District standardize on black unless otherwise indicated in project documentation. NOTE MODULAR PATCH PANELS MUST BE POPULATED WITH JACKS AS WELL AS STAINLESS FACEPLATES.
Panduit	CMBBL-X	Mini-Com blank module to blank out open spaces (holes) on faceplates and patch panels. For colors other than black replace “BL” with IW (Off White) with EI (Electric Ivory), WH (White), or IG (International Gray).
Panduit	CPPL24WBLY	24-port patch panel with labels, supplied with six factory installed CFFPL4 type front removable snap-in faceplates. Contractor to populate black Cat 6 jacks as specified in this document.
Panduit	CPPL48WBLY	48-port patch panel with labels, supplied with six factory installed CFFPL4 type front removable snap-in faceplates. Contractor to populate with black Cat 6 jacks as specified in this document.
Panduit	UTP28X**BU	Category 6A Performance, 28AWG, UTP patch cord. For lengths 1 to 50 feet (increments of one foot), replace ** with desired length in feet. For standard cable colors other than Off White, replace “BU” with color code: BL (Black), RD (Red), YL (Yellow), GR (Green), OR (Orange), GY (Gray), PK (Pink), or VL (Violet).
Panduit	CFPSL4IWY	Single gang, plastic, sloped vertical faceplate accepts four Mini-Com® Modules.
Panduit	CFPSL6IWY	Double gang, plastic, sloped vertical faceplate accepts eight Mini-Com® Modules. For labels use
Panduit	UICFPSE8IW-2G	Double-gang, plastic, sloped vertical faceplate holds up to eight Mini-Com® Modules.
Panduit	CFPL4SY	Single gang, stainless steel vertical faceplate accepts four Mini-Com® Modules. Requires minimum 1.9" wide electrical box for proper mounting.
Panduit	CFPL8S-2GY	Double gang, stainless steel vertical faceplate accepts eight Mini-Com® Modules.
Panduit	P110KB1005Y	Panduit Pan-Punch 100 pair 110 block termination kits for 25pr 5E cable. Field terminated. Includes a base, 5-pair connector kit with five 5-pair connectors per row of 25 pairs, two label holders, and two white designation labels.
FIBER DISTRIBUTION SYSTEMS		
General Cable	BE0121ANU-ILPA	Plenum-rated, indoor/outdoor tight-buffered, armored OM3 12 strand fiber cable.
General Cable	BE0241ANU-ILPA	Plenum-rated, indoor/outdoor tight-buffered, armored OM3 24 strand fiber cable.
General Cable	BL0121ANU-ILPA	Plenum-rated, indoor/outdoor tight-buffered, armored OM4 12 strand fiber cable. (Use OM4 for any telecom rooms that are further than 300M apart).
General Cable	BL0241ANU-ILPA	Plenum-rated, indoor/outdoor tight-buffered, armored OM4 12 strand fiber cable. (Use OM4 for any telecom rooms that are further than 300M apart).
Panduit	FLCDMCXAQY	LC OptiCam® 10Gig™ 50/125µm Multimode Duplex Fiber Optic Connector for 900µm tight-buffered fiber installation.
Panduit	FCE1U	Opticom® QuickNet™ Rack Mount Fiber Enclosures, holds up to four QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions: 1.73"H x 17.60"W x 16.30"D (43.9mm x 447.0mm x 414.0mm).



INFORMATION TECHNOLOGIES

8/31/2018

Panduit	FCE2U	Opticom® QuickNet™ Rack Mount Fiber Enclosures, holds up to eight QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions: 3.48"H x 17.60"W x 16.30"D (88.4mm x 447.0mm x 414.0mm).
Panduit	FAP6WAQDLC	LC 10Gig™ FAP loaded with six LC 10Gig™ Duplex Multimode Fiber Optic Adapters (Aqua) with phosphor bronze split sleeves.
Panduit	FAPB	Blank fiber adapter panel – reserves space for future use.
Panduit	FX2ERQNSNM***	OM4 push/pull LC jumper/patch cord. Riser rated. *** At end of part number is for length in meters. Comes in 1 M increments up to 20 meters, then in lengths of 20 M, 25 M, 30 M, and 35 M. Put length in the following (3 digit) format: 001 for 1 M, 020 for 20 M, etc.
		RACKS AND CABLE MANAGERS
Panduit	R4P	4 post EIA rack with #12-24 threaded rails. Dimensions: 84.0"H x 23.25"W x 30.0"D (2134mm x 591mm x 762mm).
Panduit	R4P36	4 post EIA rack with #12-24 threaded rails. Dimensions: 84.0"H x 23.25"W x 36.0"D (2134mm x 591mm x 914mm).
Panduit	R4P42	4 post EIA rack with #12-24 threaded rails. Dimensions: 84.0"H x 23.25"W x 41.5"D (2134mm x 591mm x 1054mm). FOR TOP OF RACK INTERBAY ROUTING.
Panduit	R4PWF	Top trough with waterfall for 4-post racks creates pathway above rack. Dimensions: 1.9"H x 26.1"W x 8.5"D (50mm x 662mm x 216mm).
Panduit	R2P	19" EIA 2-post rack, aluminum. Dimensions: 84.0"H x 20.3"W x 3.0"D (2134mm x 514mm x 76mm).
Panduit	R2PPEVWF	Waterfall Trough for 2 Post Rack and PatchRunner high capacity – Vertical Cable Managers. FOR TOP-OF-RACK INTERBAY ROUTING.
Panduit	PEV6	High capacity dual-sided vertical manager. Dimensions: 83.5"H x 6.0"W x 28.1"D (2120mm x 152mm x 714mm).
Panduit	PED6	Dual hinged metal door. Dimensions: 82.8"H x 6.1"W x 1.7"D (2103mm x 155mm x 43mm).
Panduit	PEV8	High capacity dual-sided vertical manager. Dimensions: 83.5"H x 8.0"W x 28.1"D (2120mm x 203mm x 714mm).
Panduit	PED8	Dual hinged metal door. Dimensions: 82.8"H x 8.1"W x 1.7"D (2103mm x 206mm x 43mm).
Panduit	PEV10	High capacity dual-sided vertical manager. Dimensions: 83.5"H x 10.0"W x 28.1"D (2120mm x 254mm x 714mm).
Panduit	PED10	Dual hinged metal door. Dimensions: 82.8"H x 10.1"W x 1.7"D (2103mm x 256mm x 43mm).
Panduit	NM1	Horizontal Cable Manager High Capacity Front and Rear 1 Rack Unit. 1.7"H x 19.0"W x 13.1"D (44mm x 482mm x 332mm).
Panduit	NMF1	Horizontal Cable Manager High Capacity Front Only 1 Rack Unit. 1.7"H x 19.0"W x 6.2"D (44mm x 482mm x 157mm).
Panduit	NM2	Horizontal Cable Manager High Capacity Front and Rear 2 Rack Units. 3.5"H x 19.0"W x 13.1"D (88mm x 482mm x 332mm).
Panduit	NMF2	Horizontal Cable Manager High Capacity Front Only 2 Rack Units. 3.5"H x 19.0"W x 6.2"D (88mm x 482mm x 157mm). FOR MID-RACK INTERBAY ROUTING.
Panduit	NMF3	Horizontal Cable Manager High Capacity Front Only 3 Rack Units. 5.2"H x 19.0"W x 6.2"D (133mm x 482mm x 157mm). FOR MID-RACK INTERBAY ROUTING.
Panduit	CMUT19	2 RU upper trough with 1.3" bend radius mounts to the top of a standard 19" EIA rack. Dimensions: 3.5"H x 19.0"W x 4.5"D (89mm x 483mm x 114mm). FOR BOTTOM-OF-RACK INTERBAY PATHWAY.
Panduit	CMLT19	4 RU lower trough with 1.3" bend radius mounts to the bottom of a standard 19" EIA rack. Dimensions: 8.0"H x 19.0"W x 4.5"D (203mm x 483mm x 114mm). FOR BOTTOM-OF-RACK INTERBAY PATHWAY. LARGER OPTION THAN CMUT19 IF NEEDED.
		CABLE PATHWAYS
Panduit	J-Pro J-Hook system	Panduit J-Pro System. Plenum rated composite J-hooks with hardware available for various hardware applications.
B-line	WB400	B-line basket tray.



INFORMATION TECHNOLOGIES
8/31/2018

Panduit	LD10IW10-A	LD10 International White Plastic Raceway, see catalog or www.panduit.com for fittings. For 8' sections order LD10IW18-A.
Panduit	LD2P10	Dual Power/Data Raceway channel plastic raceway for concurrently running power and data. See catalog or www.panduit.com for fittings.
Panduit	JBX3510IW-A	Single gang two-piece snap together outlet box with adhesive backing. Box accepts Pan-Way® Screw-On Faceplates or any NEMA standard single gang faceplate. For use with Pan-Way® T45 or LD profile raceway. 5.00"L x 3.26"W x 1.62"H (127.1mm x 82.7mm x 41.1mm). Breakouts for 1/2", 3/4", or 1" diameter conduit.
Panduit	JBP2IW	Double gang two-piece screw together outlet box. Box accepts Pan-Way® Screw-On Faceplates or any NEMA standard double gang faceplates. For use with Pan-Way® LD profile raceway. 5.05"L x 5.05"W x 1.62"H (128.2mm x 128.2mm x 41.1mm). Breakouts for 1/2" or 3/4" diameter conduit.
Panduit	T70BIW10	Panduit T-70 dual channel plastic raceway for concurrently running power and data in computer labs. See catalog or www.panduit.com for partitions and fittings. For 8 foot sections replace "10" in part number with "8".
Panduit	T70CIW10	Cover for T-70 dual channel raceway. For 8 foot sections replace "10" in part number with "8".
		BONDING AND GROUNDING
Panduit	ACG24K	#6 AWG (16mm ²) jumper for armored cable diameter up to 0.84" (21.3mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.
Panduit	LCC series	Panduit two-hole compressing lugs for code conductors in BICSI hole spacing.
Panduit	HTCT series	Panduit HTAPs. Must be selected according AWG size of run and tap conductors.
Panduit	CLRCVR series	Panduit clear covers for HTAPs. Must be selected according to HTAP being covered.
Panduit	RGS134-1Y	Grounding strip (vertical busbar) for newly installed racks or cabinets with screw rails. 78.65" (2m) length; .67" (17mm) width; .05" (1.27mm) thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker and three each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
Panduit	RGCBNJ660P22	Jumper kit for bonding individual racks or cabinets into grounding backbone. #6 AWG (16mm ²) jumper; 60" (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread forming screws and a copper compression HTAP* for connecting to a #6 to #2 awg sized bonding backbone.
Panduit	GJ672UH	Rack jumper (and cabinet) kits for smaller TR (5 bays or less) to bond individual rack or cabinet directly back to wall mounted busbar. One 72" length #6 AWG green wire with yellow horizontal stripe. Jumper is pre-terminated on one end with LCC6-14JAWH-L and the other end with LCC6-14JAW-L. This rack grounding jumper is 72" long. For other lengths replace the "72" in the part number. Available lengths are 72, 96, 120, 144, 168, 192, 216, 240, 264 and 288 inches.
Panduit	RGESD2-1	Two-hole ESD port with 5/8" hole spacing; provided with an ESD protection sticker, .16 oz. (5cc) of antioxidant, and two each #12-24 x 1/2" and M6 x 12mm thread-forming screws. LOCATE ONE WITHIN REACH OF ALL EQUIPMENT. WORKS WITH WRIST STRAP RGESDWS.
Panduit	RGESDWS	Adjustable fabric ESD wrist strap with 6' coil cord, banana plug, 1 megaohm resistor and 4mm snap. LOCATE ONE WITHIN REACH OF ALL EQUIPMENT. WORKS WITH ESD PORT RGESD2-1.
Panduit	RGTBSG-C	Green thread-forming bonding screws for use to mount equipment that does not have a built-in grounding pad (terminal).
Panduit	RGEJ1024PHY	24" long pre-terminated equipment grounding jumper #10 AWG (6mm ²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws. FOR EQUIPMENT LIKE CHASSIS SWITCHES WITH BUILT-IN GROUNDING PAD (TERMINAL).
Panduit	RGEJ1036PFY	36" long pre-terminated equipment grounding jumper #10 AWG (6mm ²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws. FOR EQUIPMENT LIKE CHASSIS SWITCHES WITH BUILT-IN GROUNDING PAD (TERMINAL).



INFORMATION TECHNOLOGIES
8/31/2018

Panduit	GB2B0306TPI-1	Wall mounted telecommunications busbar suitable for small telecom room. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 2" x 12" in size.
Panduit	GB2B0514TPI-1	Wall mounted telecommunications busbar suitable for med telecom room. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 2" x 24" in size.
Panduit	GB4B0624TPI-1	Wall mounted telecommunications busbar suitable for main grounding busbar in medium sized facility. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 4" x 20" in size.
Panduit	LTYK	Wall mounted busbar label kit. Label kit includes printed tag and one flame retardant cable tie.
		NETWORK LABELING SOFTWARE – FOR INK JET/LASER PRINTER
Panduit	PROG-EM2GO	Easy-Mark Labeling Software for PC, supplied on USB Flash Drive. For preprinting communications labels on laser/inkjet printer.
Panduit	S100X150YAJ	Self-laminating cable labels for Category 6 cable for use with Easy-Mark software and laser/ink jet printer.
Panduit	C261X035Y1J	Patch Panel labels for use with Easy-Mark software and laser/ink jet printer.
Panduit	C195X040Y1J	Faceplate labels for single gang stainless or sloped plastic - use with Easy-Mark software and laser/ink jet printer.
Panduit	C288X040Y1J	Faceplate labels for double gang stainless - use with Easy-Mark software and laser/ink jet printer.
Panduit	S100X650YAJ	Cable label for indoor/outdoor tight-buffered armored fiber optic cable. For use with Easy-Mark software and ink jet printer.
Panduit	S100X160YAJ and NWSLC-3Y	Label and turn-tell sleeve for labeling fiber jumpers. For use with Easy-Mark software and ink jet printer.
Panduit	C200X100FJJ	1" high, white, vinyl tape labels for labeling grounding busbars, racks, cabinets and pathways. For use with laser/ink jet printer.
		NETWORK LABELING – HANDHELD LABELER
Panduit	LS8EQ-KIT-ACS	Panduit PanTher hand-held label printing system in kit. Includes LS8EQ printer with QWERTY keypad, one cassette of S100X150VAC self-laminating labels, six AA alkaline batteries, LS8E-ACS, LS8-CASE, LS8-PCKIT, LS8-IB, LS8-WS, quick reference card and operator's manual. USE FOR LABELS THAT MUST BE PRINTED ON THE JOB SITE.
Panduit	S100X150VAC	Self-laminating cable labels for Category 6 cable for use with PanTher LS8E hand-held printer.
Panduit	C261X035Y1C	Handheld printer labels for modular faceplate patch panels.
Panduit	C195X040Y1C	Faceplate labels for single gang stainless - use with PanTher handheld labeler.
Panduit	C288X040Y1C	Faceplate labels for double gang stainless - use with PanTher handheld labeler.
Panduit	S100X650VAC	Cable label for indoor/outdoor tight-buffered armored fiber optic cable. For use with handheld labeler.
Panduit	S100X160VAC and NWSLC-3Y	Label and turn-tell sleeve for labeling fiber jumpers. For use with hand-held labeler.
Panduit	T100X000VPC-BK	1" high, continuous black on white, vinyl tape labels for labeling racks, cabinets and pathways with PanTher LS8E handheld labeler.
		PHYSICAL SECURITY LOCKING DEVICES
Panduit	PSL-DCJB-C	Package of 100 RJ45 jack blockout devices and one removal tool. Color red.
Panduit	PSL-USBA-L	Package of 50 USB Type 'A' blockout devices and one removal tool. Color red.
Panduit	PSL-USBB-L	Package of 50 USB Type 'B' blockout devices and one removal tool. Color red.
Panduit	PSL-DCPLX-BL-C	Package of 100 RJ45 plug lock-in devices compatible with flush mount jacks, and one installation/removal tool. Color black.



INFORMATION TECHNOLOGIES
8/31/2018

Panduit	PSL-DCPLRX-BL-C	Package of 100 RJ45 plug lock-in devices compatible with recessed jacks, and one installation/removal tool. Color black.
		CABLE TIES – HOOK AND LOOP
Panduit	TTS-35RX0	.75" wide, continuous roll Hook and Loop Cable Ties, black. 35 ft roll. Carton qty 10 rolls.
Panduit	HLSP1.5S-X12	Plenum rated hook and loop cable ties for air return spaces. Maroon color, perforated at 6" length.
Panduit	HLSP3S-X12	Plenum rated hook and loop cable ties for air return spaces. Maroon color, perforated at 6" length.

<END OF APPENDIX A>

BLANK PAGE

INTENTIONALLY LEFT BLANK

SECTION 27 5123 - SOUND AND INTERCOMMUNICATION SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 ADMINISTRATIVE REQUIREMENTS:

- A. Bid Submittal:
 - 1. Equipment Costs: Breakout cost of material and labor as different line items.
- B. All bids shall be based on the existing system. The catalog numbers and model designations are that of the Rauland Telecenter TCU system. Contact Marshall Industries. Verify exact intercom system that exists within the school. Provide components that are compatible with the existing system.
- C. Coordination:
 - 1. Coordinate with Electrical contractor to meet at least twice with the ceiling installer. Hold first meeting before submittal of shop drawings to coordinate the mounting condition of all ceiling-mounted AV equipment with ceiling type. During second meeting, coordinate the location of all ceiling-mounted AV equipment in each area.
 - 2. Meet at least once with the mechanical installer prior to fabrication and installation of duct work. Coordinate depth and location of all loudspeaker and duct work in all areas.
 - 3. Meet with Electrical contractor prior to pathway rough-in to coordinate Intercom system requirements in each area.
 - 4. Coordinate color and finish of all system components with Architect or Electrical contractor as appropriate.
 - 5. Coordinate all system components within millwork/furniture with millwork shop drawings prior to rough-in.

1.3 DESCRIPTION OF WORK:

- A. Extent of sound system work is indicated by drawings and schedules. System is existing and will have components added and/or subtracted from. Refer to riser diagrams for typical wiring methods.
- B. All components that are listed for removal shall have all associated junction boxes, conduit and cabling removed back to headend or tap/splitter location unless otherwise noted.
- C. Types of Sound Systems in this section include the following:
 - 1. Central Intercom/Program and Distribution/Time Signaling.
- D. Provide complete, functioning systems as described herein. Work under this section includes the following:
 - 1. All sound system equipment, cables, and installation.
 - 2. All required housings for equipment.
 - 3. Final testing and documentation.

E. The following sound system components shall be provided by others:

1. Raceway
2. AC power
3. Support structure for loudspeakers

1.4 QUALITY ASSURANCE:

A. MANUFACTURERS:

1. Firms regularly engaged in manufacture of sound equipment, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years. Equipment supplier shall be authorized representative of the manufacturer of each major piece of equipment and be currently authorized by the manufacturer to furnish, install and service that particular equipment.
2. New equipment must match existing manufacturer's standard parts.

B. INSTALLER:

1. Qualified with at least 5 years of successful installation experience with similar systems.
2. Contractor must follow the standards described within:
 - a. BICSI/INFOCOMM AV Design Reference manual.
 - b. ANSI/INFOCOMM 2M-2010 Standard guide for Audiovisual Systems Design and Coordination Processes.
 - c. ANSI/INFOCOMM 10:2013 Audiovisual Systems Performance Verification Guide.

C. QUALIFICATIONS:

1. Any system and/or equipment proposed as an equal to that specified must be proven to conform to the standards established herein. The contractor must obtain the engineer's approval in writing prior to bidding equipment other than that specified. The manufacturer's name, model numbers and three (2) copies of shop/working drawings complete with catalog sheets, technical and installation data shall be submitted for approval.
2. Anyone seeking approval to bid must submit booklets of equipment proposed and a letter stating that the equipment submitted is either equal to or better than that specified and the reasons why. Companies seeking approval must also guarantee that the system being submitting will meet the requirements of the state, city and county over the building project. Pre-qualification of contractor shall be done 5 working days prior to bidding of the project.
3. Substitute proposals shall include all items of labor, material and equipment required for the installation of the substitute equipment including all changes in conduit, wiring, etc.
4. Each bidder proposing to use substitute equipment, shall advise the Electrical Engineer and Electrical Contractor ten (10) calendar days prior to the bid date of changes required to wiring, conduit, back boxes and terminal cabinets in order to utilized the proposed equipment. Substitution of alternate equipment will make the bidder responsible for ANY additional costs necessary to make the proposed system function as specified.
5. The system shall be supplied by the manufacturer's authorized representative

who is qualified in the proper installation, operation and service of the system. Certification shall be submitted verifying that the bidder is the manufacturer's authorized representative.

D. NEC COMPLIANCE:

1. Comply with NEC as applicable to construction and installation of sound system components and accessories.

1.5 SUBMITTALS:

A. Refer to specification 26 0500 for shop drawing submittal requirements. The following items shall be included in the shop drawings submittal.

1. All submittals shall be submitted in a digital format with bookmarks for each section of equipment. Any submittals that are partial or incomplete shall be rejected and count as one submittal against the submittal allowance.
2. Project manager to provide written proof, signed and dated, that shop drawings and/or brochure has been checked for accuracy prior to submittal. Shop drawings to comply in all respects with the requirements of the contract drawings and specifications for this project.
3. Provide a complete bill of materials for all components, accessories and hardware to be provided in order to assemble a complete and working system as described within the contract documents.
4. Submit manufacturer's data and installation details for all devices, plates, cables and similar equipment. Product data showing multiple options, products and/or models shall be clearly marked identifying the specific options, products and/or models being provided.
5. Submit dimensioned drawings and device wiring layouts for Audio, Video, Control, and power. Show how new equipment will connect to existing system.
6. Submit equipment rack elevation diagrams.
7. Submit all manufacturer training, 3rd party and/or organization certificates for each equipment and/or systems required for the implementation of this specification.

1.6 WARRANTY:

- A. Any added components to the existing system shall be guaranteed for a period of one (1) year from the date of substantial completion against defective materials, inferior workmanship or improper installation adjustment. Guarantee shall cover all parts and labor.
- B. If system failure causes audiovisual system to be inoperative or unusable for its intended purpose, contractor, when notified of the problem, shall repair system so it will be operational and usable within three (3) business days. If defective components cannot be repaired in time, provide temporary equipment as required.
- C. Contractor shall supply (1) year warranty on all system programming from the date of substantial completion. During this time period, upon owner request, the contractor shall provide programming changes up to (4) four times free of charge. During this time the programs shall be password protected. At any time during the (1) year, the owner can terminate the warranty and request the programming of each system. At this time the programs are to be turned over to the owner and all passwords are to be removed. The owner shall own all rights to the programming after this time, to be used in this facility.
- D. Contractor shall honor equipment warranties for term established by manufacturer if

greater than warranty time frame mentioned above.

PART 2 – PRODUCTS

2.1 SOUND SYSTEMS:

A. GENERAL:

1. Provide sound system products of types, sizes and capacities indicated, that comply with manufacturer's standard design, materials, components; construct in accordance with published product information, and as required for complete installation. Provide sound system for application intended, and with the following components and function features.
2. Contractor shall match existing zoning system that is currently setup. Refer to plans for new zoning of common areas.

2.2 INTERCOMMUNICATION, PROGRAM DISTRIBUTION, CLOCK/TIME SIGNALING SYSTEM SCOPE:

- A. The contractor shall provide and install a complete, new, functioning intercommunication, program distribution, time and class change signal system as described in these specifications and shown on the drawings.
- B. All loudspeaker and intercom telephone circuits shall be wired to the console.
- C. All class-change signaling shall be sounded over system loudspeakers as programmed.
- D. Clocks shall be flush mounted as shown. 12" clocks shall be battery powered. The contractor shall provide a fresh battery and install each clock set to the correct local time. Large areas shall be provided with 15" clocks with wire guards.
- E. All loudspeaker circuits may be accessed and operated with two-way voice, actuated amplifiers to allow communications from system telephones to all loudspeaker equipped areas.
- F. The contractor shall provide push button call switches located as shown on the drawings.

2.3 FEATURES/FUNCTIONS

- A. The communication system shall provide a comprehensive network between all administrative and staff locations. The system shall provide no less than the following features and functions:
 1. All staff stations, including those with both a telephone and a loudspeaker, shall require no more than a single 3 conductor, shielded cable.
 2. Each station loudspeaker shall be assignable to one or more of eight paging zones plus one or more of eight time-signaling zones. Time and paging zones shall be independent of each other.
 3. Loudspeakers shall be automatically muted in an area where a page is originating.
 4. Telephone stations that do not initiate a call within 10 seconds after going off-hook shall receive a busy signal and shall automatically disconnect after 45 seconds.
 5. Each staff station shall be programmable for 3 classes of call-in:
 - a. LEVEL 1 - NORMAL/EMERGENCY
 - b. LEVEL 2 - URGENT/EMERGENCY

c. LEVEL 3 – EMERGENCY

2.4 APPROVED EQUIPMENT

- A. Control console – Existing
- B. Control telephone – Existing
- C. Digital wall display - Existing
- D. Call switch – Rauland
- E. Loudspeakers:
 - 1. Type 'IC1' loudspeaker assembly:
 - a. Quam – C5/BU/W
 - b. Quam – ERD-8
 - c. Quam – SSB-2
 - 2. Type 'IC2' loudspeaker assembly:
 - a. Quam – C5/BU/W
 - b. Quam – ERD-8
 - c. Quam – SSB-7
 - 3. Type 'IW1' loudspeaker assembly:
 - a. Quam – 8C5PAX/TBLU
 - b. Lowell – P875X
 - c. Lowell – JG-8X
 - 4. Type 'IW2' loudspeaker Assembly:
 - a. Atlas – VTF 152UCN
 - b. Atlas – SE back box
- F. Classroom loudspeaker cable – Category Cable and West Penn 25359B Installed by the Electrical Contractor

PART 3 – EXECUTION

3.1 GENERAL:

- A. Wiring shall be installed in metallic conduit and provided with necessary junction and pull boxes. All wiring shall be color coded and in accordance with the manufacturer's instructions, local and national codes. Care shall be exercised in wiring to avoid damage to the cables. All boxes shall be plumb and square. Cables shall be pulled continuous without splicing, leaving ends in lengths as directed by the manufacturer's representative.
- B. After all circuits and cables have been pulled and completed from one extremity to the other, the electrical contractor shall check all circuits free of opens, shorts and grounds. The electrical contractor shall identify and tag all cables at the head end.
- C. The electrical contractor shall furnish and install all equipment, wiring, conduit, boxes, rough-in, etc., according to the plans and specifications.
- D. The manufacturer's representative shall make all final connections to the equipment, shall test and adjust the systems, and shall instruct the proper parties as to care and operation.

- E. Any additional equipment required for a fully functional system to meet the intent of the specifications shall be provided whether or not specifically listed herein.
- F. Pathway Requirements:
 - 1. General:
 - a. All pathways shall be designed, constructed, grounded and installed in accordance with all recommendations delineated within TIA 569-B and Standard TIA 942.
 - b. Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables. Arrangements to remove any major obstructions not identified on plans need to be determined at that time with the Engineer.
 - 2. Conduits:
 - a. Achieve the best direct route parallel with building lines with no single bend greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points or pull boxes.
 - b. Conduit runs shall not have continuous sections longer than 100 feet without a pull box. Refer to rough-in schedule for conduit fill capacity.
 - c. AV conduits should not be routed over or adjacent to heat sources such as boilers, hot water lines, or steam lines. Neither should they be routed near large motors, generators, photocopy equipment, or electrical power cabling and transformers.
 - d. After installation, conduits shall be clean, dry, unobstructed, capped for protection, labeled for identification, reamed and fitted with bushings.
 - e. A 200lb pull cord (nylon, 1/8" minimum) shall be installed in any empty conduit.
 - 3. Open Top Cable Support Requirements:
 - a. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables
 - b. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
 - 4. Pull Box Requirements:
 - a. NEC sized pull boxes are not acceptable. Follow BICSI and EIA/TIA 569-B guidelines for pull box sizing.
 - b. Provide pull boxes in sections of conduit that are 100 feet or longer, contain more than two 90 degree bends, or contain a reverse bend.
 - c. Conduits that enter a pull box from opposite ends should be aligned.
 - d. Pull boxes shall have a length 12 times the diameter of the largest conduit.
 - e. All pull boxes must be accessible.
- G. Cabling System:
 - 1. Follow TIA/EIA-568A for commercial buildings cabling.
 - 2. Provide a minimum 6" service loop in each AV system junction box. Cables shall

- be coiled in the in-wall boxes if adequate space is present to house the cable coil without exceeding manufacturers bend radius.
3. In a false ceiling environment, a minimum of 3 inches shall be maintained between cable supports and false ceiling. At no point shall cable(s) rest on lay-in ceiling grids or panels.
 4. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
 5. Cables shall not be attached to ceiling grid seismic support wires or lighting fixture seismic support wires. Where support for AV cable is required, the contractor shall install appropriate carriers to support the cabling.
 6. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
 7. Pulling tension for balanced twisted pair shall not exceed 25lbf and for optical fiber shall not exceed 50lbf.
 8. Pair untwist at the termination shall not exceed 0.125". The cable jacket shall be maintained as close as possible to the termination point.
 9. Cable shall not be draped on, tied or otherwise secured to electrical conduit, plumbing, ventilation ductwork or any other equipment. Cable shall be secured to building supports or hangers or to additional blocks or anchors specifically installed for this purpose.
- H. Grounding System:
1. All grounding and bonding shall be done according to ANSI J-STD-607-A, TIA 942, and NEC.
 2. All cabinets/racks shall utilize paint piercing grounding washers, to be used where rack sections bolt together, on both sides, under the head of the bolt and between the nut and rack.
 3. All racks shall further utilize a full-length rack ground strip attached to the rear of the side rail with the thread-forming screws provided to ensure metal-to-metal contact. Similar to Panduit RGS.
 4. All active equipment shall be bonded to ground. If the equipment manufacturer provides a location for mounting a grounding connection, that connection shall be utilized. All active equipment shall be bonded using the appropriate jumper for the equipment being installed using the thread-forming screws. Similar to Panduit RG.
 5. Racks shall have individual, appropriately sized conductors bonded to the grounding backbone. Do not bond racks or cabinets serially – daisy-chained rack grounds will not be accepted.
 6. Refer to electrical diagrams for additional ground connection requirements.
- I. Cabling groups and conduit separation:
1. Refer to "CABLING GROUPS AND CONDUIT SEPARATION SCHEDULE".
- J. Firmly secure all equipment in place that is not intended for portability.
- K. Provide adequate structural support for AV system components. Provide fastenings and supports with a safety load factor of at least five.

3.2 LABELING

- A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and wall plates. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
- B. All labels shall meet UL 969 requirements for legibility, defacement and adhesion requirements. Handwritten labels are not allowed. All labels shall maintain consistent typeface, size and color.
- C. Provide laminated plans (minimum size 11x17) of all AV as-built plans (including riser diagrams) in Equipment Rack.

3.3 INSTALLATION OF SOUND SYSTEMS:

- A. Install sound systems as indicated, in accordance with equipment manufacturer's instructions, and with recognized industry practices, to ensure that system equipment complies with requirements. Comply with requirements of NEC and applicable portions of NECA's "Standard of Installation" practices.
- B. Equalize systems using industry recognized practices and equipment.
- C. Coordinate with other electrical work, including cable/wire, raceways, electrical boxes and fittings, as appropriate to interface installation of clock and program systems work with other work.

3.4 EQUIPMENT CHECK-OUT:

- A. Provide equipment checkout by a factory trained and authorized technician before energized circuits. Make final connections under his direction.

3.5 TESTING:

- A. Upon completion of installation of sound system and after electrical circuitry has been energized, demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed retesting.
- B. Upon completion of installation of each system and after electrical circuitry has been energized, demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units on site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with testing.
- C. Before inspection by owner and AV Consultant, and after completion of the installation, conduct system tests and make necessary corrections for proper system operation.
- D. System shall have no audible hum, noise, RFI, or distortion when operating under normal conditions. System shall reproduce material at the loudspeakers rated output level without audible distortion. All input levels shall be pre-set so system may be operated without causing unstable feedback under normal use.
- E. Perform polarity checks of loudspeaker lines by means of a polarity tester or use DC source at one end of each line and a voltmeter at the other end. Loudspeaker lines shall be identically polarized with respect to color coding.
- F. Loose parts and poor workmanship or soldering shall be replaced.
- G. Provide documentation to the AV Consultant showing impedance of each end point and

each loudspeaker tap setting.

- H. At the time of final commissioning/punch, if the AV consultant determines that the systems are not sufficiently complete to do a final punch list, and was not notified at least 3 days prior to the visit, then a return visit will be required. The AV Consultant's return visit will be paid for by the AV integrator at a flat rate of \$500 per person, at no cost to the owner.

3.6 OPERATING AND MAINTENANCE MANUALS:

- A. Operating and maintenance manuals shall be submitted prior to testing of system. Total of two (2) manuals, shall be delivered to the Company. Manuals shall include all model numbers, service, installation, and programming information.
- B. Provide a copy of the "INTEGRATOR VERIFICATION CHECKLIST" at the front of the manuals.

3.7 TRAINING:

- A. Existing System. No Training required.

3.8 RECORD DRAWINGS:

- A. The Owner shall provide electronic (DWG) format of AV System drawings that as-built construction information can be added to. These documents will be modified by the AV contractor to denote as-built information as defined above and returned to the Owner.
- B. Provide a complete set of "as built" drawings in paper and electronic (DWG and PDF) formats showing cabinets, racks, patch panels, wiring, specific interconnections between all equipment and internal wiring of equipment. Drawings are to include all labeling information used in denoting equipment used in the installation. Labeling, icons, and drawing conventions used shall be consistent throughout all documentation provided.

3.9 SERVICE FACILITIES:

- A. The contractor shall make available and maintain a satisfactory service department capable of furnishing equipment inspection and service.

END OF SECTION 27 5123

BLANK PAGE

SECTION 28 0501 - COMMON REQUIREMENTS FOR SECURITY SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Architectural, Structural, Mechanical, Electrical and other applicable documents are considered a part of the security documents insofar as they apply as if referred to in full. Contractors must review the entire set of plans and specifications. Reviewing only the security set is not acceptable.
- C. Division 26, 27 & 28 basic materials and methods sections apply to work specified in this section, including but not limited to for requirements for raceways, trays, boxes, and fittings, and supporting devices, and other sections, as applicable.
- D. Refer to specification 26 0553 Electrical Identification for cabling, conduit, and junction box color requirements.
- E. Refer to specification 27 1500 Telephone Data Systems for category and/or optical fiber cable, connectivity specifications, additional pathway requirements, and installation standards.
- F. This specification does not address other Division 28 sections, such as the Nurse Call System and/or Fire Alarm and Detection Systems.

1.2 ENGINEER CONTACT INFORMATION:

- A. BNA Security Contact(s):
 - 1. Drayton Bailey
Phone: 801-532-2196
Email: Drayton@BNAConsulting.com
 - 2. Dan Varney
Phone: 801-532-2196
Email: DVarney@BNAConsulting.com

1.3 DESCRIPTION OF WORK:

- A. Security work is defined as any Division 28 system specified, including but not limited to access control and video surveillance systems.
- B. The extent of security work is indicated on drawings and/or specified in Divisions 26, 27 and 28 sections of the specification. Provide all labor, materials, equipment, supervision, and service necessary for complete and working systems.
- C. Provide the specified systems in a complete and operating condition with all necessary materials and labor to fulfill the requirements and the intent of the drawings and specifications. Except as otherwise indicated, provide manufacturer's standard system components. Contractor shall provide all cables, materials, and equipment, whether specifically mentioned herein or not, to ensure a complete and functional system.
- D. Contractor is responsible for coordinating with all other trades for equipment locations, mounting requirements, supports, and plenum space requirements. Contractor shall provide plenum rated cabling if required per the mechanical drawings.
- E. Contractor shall provide 3/4" EMT conduit from devices to accessible ceiling space, then utilize non-continuous cable support devices (J-Hooks) to head-end equipment, utilizing cable tray if on project.

- F. All raceways and enclosures shall be securely fastened and/or mounted as per the currently adopted version of the National Electrical Code (NFPA 70). All work must be completed in a neat and workmanlike manner.

1.4 BID SUBMITTAL:

- A. Provide a detailed scope of work document for all services provided.
- B. The contractor is required to furnish a comprehensive bill of materials encompassing all components, accessories, and hardware essential for the assembly of a complete and fully functional system, as specified within the contract documents. The bill of materials must detail each item with clarity, including quantities, specifications, and any pertinent details necessary for system integration. Compliance with contract specifications and industry standards is imperative.
- C. Provide a breakout cost of material and labor as different line items. Bids must include line-item pricing for major parts and components of the system.
- D. Submit manufacturer certifications for all systems provided. Certifications must be from the local office providing the installation.
- E. All permitting costs shall be included in base bid.
- F. All equipment shall be installed as shown on the drawings and in strict accordance with the specifications. Any errors, conflicts, or omissions discovered in the specifications, or drawings, shall be submitted in writing to the Security Consultant for clarification in an RFI prior to bid.

1.5 QUALITY ASSURANCE:

- A. MANUFACTURERS: Firms regularly engaged in manufacture of security system equipment and components of the types described here in and whose products have been in satisfactory use in similar applications for not less than 5 years.
- B. Integrating firm shall have worked satisfactorily for a minimum of (5) years of completing systems equal to this scope, quality, type, and complexity.
 - 1. Key personnel assigned to the project shall each have a minimum of (5) years of experience in completing systems equal to this scope, quality, type, and complexity.
 - 2. Contractor shall be a factory authorized installer of all equipment specified for the geographical area of the project.
 - 3. Contractor shall maintain complete installation and service facilities for the duration of the project contract.
 - 4. Contractors shall have current manufacturer certifications for all security systems and equipment listed within this specification. Certifications must be from local office providing the installation.
- C. All work shall be done by expert technicians qualified in the field with knowledge of specified systems. Workmanship shall comply with industry best practices concerning grounding, shielding, cable dressing, cable termination and equipment mounting.
- D. All technicians are required to have proper state licensing to perform work within this specification.
- E. List of qualifications include:
 - 1. Industries certifications including manufacturers.
 - 2. Past and current projects within the last 5 years are similar in scope and size.
 - 3. (3) Different referrals from the owners of (3) different projects within the last 5 years.

1.6 GENERAL COORDINATION:

- A. Meet with Electrical Contractor prior to pathway rough-in to coordinate system requirements in each area and review each security device that requires 120V power.
- B. Meet with Owner's IT Department prior to ordering equipment to coordinate IT services to equipment.
- C. Meet with Low Voltage Cabling Contractor (Division 27 1500) at least once, prior to rough-in, to verify all category cabling needs to equipment.
- D. Regular inspections are required and shall be scheduled by the contractor through the Owner/Architect at least twenty-four hours in advance.
- E. Coordinate color and finish of all components with Architect.
- F. Notify engineer of any modifications between contract documents and submittals. It is the contractor's responsibility to ensure compliance with the documents.
- G. Contractor's Project Manager will be required to schedule and provide weekly updates via remote meeting and/or email communications on progress of installation and update project schedule if any dates change from original completion.

1.7 SUBMITTALS:

- A. Refer to specification 26 0502 "Electrical Submittals and Spare Parts" for submittal requirements.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Provide complete raceway system for security system including but not limited to, raceway, outlets, cover plates, backboards, cabinets, grounding and miscellaneous items as required.
- B. Provide plywood terminal backboards, 4' x 8' x $\frac{3}{4}$ " unless otherwise noted for all security equipment unless otherwise noted to be installed in racks.

PART 3 – EXECUTION:

3.1 GENERAL REQUIREMENTS

- A. Provide and install proper finger wire duct with covers within each panel per project requirements. Provide and install Velcro to neatly bundle cables. All cabling shall be installed in a neat and workmanlike manner.
- B. Install systems as indicated, in accordance with equipment manufacturers' written instructions, and with recognized industry practices, to ensure that system equipment complies with requirements. Comply with NEC requirements and applicable portions of NECA's "Standards of Installation" practices.
- C. Coordinate all equipment locations and mounting details with other trades and suppliers.
- D. Provide at least one duplex receptacle on dedicated power circuit next to specified panels.
- E. Grounding: Provide grounding connections sufficiently tight to assure permanent and effective ground.
- F. Conceal raceways and conduits unless otherwise noted in specifications and drawings. Where exposed raceways are permitted, run parallel/perpendicular to walls.

PART 4 – TESTING:

4.1 GENERAL REQUIREMENTS:

- A. Testing: Upon completion of installation of system and after energized, demonstrate system compliance with intent.
- B. Coordinate final inspection of the systems installed, with Security Consultant, three (3) weeks in advance.

PART 5 – LABELING & TRAINING

5.1 GENERAL REQUIREMENTS:

- A. The contractor shall develop and submit for approval a labeling system for the device and cable installation. Coordinate with the owner and negotiate an appropriate labeling scheme with the contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels, and wall plates. The labeling system shall designate the cables' origin and destination and a unique identifier for the cable within the system. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
- B. All labels shall meet UL 969 requirements for legibility, defacement, and adhesion requirements. Handwritten labels are not allowed. All labels shall maintain consistent typeface, size, and color.

5.2 TRAINING:

- A. Provide two training sessions that consist of two hours each of training on the operation of each system, at job site, at no cost to owner. Systems shall be complete and have been finalized by the Consultant prior to training.
- B. The security contractor will terminate, program and test control equipment. As built drawing package (refer to specification 26 0502 "Electrical Submittals and Spare Parts" for as-built drawing package requirements) shall be provided to Owner personnel before commissioning shall begin. System loops will be tested, and any fault conditions found shall be corrected immediately by the contractor.

5.3 CYBERSECURITY

- A. Contractor shall change all default usernames and passwords for all network devices provided. A Strong Password should -
 - 1. Be at least 8 characters in length.
 - 2. Contain both upper and lowercase alphabetic characters (e.g., A-Z, a-z)
 - 3. Have at least one numerical character (e.g., 0-9)
 - 4. Have at least one special character (e.g., ~! @#\$%^&*()_-=)
- B. No written username or passwords shall be located in any areas of installation, except in the O&M manual.
- C. Network devices to be set up on a separate network other than owner's LAN ensuring no internal or external users can access system without authorization. Follow manufacturers hardening guide and use best industry practices to secure network and devices provided by contractor and associated with system.

5.4 WARRANTY AND SERVICE:

- A. The minimum warranty period shall be one year, the warranty period will begin when the system completion documents are submitted to the owners and the system has successfully passed all tests and inspections. Included in the completion documents will be a warranty and service contact form, this form will be filled out by the burglar alarm

contractor, all necessary contact information shall be included to guarantee a response to the system site within 24 HOURS OF THE REQUEST FOR SYSTEM SERVICE. Only qualified technicians capable of making needed repairs and/or system programming are accepted to respond for service.

- B. Contractor shall honor equipment warranties for term established by manufacturer if greater than warranty time frame mentioned above.
- C. During warranty time period:
 - 1. Systems designed for 24/7 operation shall be repaired and/or replaced within 24 hours of time of notification. If defective components cannot be repaired in time, provide temporary equipment as required.
 - 2. During warranty time period, upon owner request, the contractor shall provide programming changes up to (4) four times or 4 hours free of charge.

END OF SECTION 28 0501

BLANK PAGE

SECTION 28 2205 - ACCESS CONTROL SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Refer to Division 8 for the door hardware schedule and requirements.
- C. Division-26, 27 & 28 basic materials and methods sections apply to work specified in this section.
- D. Division 28 0501 Common Work Results for Electronic Safety & Security, apply to this section.

1.2 DESCRIPTION OF WORK:

- A. Provide a complete and operating access control system to expand onto the existing system as indicated in the drawings, diagrams, and specifications, and is hereby defined to include, but not be limited to: access control server, mercury control panels, reader boards, power supplies, batteries, credential card readers, wireless momentary door release buttons and receivers, raceway, outlets, cover plates, jacks, backboards, cabinets, grounding, video surveillance integration, intercom integration, protective enclosures, and all required wiring. Contractor shall furnish all cables, materials, and equipment, whether specifically mentioned herein or not, to ensure a complete and functional system.
- B. Provide all necessary materials and labor to fulfill all the requirements and the intent of the drawings and specifications. Except as otherwise indicated, provide manufacturer's standard system components.
- C. Contractor is responsible for coordinating with the Division 8 door hardware contractor to review the door hardware specification and ensure all components requiring a connection are installed.
- D. Equipment lists are provided to set equipment expectations and may not be complete. Coordinate with devices shown on drawings for system intent. Provide a complete and functional system as described within the construction documents.

1.3 COORDINATION (ACCESS CONTROL SPECIFIC):

- A. Coordinate with Owner, Division 8 contractor, and Division 26 contractor PRIOR to rough-in to coordinate exact location and rough-in of end devices and door functionality. Carefully review Division 8 package (including door hardware schedule and specification) prior to bid and include all components requiring a connection by Division 26 & 28. Meet with Division 8 post-bid and prior to purchase of any equipment. It is not the Security Engineer's responsibility to complete the coordination between Division 8 and Division 26 & 28 for exact locations, connections, and rough-in.
- B. All door hardware specified shall be reviewed upon award of the bid and before ordering any equipment.
- C. During construction, each location showing equipment shall be walked by the contractor and any discrepancies on door hardware fit, finish, and function shall be brought to the architect and security engineer's attention immediately. It is the contractor's responsibility to provide a complete and functioning system and door opening.
- D. Division 26, 27, and 28 contractors shall verify electrical service provided prior to ordering any electrical equipment serving electronic door hardware equipment and has the final responsibility for properly coordinating the electrical work, including the exact location of

the electrical connection(s).

- E. Obtain submittals of all door hardware equipment from door hardware specification and Division 8 and 28 contractor(s). Carefully review door hardware submittal and advise in writing of any discrepancies.
- F. The contractor shall include necessary wiring and programming for fire-alarm panel tie-in and door release. Contractor is responsible to schedule and coordinate with the fire alarm contractor. It is the responsibility of the Contractor to review the Division 8 package (specifications and door hardware schedule) to confirm which doors require fire alarm release.
- G. Prior to starting any work coordinate with the owner, the Div.8 and Div.26 contractors and discuss how the ADA equipment will need to be programmed to operate with the access control system. The access control contractor shall include the necessary wiring to the ADA operators.
- H. Coordinate all interfaces between door hardware and electrical contractor, including any additional panel interface modules and licensing to provide interface between PoE/wireless electronic locks.
- I. Provide a dedicated 20-amp circuit for access control panel equipment.

1.4 QUALITY ASSURANCE:

- A. Manufacturer Certified & State Licensed Contractor(s):
 - 1. Lenel / OnGuard
 - i. Stone Security
 - ii. Security 101
- B. Bidders not pre-approved: See Division 28 0501 Part 1.5.

PART 2 – PRODUCTS

2.1 GENERAL REQUIRMENTS:

- A. Provide a complete and operable open platform / mercury-based access control system that meets the owner's requirements, operates to the manufacturer specifications, and maintains building security.
- B. The network appliance shall be able to run on an existing TCP/IP network and accessible, configurable, and manageable from any network-connected PC with a browser and/or client.

2.2 GENERAL EQUIPMENT REQUIREMENTS:

- A. Provide necessary equipment as a baseline to ensure a complete access control system is achieved:
 - 1. Access Control Head-End Equipment/Panels

<u>Description</u>	<u>Manufacturer</u>	<u>Part Number</u>
Access Control Workstation	-	Owner Provided
OnGuard PRO System	Lenel	LNL-CTX
OnGuard PRO System	Lenel	LNL-CTX-6
Intelligent Dual Reader Controller	Lenel	LNL-X2220
Intelligent Single Door Controller	Lenel	LNL-X2210
Intelligent System Controller	Lenel	LNL-X3300

Advanced Dual Reader Controller	Lenel	LNL-X4420
Output Control Module	Lenel	LNL-1200
Dual Reader Interface Module	Lenel	LNL-1320-S3
Single Reader Interface Module	Lenel	LNL-1300
Input Control Module	Lenel	LNL-1100
Access Control Power Supply	Altronix	AL600ULACM
4 Door Power Supply ACS Enclosure	LifeSafety Power	FPO75-B100C4D8PE2M
8 Door Power Supply ACS Enclosure	LifeSafety Power	FPO150-B100C8D8PE4M1
16 Door Power Supply ACS Enclosure	LifeSafety Power	FPO150/250-2C82D8PE8M2
Rechargeable Sealed Back-Up Battery	Yuasa, UltraTech Power Sonic, Elk	12V 8Ah

2. End Devices

Credential Card Readers		
Signo 40-Standard Wall Reader	HID Global	40NKS-02-000000
Signo 20-Mullion Style Reader	HID Global	20NKS-02-000000
Signo 40K-Standard Wall Reader w/Keypad	HID Global	40KNKS-02-000000
Signo 20K-Mullion Style Reader w/Keypad	HID Global	20KNKS-02-000000
Request to Exit Motion	Bosch	DS160 (or equivalent)
Trim Plate	Bosch	TS160 (if applicable)

- B. Equipment lists are provided to set equipment expectations and may not be complete. Coordinate with devices shown on drawings, system risers and equipment list for system intent. Provide a complete and functional system as described within the construction documents.
1. DIV.28 to provide and install all integrated credential card reader / electrified lockset combinations.
 2. DIV.28 shall provide all the power supplies for electrified door hardware equipment. Coordinate & verify with DIV.8 for the exact power requirements.
 3. Coordinate, discuss, and verify with the architect, owner, and electrical contractor the door hardware that is going to be provided & installed.
 4. Provide 1 year of software updates for access control software.

2.3 POWER SUPPLIES:

- A. The DC voltage power supply shall provide dual output fused ports of either 12 or 24 VDC and receive its power input from 120VAC. Units shall be expandable by adding additional modules for up to three power modules. Power modules shall provide power capabilities from 75 to 250W. The system shall provide configurations for power distribution, control & signaling, fire alarm interface, fail safe/fail secure locking control, and shall be a standard feature of the system.
- B. Locate separate power supplies by the access control panels. Provide additional enclosures if needed.
- C. Provide all access control panels and electrified door hardware power supplies with 12V sealed lead rechargeable backup batteries that will provide minimum standby power capacity for 24 hours.
- D. Provide a category cable as required to each device for remote functionality such as control, status reporting, information logging, remote battery testing, fault reporting /

restore, and shall interface with multiple control and monitoring modules to extend the remote functionality to multiple individual outputs for direct control, extended information gathering and reporting.

2.4 CREDENTIAL CARD READERS:

- A. Connect contactless smart card reader with pigtail cable.
- B. Tamper detection on card readers shall be programmed to send notification through access control system in the event of damage or tampering.
- C. Credential card readers must support mobile phone credentials.
- D. Mount card readers on a 4 square j-box with a single gang mud ring. Do not provide a junction back box for mullion style card; route wiring through mullion/door frame.

PART 3 – EXECUTION

3.1 INSTALLATION OF ACCESS CONTROL SYSTEM:

- A. GENERAL: Install the access control system as indicated, in accordance with the equipment manufacturer's specifications, written instructions, and with recognized industry practices, to ensure that system equipment complies with requirements. Comply with the requirements of NEC, and applicable portions of NECA's "Standards of Installation" practices.
- B. Prior to starting any work, coordinate and verify the access control layout, wiring, equipment device locations, and mounting details with the owner, architect, and any other trades and suppliers that are applicable, and get written approval.
- C. COORDINATION MEETINGS:
 - 1. Meet at least twice with the door hardware systems installer. Hold the first meeting before the submittal of shop drawings to coordinate electronic door hardware components for each door, rough-in requirements, and door schedules. Hold the second meeting before the physical installation of components to verify raceway and cabling, equipment list, any changes have been accounted for, and site conditions for each area.
 - 2. Review and coordinate access control system layout and wiring with owner.
- D. NETWORK DEVICES: Provide network cable(s) to any networked devices for access control system and coordinate terminations.
- E. Grounding: Provide grounding connections sufficiently tight to assure permanent and effective ground.
- F. Testing: Upon completion of installation of system and after energized, demonstrate system compliance with intent.
- G. WIRING & TERMINATIONS: All components of this system will need to be in accordance with the manufacture's specifications & recommendations. All final connections shall be made by a qualified & certified technician familiar with the manufacture's equipment and adhering to the owner's procedures.
- H. ON-SITE EQUIPMENT: The contractor shall provide their own installation equipment unless they have written permission from the owner to use any of the owner's equipment (lifts, ladders, tools, etc.) onsite. It is the contractor's responsibility to provide all labor and equipment costs in their proposals.
- I. ZONING: Each detector, door position switch, and sensing device shall be considered a location. Multiple doors at a common entry can be considered one location. The system shall be programmed to log and detect individual status of a monitored door based on a schedule. Doors with a door contact must have the ability to receive alerts for that specific

opening if the door is opened during a certain time and/or left open for a specific time (60 seconds).

- J. LABELING: The contractor shall develop and submit for approval a labeling system for the cable installation. Coordinate with the owner and negotiate an appropriate labeling scheme with the contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels, and wall plates. The labeling system shall designate the cable's origin and destination and a unique identifier for the cable within the system. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
 - 1. All labels shall meet UL 969 requirements for legibility, defacement, and adhesion requirements. Handwritten labels are not allowed. All labels shall maintain consistent typeface, size, and color.
 - 2. Provide laminated plans (minimum size 11x17) of all Security Systems as-built plans (including riser diagrams) at each telecom room/panel location.
- K. Occupancy Adjustments: When required within one year of date of substantial completion, provide on-site assistance in adjusting and reprogramming to suit actual occupied conditions. Provide 1 visit to the site for this purpose without additional cost.
- L. Mounting Height: Credential card readers and intercoms should meet all ADA mounting requirements. Card readers shall be mounted 48" from the floor to the top of the card reader.
- M. Roof Access Hatch/Door: Verify each roof access hatch/door location with the owner and install a door position contact on each one. Each roof hatch door position contact shall be tied into the access control system, and into the intrusion detection system that will provide a scheduled notification when opened.
- N. Request to Exit Motions: Prior to installation coordinate with the owner the location of the request to exit motions above the door.
- O. Provide all relays required to tie access control system into fire alarm system.
- P. ADA OPERATION: The security contractor is responsible for integrating access control and ADA operators. coordinate with the owner, Division 8 and 26 contractors to for operation and functionality.
 - 1. ADA Door Opener/Actuator: Provide connection to door opener/actuator to access control system. Program credential card reader and ADA operator per IBC requirements. Provide all necessary cabling, relays, and equipment from the ADA operators and actuators to tie into access control system. Program credential card reader and ADA operator to operate per the Owner's requirements. At a minimum, the ADA actuator shall be disabled during lockout and closure periods.

3.2 WIRING:

- A. Pathway Requirements:
 - 1. See specification 28 0501 for requirements.
- B. Cabling:
 - 1. See specification 27 1500 for category cable requirements.
 - 2. All Security cable outer jacketing shall be Yellow; UL Listed; and CMP rated.
 - 3. Access Control Cabling:
 - a. Provide the following cable from the ACS head-end panel(s) to the junction box located above each door that has access control door hardware equipment installed:
Access Control Composite Cable: Windy City Wire (or equivalent manufacture), UL Listed, Plenum Rated (if applicable) #4461030-OSDP.

- b. Provide the following cable from each card reader device up to the j-box that is located on the secure side of the door in accessible ceiling space:
 - i. Credential Card Reader (CR): 22/1P OAS Lo-Cap, RS-485, 120 Ohms + 18-02 Twisted Non-Shielded, Jacketed, UL listed, Stranded, & CMP rated (OSDP)
- 4. Request for Exit Motion (REX): 4/C, 22 AWG, Stranded, CMP, UL listed.
- 5. Electrified Door Hardware Equipment: 4/C, 18AWG, Stranded, CMP rated, UL listed.
- 6. Door Position Switch (DPS): 2/C, 22 AWG, Stranded, CMP rated, UL listed.
- 7. Panic / Duress Button, Push to Exit, Momentary Door Release Button: 4/C, 18 AWG, Stranded, CMP Rated, & UL Listed.
- 8. Access control contractor shall provide, install, terminate, and test all necessary communication cabling to facilitate seamless communication between the existing access control panel and the new access control panel. Cabling must meet industry standards, be properly labeled, and organized. Post-installation testing is required for performance verification. Compliance with relevant regulations and guidelines is mandatory.
- 9. Wiring by Divisions 26: The electrical connections/terminations for certain equipment provided under door hardware divisions has not been specifically indicated on the electrical drawings and must be provided by and field coordinated by the door hardware trade requiring such electrical connections. Electrical contractors shall review architectural drawing, and door hardware specifications and coordinate with said contractors to confirm electrical needs.

3.3 SYSTEM CONFIGURATION, PROGRAMMING AND COMMISSIONING

- A. Configure the system for full operation. Include owner in the process as much as feasible to understand their intended operation and insure full transfer of operations to them.
- B. Provide a fully commissioned system to ensure the entire system is operating as intended and in accordance with Owner's policy. Label cables on both ends in all boxes, panels, and racks according to Owner standards.
- C. The contractor shall include in the base contract all costs required to program lockdown procedures based on the owner's requirements and direction.
- D. The contractor shall include necessary programming for fire-alarm panel tie-in and door release based upon the requirements and direction of the owner and/or AHJ.
- E. Contractor shall input database of all required card holders and desired schedules for users and/or groups. It is the contractor's responsibility to coordinate with the owner on which card holders have access to which openings.

END OF SECTION 28 2205

SECTION 28 2300 - IP VIDEO SURVEILLANCE SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26, 27 & 28 basic materials and methods sections apply to work specified in this section.
- C. Division 28 0501 Common Work Results for Electronic Safety & Security, apply to this section.

1.2 DESCRIPTION OF WORK:

- A. Uninstall existing IP surveillance cameras and replace and relocate some of them with new IP surveillance cameras. Provide new IP surveillance cameras with all necessary mounting hardware, equipment, licensing, for the locations that they will be installed into. Install the IP surveillance cameras to the manufacturer's specifications and instructions and to the owner's requirements.

1.3 COORDINATION:

- A. Contractor shall coordinate color and finish of all camera components with architect or electrical contractor as appropriate. Provide black camera finishes for all cameras in locations surrounded by dark finishes, whether wall-mounted or ceiling mounted.

1.4 QUALITY ASSURANCE:

- A. Pre-Approved Installation Contractor(s):
 - 1. Stone Security
 - 2. Security 101
- B. Bidders not pre-approved: See Division 28 0501 Part 1.5.B.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS:

- A. The network appliance shall be capable of running on an existing TCP/IP network and shall be accessible, configurable, and manageable from any network-connected PC with a browser and/or client.

2.2 AUTHORIZED EQUIPMENT MANUFACTURE:

- A. Authorized IP Camera Manufacture(s):
 - 1. AXIS Communications
 - a. P3735-PLE (#02633-001) Multidirectional Camera (Ceiling Mounted)

2.3 Camera Requirements

- 1. The camera shall be fully supported by the VMS manufacturer.
- 2. All cameras are denoted by subscript on plans and shall be PoE or PoE+.
- 3. Exterior cameras shall have weatherproof enclosures regardless of location. They may be either dome or other environmental housing which suits the general appearance of the facility. Camera's housing will entirely enclose all of the wiring and the camera is to be tamper proof.

4. Provide each IP surveillance camera with one 64GB micro SDXC memory card.
5. Exterior and interior IP surveillance cameras category transmission lines must be protected against lightning and other related power surges with in-line surge protectors.
6. Coordinate all camera locations, wiring, and rough-in requirements with owner and supplier prior to rough-in.
7. The camera shall be equipped with (1) 100BASE-TX Fast Ethernet port or faster, using a standard RJ-45 socket and shall support auto negotiation of network speed (100 Mbps and 10 Mbps) and transfer mode (full and half duplex)
8. Provide camera types and quantities as indicated on the associated drawings.

2.4 WIRING / CABLING, AND PATHWAYS:

- A. See Specification 27 1500 Telephone Data Systems for cabling and 28 0500 for pathway requirements.

PART 3 – EXECUTION

3.1 INSTALLATION OF IP VIDEO / CAMERA SURVEILLANCE SYSTEMS:

- A. Install all IP cameras at locations shown on drawings and after conducting a walk-through with the owner to verify exact locations. Install NVR and all power equipment to provide a fully functional system.
- B. Coordinate all cabling work, patch cabling and labeling with owner.
- C. Contractor shall configure camera frame rates, resolutions, and IP addressing of cameras.
- D. Contractor shall be responsible for coordinating work with owner and the IT staff to coordinate devices on network specific to the video surveillance system.
- E. Contractor shall verify all mounting heights/locations to ensure ideal views for each camera. Typical mounting height to be 9-12' unless noted in plans.
- F. Test existing category cabling that the IP surveillance cameras will be connecting to.

3.2 FIELD QUALITY CONTROL:

- A. Testing: Upon completion of installation of the IP Video/Camera Surveillance system and after electrical circuitry has been energized, test compatibility and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace them with new units, and proceed with retesting.

3.3 SYSTEM CONFIGURATION, PROGRAMMING, & COMMISSIONING SERVICES:

- A. Configure the system for full operation. Include owner in the process as much as feasible to understand their intended operation and insure full transfer of operations to them.
- B. Provide a fully commissioned system to ensure the entire system is operating as intended and in accordance with Owner requirements ~~policy~~.
- C. Contractor is to program the system and train the authorized personnel how to perform all necessary functions of the video surveillance system. Refer to Division 28 0501 Common Work Results for Electronic Safety & Security Part 5.2.

END OF SECTION 28 2300

SECTION 28 3111 - FIRE ALARM AND DETECTION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. Provide new addressable fire alarm devices as required to expand the existing fire alarm system as required.
- B. Install all new wiring in steel conduit (3/4" minimum). All conduit runs shall form a complete loop from the fire alarm control panel.
- C. Comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories. Provide components and systems, which are UL-listed and labeled for fire alarm. Provide fire alarm and detection systems and accessories, which are FM approved. Comply with State and local requirements as applicable. Provide wiring of horn/strobe units such that the horn section and the strobe section are controlled separately. Provide the ability to silence the horns and maintain the operation of the strobes.
- D. Comply with applicable provisions of current NFPA Standards 72 National Fire Alarm Code (as applicable), local building codes, and meet requirements of local authorities having jurisdiction.

1.3 SUBMITTALS:

- A. PRODUCT DATA: Submit manufacturer's data on fire alarm and detection systems including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
- B. SHOP DRAWINGS: Provide shop drawings showing equipment/device locations and connecting wiring of entire fire alarm and detection system. Include wiring diagrams and riser diagrams of panel. Provide dimensioned drawing of Fire Alarm Control Panel and Building Graphic.
- C. CERTIFICATION: Submit a written statement to the Architect and the state and local Fire Marshal's Office that each device of the fire alarm system will be installed, inspected and tested in accordance with applicable requirements of NFPA Standard 72.
- D. Provide to the Fire Marshall's office the following:
 - 1. A complete set of shop drawings indicating:
 - a. Location of all alarm-initiating and alarm-signaling devices.
 - b. Point-to-point wiring diagrams for all alarm-initiating and alarm-signaling devices.
 - 2. Wiring diagrams for:
 - a. Alarm control panels.
 - b. Auxiliary function relays and solenoids.

- c. Remote signaling equipment.
 - d. Standby battery calculations, including voltage drop calculation.
- 3. A complete equipment list identifying:
 - a. Type
 - b. Model
 - c. Manufacturer
 - d. Manufacturer catalog data sheets
 - e. UL Listing and/or FM approval showing compatibility of device with Fire Alarm Control Panel (FACP)
- 4. A complete zone list identifying all:
 - a. Alarm-initiating and alarm-signaling devices.
 - b. Remote signaling and auxiliary function zones.
 - c. Specific devices associated with each zone.
- E. Submit to State and Local Fire Marshall, a complete Certificate of Compliance

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. MANUFACTURER: Subject to compliance with requirements, provide fire alarm and detection systems of one of the following:
 - 1. The existing system is FCI Gamewell E3 System. Contact Nelson Fire Systems for requirements of the system. Fire alarm supplier shall be Gamewell-FCI Platinum Level Distributor.

2.2 FIRE ALARM AND DETECTION SYSTEMS:

- A. GENERAL: Add to and maintain the existing electrically operated, electrically supervised fire alarm system as required. Include control units, power supplies, alarm initiating and indicating devices, conduit, wire, fittings and accessories required to provide maintain the operating system. Enclose entire system in raceway. Provide basic wiring materials which comply with Division 26, Basic Materials and Methods Sections for raceways, conductors, boxes, fittings, supports, etc. Minimum wire size to be #14 AWG copper.
- B. SYSTEM TYPE: Analog addressable, non-coded. Either manual activation of a fire alarm station or activation of an automatic initiating device energizes all fire alarm signaling devices, sounding a non-coded alarm and providing device identification on an annunciator panel.
- C. SYSTEM OPERATION: Add to the system as required such that any manual station or automatic initiating device annunciates all alarm indicating units (bells, horns, buzzers, chimes, visual alarm lamps, etc.) continuously until the manual station or initiating device is restored to normal and the fire alarm control unit reset. Annunciate alarm signals by device at the control panel and all remote annunciators. Provide all conductors, raceway, equipment and labor to accomplish the following:
- D. For fans which are not part of the smoke evacuation system, deactivate air supply and return fan units simultaneously by means of a supervised master fan shutdown relay with slave relays as required. Restart air units automatically after panel has been reset. Provide a bypass switch for master fan shut down relay for drill purposes, and indicate by a locked-in lamp that the circuit has been bypassed.

- E. Selectively activate and/or deactivate fan units as required.
- F. Release all magnetic door holders upon activation of an alarm from any device by use of a master relay in the control panel.
- G. Provide supervised circuits for the following:
 - 1. Close dampers upon activation of an alarm from any device through the HVAC interface relays at the Fire Command Center.
 - 2. Recall elevators, upon activation of an alarm, to the floor of building egress unless the alarm is on the egress floor, in which case recall elevator to the level designated by the Fire Marshall. Cooperate with the elevator supplier to ensure complete operable system. Provide shunt trip breaker(s) as required.
- H. Central Station Monitoring. Provide a UL listed fire control communicator in accordance with NFPA 71 with a minimum of two reporting zones to the central station. Provide a communicator with dual phone lines for central station reporting by using Contact I.D. format. Provide integral trouble annunciator. Provide with compatibility for automatic test reports every 24 hours. Provide system and components which comply with UL 2635 and UL 864.
- I. Provide fire alarm control panel with capability of shutting down individual initiating devices for maintenance purposes without affecting the continued operation of other initiating devices.

2.3 MONITOR MODULE:

- A. Remote identification module devices shall be attached to any single normally open initiating device (heat detector, waterflow switch, duct detectors, sprinkler, tamper switches, kitchen hood, pull station, etc.). The modules shall supply addressing and status information to the Fire Alarm Control Panel through the dual loop module.

2.4 CONTROL POINT MODULE:

- A. The control point module shall be connected to the same loop as the initiating devices, and shall provide a relay output (Form "C" 2 Amp @ 24 VDC, resistive only).
- B. This relay output shall be used to perform auxiliary functions.
- C. When the AOM is activated, the red "ACTIVE" LED shall be on solid. Under normal conditions, the red "ON LINE" LED shall flash.

2.5 IONIZATION SMOKE DETECTORS):

- A. All ionization smoke detectors shall be capable of being replaced without disconnecting any wires or wire connectors from the base of the detector. Each detector shall be installed on a separate base. The detector base shall be capable of receiving a photoelectric, ionization, or electronic thermal detector. All ionization fire detectors shall be UL 268 listed. All detectors shall have (2) viewable LEDs to indicate the status of the device.

2.6 DUCT FIRE DETECTORS:

- A. Provide ionization type with UL 268A listings. Each detector shall be equipped with a remote light. Each detector shall have (2) form "c" alarm contacts rated at 10 amps (at 120VAC).

2.7 THERMAL DETECTOR:

- A. Thermal detectors shall operate on the Rate-of-Rise principal. The detectors shall have a fixed temperature rating of 135 degrees Fahrenheit. Exception: in Boiler rooms, provide temperature rating of 200 degrees Fahrenheit.
 - 1. The heat detector shall consist of a base and a head.
 - 2. The base shall be capable of accepting either a smoke detector or a 135 (or 200) degree heat detector.
 - 3. The head shall automatically restore to its normal standby condition when the temperature returns to its normal range.

2.8 AUDIOVISUAL ALARM HORNS:

- A. Provide audio-visual alarm horns with selectable multi-candela strobes (15/30/75/110 cd) and selectable horn (90 or 95 dba). Provide outdoor devices listed for exterior use. Provide white devices inside and red devices outside, or as instructed by the architect.
- B. All strobes shall be synchronized.

2.9 VISUAL ALARM STROBES:

- A. Provide visual alarm strobes with selectable multi-candela strobes (15/30/75/110 cd). Provide white devices.
- B. All strobes shall be synchronized.

2.10 CARBON MONOXIDE (CO) DETECTOR:

- A. Provide a carbon monoxide detector. Provide detectors with the following features:
 - 1. Compliance with UL2075.
 - 2. Trouble relay.
 - 3. Wiring supervision with SEMS Terminals.
 - 4. A six year end-of-life timer.
 - 5. Sounder base for sound audible alarm.

2.11 VISUAL ALARM STROBES (BLUE):

- A. Provide a visual alarm strobe with blue light for CO notification.

2.12 AUXILIARY RELAY:

- A. Remote auxiliary relay boards shall be rated at 10 AMPS @ 120 VAC. A red LED shall light to indicate relay activation. All relays shall transfer on general alarm and latch on until reset. All relays shall be supervised. The control output provided can be used in conjunction with fire alarm applications (i.e. fan controls, dampers, doors, and any other general alarm control).

2.13 INITIATING MODULES:

- A. Provide style "6" initiating modules capable of receiving and annunciating an alarm from any detector, even with a single fault condition on any initiating circuit.
- B. Power all smoke detectors from the "Style 6" initiating loop wiring. For systems which power smoke detectors separately from the "Style 6" loop, provide monitoring for both the power source and the independent initiating wiring, so that complete trouble and alarm indication is achieved by loop. Provide capability to operate all smoke detectors, even with a single fault condition on the smoke detector power wiring. Provide one spare initiating circuit.

2.14 SIGNALING MODULES:

- A. Provide signaling as required. Provide power adequate to sound all signaling devices concurrently. Provide supervised indicating circuits for polarized 24V D.C. alarm signaling devices. Provide 2 spare signaling circuits.
- B. Each signal circuit shall have a separate disconnect switch for servicing the fire alarm system. Each and every indicating circuit shall have a distinct location description. Power supply shall be at fire alarm control panel. Remote power supplies and indicating circuits will not be acceptable.

2.15 SUPPLEMENTAL NOTIFICATION CIRCUITS:

- A. Provide supplementary notification appliance circuit panel(s) as required. The 'PANELS' shall be capable of supplying up to four Class A, Style Z notification appliance circuits. The panel shall contain its own battery charger, regulated power supply, and shall be supervised for ground fault, overcurrent, open circuits and low battery conditions. Ground fault, battery and circuit trouble conditions shall transmit a trouble signal to the main fire alarm control panel.

2.16 SYSTEM CONFIGURATION PROGRAMMING:

- A. Update system programming as a result of the remodel. To help the owner in programming, system changes, and servicing, the fire alarm system shall have the following functions:
 - 1. The FACP shall be capable of an auto-configuration, which, via a password, all analog devices and panel modules are automatically programmed into the system. At this point the system will operate as a general alarm system without any other programming.
 - 2. If any two devices are addressed the same, the LED's on both devices will light steady and the panel will read "extra address with the address number".
 - 3. If any device is installed and not programmed into the system, the LED will light steady and the panel will read the same as above.

2.17 BATTERIES/POWER SUPPLIES:

- A. Provide standby batteries capable of operating fire alarm system for minimum of 24 hours, then operating all indicating units for at least five minutes. Locate batteries in fire alarm control unit, or in similar type enclosure located as directed. Provide all interconnecting wiring. Place batteries which vent hydrogen gas in separate enclosure. Provide 30 percent spare capacity.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS:

- A. Install fire alarm and detection devices as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of NEC and NECA's "standard of installation".
- B. Wire each CO detector to deactivate the HVAC fan unit feeding the zone served by the detector to shut down the fan when CO levels exceed the allowable levels set by the Utah State Fire Marshal.
- C. Review proper installation procedure for each type of device with equipment supplier before installation.
- D. Where surface installation is required, it must be approved by the architect. Use wiremold as approved in each application

3.2 GUARANTEE:

- A. Furnish a three-year guarantee for all equipment, materials and installation, including all labor, transportation, and equipment.
- B. Emergency Response. The fire alarm equipment supplier shall provide an emergency response within four hours of any reported system failure to resolve the problem on a continuous basis.

3.3 PRE-TEST:

- A. The contractor shall with a representative of the manufacturer conduct a test 3 days before the final test to verify operation of all devices, new and existing. Any problems must be corrected before the final test.

3.4 FINAL TEST:

- A. Before the installation shall be considered completed and acceptable, a test on the system shall be performed as follows:
 - 1. The contractor's job foreman, a representative of the manufacturer, a representative of the owner, shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel. Fan shutdown and door holder circuits shall operate.
 - 2. Conduct a full 24 hour test of battery operation. System shall be put on the batteries for a full 24 hours and all notification appliances shall be operational for a period of 5 minutes.
 - 3. The supervisory circuitry of the initiating and indicating circuits shall also be verified.
 - 4. Provide printout demonstrating successful performance of all devices.
 - 5. Re-certify the system as compliant with State regulations.

3.5 LABELING:

- A. All devices shall be labeled with their appropriate address. The labels shall be 18 point pressure sensitive labels.

- B. All initiating devices shall be programmed to include the device address and a complete user text English location description, i.e. Device L4S76, Smoke Detector, 1st floor Rm.17.
- C. Label the end of all wires in all boxes including panels, power supplies, pull boxes, etc.

3.6 RECORD DRAWINGS

- A. Update existing recording drawings and building map. The building map shall indicate the various devices and wiring by the use of different colors (minimum of five colors).

3.7 OPERATING AND MAINTENANCE MANUALS:

- A. Operating and maintenance manuals shall be submitted prior to testing of the system. Manuals shall include all service, installation, and programming information.

END OF SECTION 26 3111

BLANK PAGE

APPENDIX

	Utah State Tax Commission Exemption Certificate for Governments & Schools (Sales, Use, Tourism and Motor Vehicle Rental Tax)	TC-721G Rev. 3/16
---	---	-----------------------------

Name of institution claiming exemption (purchaser)		Telephone Number	
Street Address	City	State	ZIP Code
Authorized Signature	Name (please print)	Title	
Name of Seller or Supplier:		Date	

The person signing this certificate **MUST** check the applicable box showing the basis for which the exemption is being claimed.

Email questions to taxmaster@utah.gov. You may also write or visit the Tax Commission at 210 N 1950 W, Salt Lake City, UT 84134, or call 801-297-2200 or toll free 1-800-662-4335.

DO NOT SEND THIS CERTIFICATE TO THE TAX COMMISSION
 Keep it with your records in case of an audit.

☐ **UNITED STATES GOVERNMENT OR NATIVE AMERICAN TRIBE**
 I certify the tangible personal property or services purchased are to be paid directly with funds from the entity noted on this form and will be used in the exercise of essential governmental or tribal functions.
NOTE: Includes sales of tangible personal property to federally chartered credit unions. "Directly" does not include per diem, entity advances, or government reimbursements for employee credit card purchases.

☐ **CONSTRUCTION MATERIALS PURCHASED FOR SCHOOLS OR PUBLIC TRANSIT DISTRICTS**
 I certify the construction materials purchased are on behalf of a public elementary or secondary school, or public transit district. I further certify the purchased construction materials will be installed or converted into real property owned by the school or public transit district.

Name of school or public transit district: _____

Name of project: _____

☐ **FOREIGN DIPLOMAT**
 I certify the purchases are authorized by a diplomatic tax exemption card issued by the United States.
 Foreign diplomat number: _____

☐ **UTAH LOCAL GOVERNMENTS AND PUBLIC ELEMENTARY AND SECONDARY SCHOOLS**
Sales Tax License No. _____
 I certify the tangible personal property or services purchased are to be paid directly with funds from the entity noted on this form and will be used in the exercise of that entity's essential functions. For construction materials, if the purchaser is a Utah local government, these construction materials will be installed or converted into real property by employees of this government entity.

CAUTION: This exemption does not apply to government or educational entities of other states and is not valid for lodging-related purchases.

☐ **UTAH STATE GOVERNMENT**
Sales Tax License No. _____
 I certify the tangible personal property or services purchased are to be paid directly with funds from the entity noted on this form and will be used in the exercise of its essential functions. For construction materials, they will be installed or converted into real property by employees of this government entity.

CAUTION: This exemption does not apply to other states and is not valid for lodging-related purchases.

☐ **HEBER VALLEY HISTORIC RAILROAD**
 I certify these purchases and sales are by the Heber Valley Historic Railroad Authority or its operators and are related to the operation and maintenance of the Heber Valley Historic Railroad.

To be valid this certificate must be filled in completely, including a check mark in the proper box.

A sales tax license number is required only where indicated.

Please sign, date and, if applicable, include your license or exemption number.

NOTE TO SELLER: Keep this certificate on file since it must be available for audit review.

NOTE TO PURCHASER: Keep a copy of this certificate for your records. You must notify the seller of cancellation, modification, or limitation of the exemption you have claimed.

If you need an accommodation under the Americans with Disabilities Act, email taxada@utah.gov, or call 801-297-3811 or TDD 801-297-2020. Please allow three working days for a response.



MHTN
ARCHITECTS

License and Indemnification Agreement

Project:

MHTN Project No.:

In response to the Receiver's request to obtain Drawings, Specifications, electronic data, and/or other Instruments of Service (the "Information") produced by MHTN Architects, Inc. ("MHTN") for the above referenced project, MHTN and the Receiver agree to the following:

Receiver's authorized representative to initial Receiver's assent to each term in the space provided.

- _____ 1. MHTN grants to the Receiver a non-exclusive license to the Information for production of the Receiver's portion of the work for this project only. The Receiver shall not transfer or assign this license. MHTN retains its copyrights, the right to retain electronic data or other reproducible copies of the Information, and the right to use information, ideas, and/or concepts contained in the Information in the normal course of the its professional activities.
- _____ 2. The Information is for information purposes only. Under no circumstances shall the conveyance of the Information be deemed a sale by MHTN. MHTN makes no warranties, express or implied, of merchantability or of fitness of the Information for a particular purpose.
- _____ 3. The Receiver shall remove all title blocks and other references to MHTN, MHTN's consultants, and the project owner from the electronic data contained in the Information upon receipt.
- _____ 4. The Receiver shall remove all notes, text, and detail cuts from the electronic data contained in the Information upon receipt.
- _____ 5. Use of the Information shall be at Receiver's sole risk and without liability to MHTN or its consultants. The Receiver shall make no claim against MHTN or its consultants. The Receiver shall defend, indemnify, and hold harmless MHTN, MHTN's consultants, and agents and employees of any of them from and against all claims, damages, losses, and expenses, including but not limited to attorney fees and costs, arising out of the Receiver's use of the Information.

Receiver Company Name:

Officer & Title (printed):

Officer & Title (signed):

Date:

MHTN Architects, Inc.

Representative & Title:

Representative & Title (signed):

Date:
