PART 1  GENERAL

1.1  SUMMARY

A. Section includes markerboards.

B. Related Sections:

1. Section 04220: Concrete Masonry Units, for wall construction.

1.2  SUBMITTALS

A. Product Data, for each type of display board indicated.

1. Include maintenance data on cleaning and stain removal.

B. Shop Drawings, showing elevations, dimensions, joint locations, and method of attachment, and interface with other work.

C. Samples: 6 by 8 inch in size illustrating materials, finish, colors, and textures.

1.3  QUALITY ASSURANCE

A. Use skilled workers trained and experienced in necessary crafts and familiar with requirements and methods needed for proper performance of the Work of this Section.

PART 2  PRODUCTS

2.1  MARKERBOARDS, (Whiteboards):

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:

1. Claridge Products and Equipment, Inc.
4. Substitutions: Submit in accordance with requirements of Section 01630.

B. Porcelain Enamel on Sheet Steel: ASTM A 526, galvanized to G90. ASTM A 242, Type I, commercial quality.

1. Outer Face Sheet: 24 gage.
2. Finish: Glass fibered enamel, baked to vitreous surfaces; Porcelain Enamel Institute Type A.

C. Core: Particle Board, NPA A208.1.

D. Foil Backing: Aluminum foil sheet.

E. Frame and Chalkrail: Aluminum extrusions, ASTM B 221, 6061 alloy.

1. Finish: Clear anodized.

F. Accessories:

1. Adhesives: Type recommended by manufacturer of markerboard.
PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify that all substrates are ready to receive Work of this Section.
   B. Correct conditions detrimental to timely and proper completion of the Work.

3.2 INSTALLATION
   A. Install Work of this Section in accordance with manufacturer's installation instructions, and as shown.
   B. Secure units level and plumb.
   C. Provide grounds, clips, backing materials, adhesives, brackets, anchors, and accessories necessary for a complete installation.

3.3 CLEANING AND PROTECTION
   A. Clean markerboard surfaces in accordance with manufacturer's instructions.
   B. Cover markerboards with protective cover, taped to frame.
   C. Remove temporary protection cover at date of Substantial Completion, and reclean surfaces.

END OF SECTION
PART 1  GENERAL

1.1  SUMMARY
A.  Section Includes:
   1.  Fire extinguisher cabinets.
   2.  Portable fire extinguishers.
B.  Related Sections:
   1.  Section 04220: Concrete Masonry Units, for wall construction.

1.2  SUBMITTALS
A.  Product Data: For each type product and accessory specified.

1.3  QUALITY ASSURANCE
A.  Provide extinguishers, cabinets and accessories from a single Manufacturer.
B.  Coordinate as required with other trades to assure proper and adequate provision in work of those trades for interfacing with Work of this Section.

1.4  REGULATORY REQUIREMENTS
A.  Fire extinguishers: Provide label showing type, rating and classification.

1.5  DELIVERY, STORAGE, AND HANDLING
A.  Deliver products to project site in Manufacturer's original containers with original labels intact and legible.
   1.  Maintain packaged materials with seals unbroken and labels intact until time of installation.
B.  Store above ground, under cover and protected from damage.

PART 2  PRODUCTS

2.1  MANUFACTURERS
A.  Subject to compliance with requirements, provide products from one of the following:
   1.  J.L. Industries.
   2.  Larsen Manufacturing.

2.2  FIRE EXTINGUISHER CABINET
A.  Type: Non-Fire rated.
   1.  J.L. Industries:
      b.  Surface mounted: Ambassador No. 1013F12.
   2.  Larsen Manufacturing Co.
      b.  Surface mounted: Architectural Series No. 2409-SM.
B. Location: Refer to Drawings (Fire extinguisher cabinets are designated as “FEC”), or comply with requirements of NFPA 10.

C. Mounting: Semi-recessed, with 2-1/2 inch rolled edge return trim, or surface mounted, as indicated, or required to suit condition.

D. Material: Steel cabinet with steel door.
   1. Door style: Full glass.
   2. Door glazing: 1/4 inch clear acrylic.

E. Minimum inside cabinet dimensions: 9-1/2 inches wide by 24 inches high by 5 inches deep.

F. Exterior and interior cabinet and door finish: Manufacturer’s white, unless otherwise noted.

2.3 FIRE EXTINGUISHERS

A. Model:
   1. J.L. Industries Cosmic 5E.
   2. Larsen Manufacturing Co.: MP-5.

B. Multi-purpose dry chemical: U.L. rating: 2A-10BC

C. Capacity: 5 lbs., Verify size to fit cabinet.

D. Color: Red

E. Location: One per cabinet

PART 3 EXECUTION

3.1 INSTALLATION

A. Install Work of this Section in accordance with requirements of governmental agencies having jurisdiction and manufacturer's recommended installation procedures.

B. Mount at height to comply with requirements of The Americans with Disabilities Act and local governmental authorities having jurisdiction regarding accessibility disabled.

C. Conceal fasteners wherever possible.

D. Apply sealant between cabinet flange and wall surface.

E. Fill and service each fire extinguisher prior to Date of Substantial Completion; attach certificate of service, including date.

3.2 CLEANING AND PROTECTION

A. Clean, without damaging, exposed surfaces (including cabinet interior) affected by Work of this Section, and repair damaged surfaces

B. Touch-up scratches and abrasions so as to be permanently and completely invisible to unaided eye from a distance of 5 feet.

END OF SECTION
PART 1  GENERAL

1.1  SUMMARY

A.  Section Includes toilet room accessories.

B.  Related Sections:

1.  Section 04220: Concrete Masonry Units, for wall construction.
2.  Section 11191: Detention Furnishings, for detention grade toilet accessories.

1.3  SUBMITTALS

A.  Product Data: For each product specified describing size, finish, details of function, and attachment methods.

1.4  REGULATORY REQUIREMENTS

A.  Conform to applicable code for installing work in conformance with ADA Guidelines.

1.5  COORDINATION

A.  Coordinate Work of this Section with placement of internal wall reinforcement, and reinforcement of toilet partitions to receive anchor attachments.

PART 2  PRODUCTS

2.1  MANUFACTURERS

A.  Subject to compliance with requirements, provide products indicated in the Schedule of toilet accessories at the end of Part 3, as manufactured by one of the following:

1.  Bobrick Washroom Equipment, Inc.
2.  American Specialties, Inc.

2.2  MATERIALS

A.  Sheet Steel: ASTM A 366.
B.  Stainless Steel Sheet: ASTM A 167, Type 304.
C.  Tubing: ASTM A 269, stainless steel.
D.  Fasteners, Screws, and Bolts: Stainless steel.
E.  Expansion Shields: As recommended by manufacturer for suitable for application.

2.3  FABRICATION

A.  Weld and grind smooth joints of fabricated components.
B.  Form exposed surfaces from single sheet of stock, free of joints.
C.  Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
D.  Shop assemble components and package complete with anchors and fittings.

LRS Architects, Inc.
E. Provide steel anchor plates, adapters, and anchor components for installation.

2.4 FACTORY FINISHING
A. Stainless Steel: No. 4 satin luster finish.

2.5 KEYING
A. Provide tumbler locks for all lockable access doors and panels.
B. Key lock alike per each room or per entire project, in accordance with Owner’s instructions.
C. Master key all accessories.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify that site conditions are ready to receive Work of this Section.
B. Correct conditions detrimental to timely and proper completion of Work.

3.2 PREPARATION
A. Provide templates and rough-in measurements as required.
B. Verify exact location of accessories for installation.

3.3 INSTALLATION
A. Install fixtures, accessories and items in accordance with ADA Guidelines and manufacturer’s installation instructions.
B. Install each item in its proper location, plumb and level, securely and rigidly anchored to substrate.

3.4 SCHEDULE
A. Toilet Accessories: Bobrick Washroom Equipment, Inc. products are listed as standard:

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TPD-1 Toilet Paper Dispenser</td>
<td>B-274</td>
</tr>
<tr>
<td>2</td>
<td>PTD-1 Paper Towel Dispenser</td>
<td>B-262</td>
</tr>
<tr>
<td>3</td>
<td>SCD-1 Seat Cover Dispenser</td>
<td>B-221</td>
</tr>
<tr>
<td>4</td>
<td>GB-1 Grab Bar with Peened Grip</td>
<td>B-6206 x 36</td>
</tr>
<tr>
<td>5</td>
<td>GB-2 Grab Bar with Peened Grip</td>
<td>B-6206 x 42</td>
</tr>
<tr>
<td>6</td>
<td>M-1 Mirror</td>
<td>B-165 24 x 30</td>
</tr>
<tr>
<td>7</td>
<td>MR-1 Mop and Broom Rack</td>
<td>B-223</td>
</tr>
</tbody>
</table>

END OF SECTION
<table>
<thead>
<tr>
<th>ROOM NO.</th>
<th>ROOM NAME</th>
<th>EQUIPMENT</th>
<th>QUAN. EA. RM.</th>
<th>PRODUCT DESIGNATION</th>
<th>STATUS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>Dayroom</td>
<td>TV/VCR Bracket</td>
<td>1</td>
<td>C-C</td>
<td></td>
<td>Mount top of bracket @ +12'-0&quot; AFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Table w/ 4 attached stools</td>
<td>6</td>
<td>C-C</td>
<td></td>
<td>Bid Alternate No. 7</td>
</tr>
<tr>
<td>104</td>
<td>Academic</td>
<td>Marker Board</td>
<td>2</td>
<td>C-C</td>
<td></td>
<td>See section 10115 / Bid Alt. No. 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pull Down Protection Screen</td>
<td>1</td>
<td>C-C</td>
<td></td>
<td>See section 11132</td>
</tr>
<tr>
<td>107-115</td>
<td>Sleeping Rooms (9)</td>
<td>Mirror</td>
<td>1</td>
<td>DM</td>
<td>C-C</td>
<td>Mount bottom of mirror no higher than 40&quot;</td>
</tr>
<tr>
<td>116</td>
<td>ADA Sleeping Room</td>
<td>36&quot; Grab Bar</td>
<td>1</td>
<td>DGB-1</td>
<td>C-C</td>
<td>See plan for configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>48&quot; Grab Bar</td>
<td>1</td>
<td>DGB-2</td>
<td>C-C</td>
<td>See plan for configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mirror</td>
<td>1</td>
<td>DM</td>
<td>C-C</td>
<td>Mount bottom of mirror no higher than 40&quot;</td>
</tr>
<tr>
<td>118</td>
<td>ADA Shower</td>
<td>48&quot; Grab Bar</td>
<td>1</td>
<td>DGB-2</td>
<td>C-C</td>
<td>See plan for configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>36&quot; Grab Bar</td>
<td>1</td>
<td>DGB-1</td>
<td>C-C</td>
<td>See plan for configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Detention Shwr Seat</td>
<td>1</td>
<td>DSH-1</td>
<td>C-C</td>
<td>Mount 18&quot; above fin. floor</td>
</tr>
<tr>
<td>123</td>
<td>Janitor</td>
<td>Mop Rack</td>
<td>1</td>
<td>MR</td>
<td>C-C</td>
<td>Locate as directed</td>
</tr>
<tr>
<td>125</td>
<td>ADA Toilet</td>
<td>Mirror</td>
<td>1</td>
<td>M</td>
<td>C-C</td>
<td>Mount bottom of mirror no higher than 40&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toilet Paper Holder</td>
<td>1</td>
<td>TPD</td>
<td>C-C</td>
<td>Mount 19&quot; min. above fin. floor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>48&quot; Grab Bar</td>
<td>1</td>
<td>GB-2</td>
<td>C-C</td>
<td>See plan for configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>36&quot; Grab Bar</td>
<td>1</td>
<td>GB-1</td>
<td>C-C</td>
<td>See plan for configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paper Towel dispenser</td>
<td>1</td>
<td>PTD</td>
<td>C-C</td>
<td>See Int. Elev. for location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seat Cover Dispenser</td>
<td>1</td>
<td>SCD</td>
<td>C-C</td>
<td>See Int. Elev. for location</td>
</tr>
<tr>
<td>126</td>
<td>Dayroom</td>
<td>TV/VCR Bracket</td>
<td>1</td>
<td>C-C</td>
<td></td>
<td>See Int. Elev. for mounting height</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Table w/ 4 attached stools</td>
<td>6</td>
<td>C-C</td>
<td></td>
<td>Bid Alternate No. 7</td>
</tr>
</tbody>
</table>

LRS Architects, Inc.
### Furnishings and Accessory Schedule: 11000

<table>
<thead>
<tr>
<th>ROOM NO.</th>
<th>ROOM NAME</th>
<th>EQUIPMENT</th>
<th>QUAN. EA. RM.</th>
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<th>REMARKS</th>
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</thead>
<tbody>
<tr>
<td>128</td>
<td>Academic</td>
<td>Marker Board</td>
<td>2</td>
<td>~</td>
<td>C-C</td>
<td>See section 101195 / Bid Alt. No. 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pull Down Projection Screen</td>
<td>1</td>
<td>~</td>
<td>C-C</td>
<td>See section 11132</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TV/VCR Bracket</td>
<td>1</td>
<td>~</td>
<td>C-C</td>
<td>Mount top of bracket @ +5'-10&quot; AFF</td>
</tr>
<tr>
<td>133-141</td>
<td>Sleeping Rooms (9)</td>
<td>Mirror</td>
<td>1</td>
<td>DM</td>
<td>C-C</td>
<td>Mount bottom of mirror no higher than 40&quot;</td>
</tr>
<tr>
<td>142</td>
<td>ADA Sleeping Room</td>
<td>36&quot; Grab Bar</td>
<td>1</td>
<td>DGB-1</td>
<td>C-C</td>
<td>See plan for configuration</td>
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<tr>
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</tr>
<tr>
<td></td>
<td></td>
<td>Detention Shwr Seat</td>
<td>1</td>
<td>DSH-1</td>
<td>C-C</td>
<td>Mount 18&quot; above fin. floor</td>
</tr>
<tr>
<td>146</td>
<td>Janitor</td>
<td>Mop Rack</td>
<td>1</td>
<td>MR</td>
<td>C-C</td>
<td>Locate as directed</td>
</tr>
</tbody>
</table>

**General Notes:**
1. See specification sections and for **Product Designation** descriptions
2. **Status:** C-C is Contractor Provided - Contractor Installed O-O is Owner Provided - Owner Installed
3. Quantities reflect number of items per room
4. Coordinate paint finish of equipment with Manufacturer’s recommendations
5. Coordinate weld plate requirements with Section 05500 Metal Fabrications.
6. Unless otherwise noted, accessories are specified in section 11192 (detention) or 10810 (non-detention)
PART 1  GENERAL

1.1  SUMMARY

A.  Section Includes:
   1.  Wall mounted projection screen.

B.  Related Sections:
   1.  Section 09260: Gypsum Board Assemblies, for concealed in-wall blocking and support blocking.

1.2  SUBMITTALS

A.  Product Data, including data on project screen materials and operation, hardware and accessories, and finishes.

B.  Shop Drawings, indicating requirements for wall mounting and finish trim.

C.  Manufacturer's Installation Instructions: Indicating special procedures, conditions requiring special attention, and installation sequence.

1.3  MAINTENANCE DATA

A.  Describe cleaning materials detrimental to finish surfaces.

B.  Include recommended cleaning methods, cleaning materials, and stain removal methods for projection screen.

1.4  QUALIFICATIONS

A.  Use skilled workers trained and experienced in necessary crafts who are familiar with requirements and methods needed for proper performance of Work of this Section.

1.5  COORDINATION

A.  Coordinate as required with other trades to assure proper interface with work of those trades and work of this Section.

PART 2  PRODUCTS

2.1  MANUFACTURERS

A.  "Luma 2" Heavy Duty Spring Roller Projection Screen by Draper Shade & Screen Co., Inc.

B.  Equivalent by Da-Lite.

2.2  PROJECTION SCREENS

A.  Size: 4 foot high by 8 foot wide.

B.  Case: 22 gauge steel.

C.  Matte white fiberglass surface.

D.  Installation: Surface wall mounted.

LRS Architects, Inc.
E. Case Finish: Manufacturer's standard gray.

F. Provide wall brackets sized for projection screen.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify attachment substrate and in-wall supporting reinforcement is ready to receive projection screens.

3.2 INSTALLATION

A. Install projection screen on wall as shown in Drawings, in accordance with manufacturer's instructions.

B. Install plumb and level.

3.3 ADJUSTING AND CLEANING

A. Adjust and service moving parts to operate smoothly and quietly during warranty period.

B. Clean exposed surfaces sand touch up scratches and abrasions.

3.5 DEMONSTRATION

A. Demonstrate operation of projection screen, and identify potential operational problems.

END OF SECTION
PART I GENERAL

1.1 SECTION INCLUDES

A. Single responsibility requirements for detention equipment.

1.2 PERFORMANCE REQUIREMENTS

A. Contractor shall engage a single entity as Subcontractor to assume sole responsibility for Work of the following Sections:

1. Section 08320: Detention Doors and Frames.
2. Section 08510: Steel Windows, for detention window frames.
3. Section 08781: Detention Hardware.
4. Section 11191: Detention Furnishings.

B. Selected Subcontractor shall supply and install complete Work of the above mentioned Sections, and shall be referenced in this Section as the Detention Equipment Subcontractor.

1.3 SUBMITTALS

A. The following requirements are in addition to, if not already required, submittal requirements indicated in separate Sections related to detention equipment.

1. Provide all submittals required for Sections 08320, 08510 and 08781 as a complete package for concurrent review and proper coordination purposes.

B. Shop drawings:

1. Provide detailed drawings of equipment showing construction methods, type and gage of metal, hardware and fittings; with plans, elevations, and cross sections as required to fully describe the Work.
2. Show service roughing-in connections, characteristics, and wiring diagrams for control systems.
3. For concrete or masonry embedded items, provide to the appropriate trade setting drawings and templates showing anchorage requirements.

C. Detention Hardware Schedule:

1. Submit final detention hardware schedule signed by an Architectural Hardware Consultant who is certified by the Door Hardware Institute. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware. Organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening; and include the following information:
   a. Type, style, function, size and finish of each hardware item.
   b. Name and manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of hardware sets cross-referenced to indications in drawings both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, codes, etc.
   f. Mounting locations for hardware.
   g. Door and frame sizes and materials.
2. Submit schedule at earliest possible date, particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., door and frame metal work which is critical to the construction schedule).

D. Samples: If requested, and prior to final ordering of finish hardware, submit one sample of each type of exposed detention hardware unit with required finish.

E. Keying Schedule: Submit a complete keying schedule prepared in accordance with the Door and Hardware Institutes manual "Keying Procedures, Systems and Nomenclature". Coordinate keying with the Owner.

F. Substitutions and Equivalents:

1. Any product submitted as a substitution or equivalent shall fulfill the requirements of the Specifications and have passed the same testing agency (ANSI, UL, ASTM, etc.) as referenced with the product.

2. Include with substitution request an itemized list indicating manufacturer, model number, sizes, finishes, and any difference from the specified products.

3. Include with substitution request a sample of the product to be substituted with a written list showing the names, locations, and Architects of a minimum of 10 institutions for which similar products have been installed.

4. Submit substitution requests 14 days prior to Bid opening to allow notification of approval by Addendum 7 days prior to Bid opening.

5. It is the Architect's and Owner's option to accept or reject any substitution to the equipment specified. No substitution will be allowed after Bid date.

G. Maintenance Manuals: Furnish 3 copies of maintenance manuals including all detention equipment for this Project.

1. Include current name, address, and phone number of Detention Equipment Subcontractor, maintenance instructions and parts list for each type of hardware.

H. Templates: Detention Equipment Subcontractor shall furnish hardware templates to door and frame manufacturer to ensure proper preparation for installation of hardware.

I. Wiring Diagrams: Complete system wiring diagrams for all electric locks and controls shall be prepared and provided by the detention hardware manufacturer, to include lock functions, monitoring requirements, color coded conductor locations, and conductor connections.

1.4 QUALITY ASSURANCE

A. Prequalified Detention Equipment Subcontractors are as follows:

1. Engineered Maximum Security Systems, Newark, CA
2. Universal Security Products, Hayward, CA
3. Western Systems, Inc.
B. Non-prequalified Detention Equipment Subcontractors who intend to submit a Bid for Work specified in this Section shall provide to the Architect the following information 14 days prior to Bid date, and shall be notified by addendum 7 days prior to Bid date if approved. Verbal approval will not be given.

1. Evidence of 10 years prior experience in the installation of detention equipment.
2. Provide a list of all employees in supervision capacity stating their area of responsibility and their years of experience in that capacity.
3. Submit a list of 5 projects comparable in size and construction built in the last 5 years. Include project name, person to contact and phone number, and the contract amount.
4. Provide an audited financial statement for the most recently completed fiscal year.
5. Submit a listing of all projects in which Detention Equipment Subcontractor is presently, and has been, involved in litigation and the status thereof.
6. Submit a current letter from the detention hardware manufacturer that Bidder is a factory trained, fully authorized distributor and installer of products specified for this Project.
7. Provide a letter from Bidder's agent stating the bidder has the bonding capacity for this project, and that bonding will be allocated to this project if the bidder is successful.
8. Any bidder who fails to submit the above, or submits misrepresented or incomplete information, shall be disqualified.

C. Approval for Manufacturers of Detention Hardware.

1. Manufacturers supplying detention hardware products for this Project must be approved prior to bidding.
2. Approval for specific products is conditional on manufacturer providing proof of compliance with requirements listed in Paragraph D below.
3. Submit products for approval by the Architect 14 days prior to Bid opening to allow notification of approval by Addendum 7 days prior to Bid opening.

D. Conditions for approval of manufacturers supplying detention hardware products are as follows:

1. The manufacturer of detention hardware shall have a minimum of 15 years successful experience in the design and manufacture of the type of detention equipment required for this project.
2. The manufacturer shall ensure future availability of repair parts by warranting that replacement parts will be available for 20 years from the date of original purchase, and that manufacturer actively maintains a stock of repair parts, and publishes repair parts and maintenance manuals for all items proposed to be provided for this Project.
3. A local representative of the manufacturer specially trained in the operation and design, and with a thorough knowledge of the products, shall be available for consultation on this Project.
4. The manufacturer shall submit proof of product liability insurance.
5. Submit proof of a quality assurance program equal to or exceeding the requirements of Military Standard 105D testing to an AQL level of 1.5 percent.
6. Submit evidence that engineering functions of the manufacturer are under the direction of a registered professional engineer.
7. UL1034 is used to establish the quality, construction, performance and operation of locks. Manufacturer shall submit proof of compliance and listing under UL Standard 1034 Burglary-Resistant Electric Locking Mechanisms.

8. UL437 is used to establish the quality, construction, and pick-resistance of pin tumbler cylinders. Manufacturer shall submit proof of compliance and listing under UL Standard 437 Key Locks.

9. Manufacturer shall submit proof that keying records are permanently maintained on electronic media and hard copy records.

E. Code Compliance: Work governed by the requirements of this Section shall comply with the latest requirements of the Federal, State, and local codes or ordinances, and other agencies having jurisdiction. In the event of conflict, the more stringent requirements shall apply.


2. Fire-rated openings shall comply with NFPA Standard number 80. Provide only hardware which has been tested and listed by Underwriters Laboratories for these openings.

F. Field Welding:

1. Welder Qualifications: Employ only welders who are qualified by American Welding Society's (AWS) testing procedure.

2. Quality: Repairing of defective welds by adding new material over the defects will not be permitted.

3. Welds: Shall be of neat and clean appearance, and deep penetration in accordance with AWS. Joints shall be tight and true with members ground where necessary to assure a correct fit.

G. Security Fasteners: Ensure that manufacturers, suppliers, and installers of detention equipment provide and use detention screws as specified in Section 11192.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing and Delivery:

1. Mark or tag each item of hardware, with identification related to final hardware schedule, and include basic installation instructions with each item or package.

2. Wrap and crate finished components and assemblies to prevent damage to finished items.

3. Deliver individually packaged hardware items at the proper time and location (shop or project site) for installation.

4. Determine and coordinate the openings for delivery and installation of equipment.

B. Storage and Protection:

1. Hardware received, but not installed shall be placed in secured storage. Control handling to prevent losses and delays before and after installation.

2. Lay panels and flat sections flat and blocked clear of floor in a manner to prevent warping, twisting or sagging.

3. Immediately upon delivery, inspect components and assemblies for damage; remove from the site any damaged items.
C. Key Delivery: Keys shall be sent direct to the person and address as directed by the Owner, via direct mail with restricted delivery, and return receipt requested.

D. Off-Site Storage: In the event that off-site storage is necessary the following requirements apply:

1. Protect stored items from diversion, destruction, theft, and damage.
2. Mark stored items for use on the project.
3. Make stored items available for inspection by Architect and Owner.
4. Submit copies of bill of sale for stored items to Architect and Owner.
5. Submit to Architect and Owner certificates of property insurance for stored items, protecting against damage and theft while in storage, certifying said coverage, and indicating the nature, quantity, and exact location of stored items.
6. Provide a waiver of lien in accordance with the Contract Documents.

1.6 PROJECT CONDITIONS

A. Coordination:

1. Coordinate the Work governed by requirement of this Section with other work.
2. Provide items of proper design for use on this project as indicated and in accordance with the approved hardware schedule, door schedule, and keying control schedule, as required for a complete and functional use of items.
3. Coordinate the delivery and location of items to meet the progress schedule.
4. Provide to manufacturers of related equipment and trades effected by the Work governed by requirements of this Section, copies of approved hardware schedule and drawings of other work to confirm adequate provisions have been made for the proper location and installation of detention equipment.

1.7 WARRANTY AND SERVICE

A. Detention Equipment Subcontractor shall warrant the material and workmanship on this project for a period of one year after acceptance by Owner. Detention Equipment Subcontractor agrees to repair or replace without delay defective detention materials or work when given written notice during Warranty period.

B. Manufacturer of detention hardware shall warrant that replacement parts shall be available for locking mechanisms for a minimum of 20 years from the date of purchase of original equipment.

C. Preventative Maintenance: Detention Equipment Subcontractor shall include in his Bid, two service and inspection trips during the 12 month warranty period. Equipment shall be inspected for function, adjustment, and lubrication. Necessary adjustments and lubrication shall be made and a written account provided to the Owner. Schedule the first visit two months after operational turn-over.

D. Provide emergency service during the 12 month warranty period, should a major break down occur. Response time shall be within a 24 hour period.

E. At the Owners option, provide continuing emergency service at a fixed rate per day, beyond the warranty period.
1.8 MAINTENANCE

A. Spare Parts:

1. Furnish Owner with the following maintenance/spare parts:

<table>
<thead>
<tr>
<th>Spare Part</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric limit switches</td>
<td>6 each</td>
</tr>
<tr>
<td>Lock assembly (1 ea. hand)</td>
<td>2 each</td>
</tr>
<tr>
<td>Door position switch (1 ea. hand)</td>
<td>2 each</td>
</tr>
<tr>
<td>Door closer (1 each hand)</td>
<td>2 each</td>
</tr>
<tr>
<td>Torx tamper-resistant screws</td>
<td>100 each size</td>
</tr>
<tr>
<td>Torx Tool Sets</td>
<td>6 each</td>
</tr>
</tbody>
</table>

Each set packaged in an individual kit.

2. Parts shall be packed in suitable containers clearly labeled. Deliver and store maintenance/spare parts material where directed by Owner.

PART 2 PRODUCTS

2.1 PRODUCT SAFETY REQUIREMENTS

A. Locks shall comply with UL Standard 1034 for Burglary-Resistant Electric Locking Mechanisms.

B. Pin tumbler cylinders shall comply with UL Standard 437 Key Locks.

C. Security Mode:

1. Security is of the essence.
2. Unless otherwise required by code, electrically operated hardware shall remain secured in the event of power failure.
3. Normal operation will require energy to operate.
4. Emergency operation shall be by key or other mechanical means.

D. Registration of Keying:

1. The manufacturer of detention hardware shall maintain permanent key identification records, on electronic media and hard copy, in locked fire proof files, for security and future key replacement.
2. Manufacturer to guarantee restricted replacement of keys. Replacement keys will only be cut by factory authorized agents with written authorization from the institution.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine and inspect surfaces, anchors and grounds that are to receive specified materials, assemblies, and equipment. Report unsatisfactory conditions to the Architect.

B. Do not begin installation until unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Prior to installation, meet at project site for purpose of reviewing products and installation methods selected, procedures to be followed in performing the work and coordination.

B. Protect adjacent surfaces while installing products against damage and stains.

C. Ascertain location and arrangement of anchorage required to accommodate work; coordinate with other trades where necessary to make provisions for installation.

D. Furnish setting drawings, diagrams, templates, instructions, and directions for installation of all products.

E. Distribute products and assemblies to installation locations immediately prior to installation, complying with all applicable product handling requirements. Coordinate timing of distribution with installation schedule.

F. Coordinate with other trades for proper location of roughing-in services and service connections specified in other Sections.

G. Check roughing-in and field dimensions prior to beginning work.

3.3 INSTALLATION

A. Do not install products which are observed to be defective.

B. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels and being visually parallel.

C. Install in alignment, free from warp, twist or distortion, plumb, level and true.

1. Comply with reviewed shop drawings, manufacturer's instructions and recommendations for both handling and installation of the products for particular conditions of installation in each case, except where more stringent requirements are indicated or specified, or where Project conditions require extra precautions of provisions for satisfactory performance of work.

2. Where printed instructions are not available or do not apply to Project conditions, consult manufacturer's technical representative for specific recommendations before proceeding.

D. During installation, protect adjacent surfaces and detention equipment from damage. Work shall be free from scratches, dents, permanent discolorations and other defects; remove and replace damaged parts, surfaces with imperfections, or damaged during installation or thereafter before time of final project acceptance.

E. Perform cutting, drilling, and fitting required for the installation complying with templates or detail drawings and project conditions.
F. Comply with AWS code for welding procedures, including appearance and quality of welds made, and methods used in correcting welding work.

   1. Where surfaces are to be exposed to view, grind welds smooth; finish holes, defects and other imperfections so surfaces will be smooth when painted.
   2. Partially welded metal to metal joints exposed shall be filled with metal body putty and ground smooth prior to painting.

G. Handling: Where Drawings show direction of swing or hand of each door leaf, furnish and/or install each item of hardware for proper installation and operation of door movement as indicated.

3.4 ADJUSTMENT AND TOUCH-UPS

   A. Test electrically operating or sensing items and adjust as required to provide proper functions.
   B. Adjust and lubricate moving parts to operate smoothly and quietly, without binding.
   C. Work shall be free from scratches, dents, permanent discoloration and other defects.

   1. Remove and replace damaged parts, surfaces with imperfections, or damaged during installation or thereafter before time of final project acceptance.
   2. Prior to touch-up painting, remove objectionable foreign material from metal surfaces including connections.
   3. Touch-up welds, bolted connections, and all abraded/damaged areas with shop applied finish of metal primer paint.

3.5 CLEANING

   A. Remove non-permanent labels, non-permanent protective coatings and identifying marks, and thoroughly clean all surfaces and remove foreign materials prior to inspections intended to set date of substantial completion. Clean concealed work similarly, prior to enclosure.
   B. During installation, maintain storage and work area, and installation locations, in neat, orderly, broom clean condition.

3.6 MAINTENANCE/SPARE PARTS

   A. Deliver quantities of extra maintenance/spare parts as specified to location(s) as directed by the Owner in properly packed cartons, and obtain receipt when delivered.

3.7 OPERATING INSTRUCTIONS AND MATERIALS

   A. Provide operating/maintenance manuals and instructions for detention equipment products provided. Include complete listing of spare parts (with re-order part numbers and re-order procedures), a list of contact persons (including addresses, phone numbers) for both routine and emergency advice, and a schedule for appropriate maintenance activities required for each item provided.

END OF SECTION
PART 1  GENERAL

1.1  SECTION INCLUDES

A. Detention furnishings including the following detention grade toilet accessories:

1. Grab bars.
2. Toilet paper holders.
3. Mirrors.
4. Shower seats.
5. TV mounting brackets.
6. Dayroom tables (Alternate)

B. Related Sections:

1. Section 03300: Cast-in-Place Concrete, substrate for floor mounted equipment and placement of embeds in concrete.
2. Section 04220: Concrete Masonry Units: for placement of embeds in CMU.
4. Section 11000: Furnishing and Accessory Schedule.
5. Section 11190: General Requirements for Detention Equipment, for single-source requirements affecting Work of this Section.
6. Section 11192: Detention Screws, for detention furnishings fastening requirements.

1.2  SUBMITTALS

A. Product Data: For each product specified.
B. Shop Drawings: Indicate locations on plans, elevations, mounting requirements, and special anchorage details.

PART 2  PRODUCTS

2.1  DETENTION EQUIPMENT

A. Manufacturers: As indicated for each specified product.
B. Substitutions: Submit in accordance with requirements of Section 01630.

2.2  DETENTION GRADE TOILET ACCESSORIES

A. Maximum Security Grab Bars:

1. Manufacturer: Bradley.
2. Models:

   a. DGB-1: SA-70; 1-1/2 inch diameter, 36 inch length.
   b. DGB-2: SA-70; 1-1/2 inch diameter, 45 inch length.

B. DTP-1, Maximum Security Toilet Paper Holders:

1. Manufacturer: Bradley.
2. Model: SA-11; Recessed of one piece construction.
C. DM-1, Maximum Security Mirrors:
   1. Manufacturer: Bradley.
   2. Model: SA01-1; with stainless steel frames, surface mounted and secured from rear.

D. DSH-1, Shower Seat:
   1. Manufacturer: Bradley.
   2. Model: SA-65; Recessed Type 304 stainless steel.
   3. Seat be capable of supporting 750 lbs.

2.3 TV/VCR MOUNTING BRACKETS
A. 16 gage perforated steel tray with 11 gage tubular wall mount.
B. Provide mounting accessories to CMU wall.
C. Provide locking shelf and safety belt.
D. Product/Manufacturers:
   2. Da-Lite: Advance Wall Mount Yoke Model WMY.

2.4 DAYROOM TABLES (BID ALTERNATE NO. 7)
A. 14 gage steel tube frame and legs fully welded to 1/4 inch steel mounting plates.
B. Configuration and Top: 4 Seat, 42 inch diameter tables with "Nu-Stone" compression molded fiberglass composite top and 13 inch diameter seats.
   1. Provide with "Nu-Stone" checkerboard game top.
C. Finish: Manufacturer’s standard powder coating.
D. Product/Manufacturer: "Max-Master" Tables, by Norix Group Inc.

PART 3 EXECUTION
3.1 INSTALLATION
A. Install in accordance with manufacturer’s instructions.
B. Install detention furnishings with detention screws specified in Section 11192.

3.2 SCHEDULE
A. Refer to Section 11000: Furnishings and Accessory Schedule.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. This Section describes requirements for security fasteners.

B. Related Sections for which requirements of this Section apply, but are not limited to:

1. Section 08320: Detention Doors and Frames
2. Section 08510: Steel Windows, for detention windows.
3. Section 08871: Detention Hardware
4. Section 11190: General Requirements for Detention Equipment
5. Section 11191: Detention Furnishings

1.2 SCOPE OF WORK

A. Exposed fasteners at all inmate accessible areas, including fasteners used in fabrication of project components, shall be security screws as specified, unless otherwise indicated.

B. Excluded items and Locations:

1. Roof-mounted mechanical and electrical equipment.
2. Control rooms and their attendant equipment in those rooms, except control panels.
3. Above suspended ceilings, behind access panels and within pipe or duct chases.
5. Moveable furnishings, storage shelving, cabinet hardware.

1.3 QUALITY ASSURANCE

A. Security screws shall be operable by tools produced for specific use of the specified security screws by manufacturer or other fabricators licensed by them.

PART 2 PRODUCTS

2.1 MATERIALS

A. Security screw head style and plating shall be selected as appropriate for installation requirements, strength and finish of adjacent materials, except screws in painted materials shall be stainless steel.

1. Size and shape variations shall be such that no more than 12 different tools/wrenches are required for security screws in Project.

B. Screw Type Allowed: "Pin Torx" security machine screw.

1. Diameter: #4 through 3/4-inch.
2. Material: Black grade 9 alloy steel or austenitic stainless steel or martensitic steel as required for particular strength or finish.
3. Head Styles: Socket head cap, button, flat or low head, as required by application or as indicated.

LRS Architects, Inc.
2.2 SOURCES

A. Security screws shall be obtained through the following dealers:

1. Riteloc Company, Freeport, NY; Telephone: (516) 378-1020
2. Holo-Krome Company, West Hartford, CT; Telephone: (203) 523-5235
3. Tamper-Pruf Screws, Inc., Paramount CA; Telephone: (213) 531-9364
4. Camcar Division of Textron, Inc., Rockford, IL; Telephone: (815) 226-7721
5. Safety Socket Screw Corporation, Chicago, IL; Telephone: (312) 763-2020
6. Bryce Fastener Company, Inc., 2924 Western Avenue, Seattle, WA Telephone: 1-800-542-7031

PART 3 EXECUTION

3.1 GENERAL

A. Individual manufacturers, suppliers or installers or each component requiring use of security fasteners shall obtain security screws as required to satisfy requirements of their work.

B. Ensure use of proper size and type of security screws for each required application, and coordinate with Detention Equipment Subcontractor to assure that quantity of tools/wrenches required does not exceed specified maximum.

END OF SECTION
PART 1  GENERAL

1.1  REFERENCES

A. The General Conditions and Division 1 Requirements shall be included in and made a part of this Section, with special attention to:

1. Section 01400 Quality Control.
2. Section 01600 Material and Equipment.
3. Section 01660 Substitutions.
4. Section 01700 Close Out.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

C. Applicable codes, in addition to those specified in other Sections:

1. UBC - Uniform Building Code, California Edition
2. UMC - Uniform Mechanical Code, California Edition
3. UPC - Uniform Plumbing Code - California Edition
4. Appendix Chapter 3A, Part 2, Title 24, California Building Code

D. Applicable published Specifications and Standards:

1. AABC - Associated Air Balance Council
2. AMCA - Air Moving & Conditioning Association
3. ANSI - American National Standards Institute
4. ARI - Air Conditioning & Refrigeration Institute
5. ASHRAE - American Society of Heating, Refrigeration & Air Conditioning Engineers
6. ASME - American Society of Mechanical Engineers
7. ASTM - American Society for Testing & Materials
8. NFPA - National Fire Protection Association

1.2  SECTION INCLUDES

A. This Section includes general requirements for all work of Division 15.

B. Provide all heating, ventilating, and air conditioning work as indicated on the Drawings and specified in Division 15. Provide complete, automatic, continuous, operational, and functioning systems, fully coordinated with work of other Sections.

C. Work under this Section shall include but not be limited to the following:

1. Furnishing and installing roof top air conditioners.
2. Furnishing and installing of exhaust fans.
3. Installation of duct distribution system, including grilles, registers, and insulation.
4. Plumbing work including toilet fixtures, gas fired hot water heaters, and sanitary, vent, water, and gas piping.
5. Sprinkler installation, with all required heads and accessories.
1.3 QUALITY ASSURANCE

A. Provide all work and materials in full accordance with the latest rules of the organizations listed in Division 1 and in other Sections of Division 15, and with any prevailing rules and regulations pertaining to adequate protection and/or guarding of any moving parts, or otherwise hazardous locations.

PART 2 PRODUCTS

2.1 NEW PRODUCTS AND MATERIALS

A. Provide new products and materials, the best of their respective kinds, free from all defects, and of the make, type and quality herein specified.

2.2 ACCESS DOORS AND PANELS

A. Furnished and installed under this Section as required.

PART 3 EXECUTION

3.1 MANUFACTURER’S DIRECTIONS

A. Obtain and follow manufacturer’s directions in all cases. Where manufacturer’s directions are in conflict with the Drawings and Specifications, submit for clarification before installing the work.

3.2 QUALITY CONTROL

A. Measurements: All materials installed shall be to exact field measurements as determined by this Division.

3.3 PAINTING

A. Finish painting shall be provided under PAINTING Section 09900. All equipment under DIVISION 15 shall have a factory prime coat.

3.4 MECHANICAL INSTALLATION

A. General: Sequence, coordinate, and integrate the various elements of the mechanical systems, materials, and equipment.

B. Comply with the following:

1. Coordinate mechanical systems, equipment, and materials installation with other building components.
2. Verify all field measurements.
3. Arrange for chase, slots, and openings in other building components during progress of construction, to allow for installation of mechanical work.
4. Sequence, coordinate, and integrate installation of mechanical materials and equipment for efficient flow of the work.

LRS Architects, Inc.
5. Install systems, materials, and equipment to conform with approved submittal data. Conform arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer to Division 1.

END OF SECTION
PART 1 GENERAL

1.1 REFERENCES

A. The General Conditions and Division 1 Requirements shall be included in and made a part of this Section, with special attention to:

1. Section 01400 Quality Control.
2. Section 01600 Material and Equipment.
3. Section 01660 Substitutions.
4. Section 01700 Close Out.

B. Related Work in following Sections:

1. Section 15010: MECHANICAL GENERAL CONDITIONS

C. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SECTION INCLUDES

A. All steel fabrication involved in making stands and supports for equipment installed under this Division, unless specified otherwise.

B. Furnishing and setting of sleeves, rods, inserts, and support and bracing devices for all piping, ductwork and equipment installed under this Division.

C. Complete closing and sealing of all openings around pipes and ducts furnished under this Division. Maintain all fire separations.

1.3 QUALITY ASSURANCE

A. Provide all work in conformance with the following:


PART 2 PRODUCTS

2.1 ATTACHMENTS TO STRUCTURE

A. Connection to Concrete Structure: Hilti Kwik-Bolt, Phillips, or equal, wedge type expansion anchors.

B. For Suspension from Metal Deck: Superstrut C-475, or equal.

C. For Connection to Steel Beams or, Other Steel Sections: Grinnel Figure 66, Superstrut C-780, or approved equal, steel welded beam attachment.
2.2 SUPPORTS, BRACING, AND ACCESSORIES

A. Miscellaneous Steel: Angles, channels, brackets, rods, clamps, etc., of new materials conforming to ASTM A36. Hot-dip galvanize all steel parts after fabrication where exposed to weather or where noted.

B. Fasteners: All bolts and nuts, except as otherwise specified, shall conform to ASTM Standard Specifications for Low Carbon Steel Externally and Internally Threaded Standard Fasteners, Designation A307. Bolts shall have heavy hexagon heads, and nuts shall be of the hexagon heavy series. All bolts, washers, nuts, anchor bolts, screws and other hardware, unless otherwise specified, shall be galvanized, and all galvanized nuts shall have a free running fit. Provide bolts of ample size and strength for the purpose intended.

C. Sheet Metal Screws: Plated, size 10 minimum.

D. Hanger Rods: Grinnel, Superstrut, or equal, steel rods, threaded at ends only with a minimum safety factor of 5 over the imposed load.

E. Pipe Hangers: Provide rod sizes to meet applicable requirements.

F. Duct Hanger Straps: See Section 15890 - Ductwork and Accessories.

G. Fireproofing of Floor and Wall Penetrations: Provide code approved mineral fiber packing with suitable binder and escutcheons. Materials and installation shall comply with "U.L. Building Materials Directory", Through Penetrations Firestop Systems:

1. No. C-AJ-1027 for uninsulated metal pipe through masonry wall and floor penetrations.
2. No. C-AJ-5001 for insulated metal pipe through masonry wall and floor penetrations.

H. Pipe Sleeves: Adjus-to-Crete, AMI Products, or equal, 24 gauge, electro-galvanized adjustable sleeve, up to 6 inch diameter. For 8 inch and larger, provide galvanized standard weight steel pipe sleeves.

I. Pipe Hangers and Supports: Support all piping so that it is firmly held in place by approved iron hangers and supports as required.

1. Hanger/Support Spacing Schedule:

<table>
<thead>
<tr>
<th>Pipe</th>
<th>&lt;1&quot;</th>
<th>1&quot; to 3&quot;</th>
<th>&gt;3&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>8 ft</td>
<td>10 ft</td>
<td>12 ft</td>
</tr>
<tr>
<td>Copper</td>
<td>5 ft</td>
<td>8 ft</td>
<td>10 ft</td>
</tr>
<tr>
<td>Gas</td>
<td>6 ft</td>
<td>10 ft</td>
<td>10 ft</td>
</tr>
<tr>
<td>Cast Iron</td>
<td>Support at every joint and 10 ft maximum</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Install galvanized metal shields on insulated pipe.

2.3 SEISMIC RESTRAINT

A. Materials: Steel and fasteners as specified herein.
B. Piping Restraint:
   1. Brace in accordance with pages 3 through 6, 23 through 26, Detail A on Page 27, Page 28 and Pages 34 through 37 of the referenced SMACNA Guidelines.

C. Duct Restraint:
   1. Brace in accordance with Pages 1, 2, and 17 through 21 of the referenced SMACNA Guidelines.

PART 3 EXECUTION

3.1 ATTACHMENTS TO STRUCTURE

A. Steel Structure: Attach at beam or truss axis. Avoid eccentric loads wherever possible.

B. Rating: Ultimate strength at least five times the imposed load.

C. Where point loads, imposed by work of Division 15, are greater than can safely be carried the roof or deck, provide structural steel spreader beams tied to the building structure. Maximum deflection 1/240.

3.2 SUPPORTS, BRACING, AND ACCESSORIES

A. Set all machines and devices dead level, except where pitch or slope is specified or shown, and securely fasten to the structure unless shown otherwise.

B. Duct Support and Bracing:
   1. Ducts Supported From Above: Attach to structure using specified attachments or as shown on the drawings.
   2. Support Spacing: See Section 15890 - Ductwork and Accessories.
   3. Double fold strap at attachment to structure.
   4. Brace ducts as specified: Where applicable see Seismic Restraint requirements.

END OF SECTION
PART 1 GENERAL

1.1 REFERENCES

A. The General Conditions and Division 1 Requirements shall be included in and made a part of this Section, with special attention to:

1. Section 01400 Quality Control.
2. Section 01600 Material and Equipment.
3. Section 01660 Substitutions.
4. Section 01700 Close Out.

B. Related Work in following Sections:

1. Section 15010: MECHANICAL GENERAL CONDITIONS
2. Section 15140: SUPPORTS AND ANCHORS.

C. Examine all Drawings and all other Sections of the Specifications for requirements of this trade.

1.2 SECTION INCLUDES

A. Motors and belt drives for Division 15 equipment.

PART 2 PRODUCTS

2.1 MOTORS

A. Manufacturers: General Electric, Westinghouse, Century, or Reliance or approved equal.

B. Enclosures: Indoors or Covered: Dripproof unless otherwise noted.

C. Insulation: Class B, or continuous full load duty at 40°C ambient, except that motors to be driven through adjustable frequency drives shall have Class F insulation.

D. Service Factor: 1.15 minimum.

E. Single Phase Motors: Capacitor start, induction run, with high starting torque and low starting current, resilient base, 1800 RPM unless otherwise noted, ball bearings, automatic reset thermal overload protection.

F. Three Phase Motors: High efficiency squirrel cage induction type, across-the-line starting duty except where otherwise noted, NEMA design "B" with low slip, low starting current, and normal starting torque. Motor efficiency shall be measured per IEEE Test Procedure 112, Method B. Provide regreaseable ball bearings and automatic reset thermal overload protection. 1800 RPM unless otherwise noted.

LRS Architects, Inc.
2.2 DRIVE COMPONENTS

A. Belt Drives: Woods Type "SVS" or Browning, short center V-belt drives of proper size to transmit the required power without slipping while starting and rated at not less than one and one-half times the motor horsepower, having dynamically balanced cast iron or steel sheaves. Drives for motors one horsepower and over shall have a minimum of two belts and fixed sheaves. Drives for motors below one horsepower shall have one belt and adjustable sheaves.

PART 3 EXECUTION

3.1 ALIGNMENT

A. Set all direct driven equipment with not more than 1/2 of the coupling manufacturer's recommended maximum tolerance for parallel and angular variance in alignment. Align all belt driven equipment to provide minimum wear on belts and drives, with belts properly tensioned and running practically noiseless.

END OF SECTION
PART 1 GENERAL

1.1 REFERENCES

A. The General Conditions and Division 1 Requirements shall be included in and made a part of this Section, with special attention to:

1. Section 01400 Quality Control.
2. Section 01600 Material and Equipment.
3. Section 01660 Substitutions.
4. Section 01700 Close Out.

B. Related Work in following Sections:

1. Section 15010: MECHANICAL GENERAL CONDITIONS
2. Section 15140: SUPPORTS AND ANCHORS.

C. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SECTION INCLUDES

A. Thermal and acoustical insulation for ducts.

B. Thermal insulation of hot and cold water piping.

1.3 QUALITY ASSURANCE

A. Provide all work in conformance with Underwriters' Laboratories Test Method No. 723: Fire Hazard Classification.

B. ICBO Uniform Mechanical Code.

1.4 PRODUCT HANDLING

A. Procedure: In accord with PRODUCT HANDLING requirements of Division 1.

B. Follow any special storage and handling requirements of the manufacturer.

PART 2 PRODUCTS

2.1 GENERAL:

A. Manufacturers: Owens-Coming Fiberglass Corp., Armstrong, Certain-Teed, or approved equal.

B. Fire Hazard: Provide insulation, lining, jackets, facings, adhesives and accessories acceptable to the State Fire Marshal, and meeting the requirements of NFPA 90A. Meet the following hazard classifications stated in accordance with U.L. Test Method of Fire Hazard Classifications of Building Materials, No. 723:

1. Flamespread: Maximum 25.
2. Fuel Contributed: Maximum 50.

2.2 DUCT INSULATION

A. Insulate all supply, return, and outside air ducts. Where not shown as lined, cover on the outside with minimum 1.5-inch thick blanket material of fine inorganic glass fibers with foil/scrim/kraft face; Owens-Corning All-Service faced duct wrap, Type-100. Pressure sensitive tape shall not be used.

1. Density: Not less than 1 lb. per cu. ft.
2. Minimum k value: 0.27.

B. Acoustical lining where indicated on the Drawing shall be 1-inch coated fiberglass Aeroflex Type T-200 with average k factor of 0.23, UL-723 Class 1A approved.

1. Increase duct size to allow for lining.

2.3 PIPE INSULATION

A. Cover all cold water piping with 1" fiber glass insulation with all-service jacket, Owens-Corning Fiberglas SSL II with double closure system.

B. Cover all hot water piping with fiber glass insulation with all-service jacket, Owens-Corning Fiberglas SSL II with double closure system as follows:

1. 1/2 " - 1" insulation
2. 1-1/4" - 2" insulation
3. >2-1/2" insulation

PART 3 EXECUTION

3.1 GENERAL

A. Apply all insulation in a neat and workmanlike fashion, in maximum continuous lengths, with all butt and lap joints and seams secured.

3.2 DUCT INSULATION

A. Attach insulation to ducts with 50% coating of bonding adhesive in 12 inch bands and wire on with 16 gauge annealed steel wires on 12" maximum centers and at each lap joint. Lap all joints not less than 6". Where space limitations will not permit lap joints, butt and seal joints.

B. Where it is not possible to insulate ducts after installation, insulate duct before final installation.

3.3 PIPE INSULATION

A. Attach to clean piping, and properly seal.

1. On hot water pipe that has heat tape attached, Contractor shall take special precaution so as not to damage the tape.

* END OF SECTION
PART 1 GENERAL

1.1 WORK INCLUDED

A. Work Included in this Section: Design, materials, equipment, fabrication, installation and tests in conformity with applicable codes and authorities having jurisdiction for the following:

1. Complete Sprinkler System.
2. Piping, fittings, valves, hangers, sprinkler heads, and other appurtenances as required.
3. All necessary flushing, testing, cleaning and adjustment.
4. Shop drawings and “as-built” drawings and other documentation as herein specified.
5. Auxiliary drain and inspector’s test connection piping.
6. Installation of the systems.
7. Initial system testing and start-up services.

1.2 RELATED WORK AND REQUIREMENTS

A. The General Conditions and Division 1 Requirements shall be included in and made a part of this Section, with special attention to:

1. Section 01 400 Quality Control.
2. Section 01 600 Material and Equipment.
3. Section 01 660 Substitutions.
4. Section 01 700 Close Out.

B. Related Work in following Sections:

1. Section 15010: MECHANICAL GENERAL CONDITIONS
2. Section 15140: SUPPORTS AND ANCHORS.

C. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.3 REFERENCE CODES AND STANDARDS.

A. Published specifications standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this section where cited below:

2. UL - Underwriters Laboratories, Inc.
4. UMC - Uniform Mechanical Code.
5. UPC - Uniform Plumbing Code.
7. Local Codes.

1.4 QUALITY ASSURANCE

A. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.
B. Supply all equipment and accessories new, free from defects and listed by Underwriters Laboratories, Inc.

C. Supply all equipment and accessories in compliance with the applicable standards listed in article 1.3 of this section and with all applicable national, state and local codes.

1.5 SUBMITTALS

A. Submit shop drawings and product data in accordance with the General Conditions.

B. Submit manufacturer's installation and maintenance instructions.

C. Submit samples of typical security head, ceiling type, and sidewall type as required by the Architect.

D. Shop drawings and Manufacturer's Data Sheets shall be submitted for the following items:

1. Sprinkler heads and escutcheons and head guards.
2. Alarm appurtenance, drains, water flow alarms and tamper switches.
3. Valves, piping and fittings.
4. Stencils, identification tags, signs.
5. Sleeves, inserts, hangers, supports and escutcheons.

1.6 WORKING PLANS FOR FIRE PROTECTION WORK

A. Before the commencement of any work, prepare complete and detailed coordinated working plans and calculations; submit and obtain all required approvals, including Board of Corrections State Fire Marshall; copies of approved working plans shall be furnished to the County, Architect, Building Department, and Fire Department.

1. Sprinkler head layout shown on Architectural Drawings are for reference only.

PART 2 PRODUCTS

2.1 BASE BID MANUFACTURERS

A. Gate and Check Valves (inside):

1. Walworth Co.
2. Jenkins Bros.
3. Kennedy Valve Co.

B. Butterfly Valves:

1. Kennedy Valve Co.
2. Grinnell Corp.

C. Noiseless check valves:

1. Williams Gauge Co. (Clow).
3. Miller Valve Co.

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D. Tamper Switches.

1. Notifier.
2. Gamewell Co.

E. Sprinkler Heads:

1. Star Sprinkler
2. Reliable.
3. Grinnell
4. Viking.

2.2 PIPING

A. Pipe shall be new, free from scale or rust, and of material and weight specified in NFPA 13 for the various services. Each length of pipe shall be properly marked at the mill for proper identification with name of symbol of manufacturer.

B. All galvanized pipe shall be hot-dipped.

C. Nipples shall be extra heavy shoulder type of same material as pipe; close nipples are not acceptable.

2.3 VALVES

A. Valves:

1. Valves shall have gland followers in stuffing box and shall be repackable while open and under pressure. All valves shall be stamped with manufacturer’s name and working. Provide valves rated not less than 175 psi working pressure at 200°F located downstream of sprinkler floor control assembly. All other valves shall be rated at 175 psi working pressure at 200°F unless otherwise indicated.

2. Provide for the Fire Protection System valves required by the drawings, specifications, Fire Department and authorities having jurisdiction.

3. Submit for review a list of valve model numbers and installed locations. All valves must be U.L. listed, or F.M. approved and have Insurance Underwriter approval and be of one manufacturer.

4. All control valves shall be provided with tamper switches. Prepare valve stem as required to accept tamper switch.

5. Control valves shall be iron body bronze mounted O.S. & Y. solid wedge gate valves with rising stem, painted iron wedge handles rated for 175 psi water working pressure as required. pressure of the valve.

B. Check valves shall be UL-FM approved iron body bronze mounted with renewable composition disk and bronze seat ring and bolted cover rated for 175 psi water working pressure as required. All valves shall be stamped with manufacturer’s name and working pressure.

C. Globe and angle valves shall be UL-FM approved all bronze construction, taper seat and rubber disk in bronze disk holder, heavy bronze stem and aluminum hand wheel.
D. Gate Valves:

1. 2 inches and smaller: bronze, OS&Y, rising spindle, similar to Jenkins 275-U.
2. 2-1/2 inches and larger: IBBM, OS&Y, rising spindle, flanged.

E. Butterfly Valves:

1. Flange type: iron body and companion flanges for valves 4 inches and up. Bronze body for 2-1/2 inches and smaller. Similar to Grinnell 911 U.L.
2. Grooved-end type: compatible with grooved end pipe and fittings, similar to flange type specified above.

F. Check Valves:

1. 2 inches and smaller: bronze, 300 psi WOG, renewable composition disk, screw-in cap, swing check, threaded body; similar to Jenkins Figure 352, U.L. and FM approved.
2. 2-1/2 inches and larger: IBBM, U.L. and FM approved, regrind-renew bronze disk and seat ring, bolted cover, swing check, flanged body; similar to Jenkins Figure 352.

2.4 UNIONS, COUPLINGS AND FLANGES

A. Piping connections under 2 inches shall be screwed or be made up with unions, and piping 2 inches and larger shall be flanged unless otherwise noted.

B. Flanges shall be of the same weight and pressure rating of adjacent pipe, valves and fittings. Flanges shall be ANSI approved, Class 125, 150, 250, or 300 constructed of cast iron, ductile iron or steel as required, complete with gasket recommended for pressure and temperature of service. Each flange recommended for pressure with manufacturer's name or trademark. Nuts, bolts and washers shall be ANSI approved for material and strength required for temperature, and pressure of service and system operation.

2.5 DISSIMILAR METALS

A. Provide insulating flanges, couplings or unions where brass or copper pipe connections to ferrous pipe material.

B. Flanged connections shall be made with gaskets, sleeves and washers of dielectric material for complete insulation between flanges, bolts, nuts and washers.

2.6 GROOVED COUPLINGS

A. Malleable and/or ductile iron couplings shall conform to ASTM A-47 recommended by the manufacturer for the service. Use vandal proof nuts and bolts on vertical piping in stairs.

B. Victaulic model numbers are used as a guide. Equal fittings by Guston Bacon & Grinnell will also be approved.

C. Provide style 75 lightweight coupling for fire protection system not exceeding 400 psi (static street pressure of water main). Style 77 couplings shall be installed when pressure exceeds 400 psi and when required by local authorities.

D. Victaulic_s "Fit", "Hooker" 920 and similar type fittings will not be approved.
2.8 MATERIALS

A. Tamper Switch OS&Y valves.
   1. UL approved.
   2. Low voltage closed circuit, mounted in accordance with UL requirements.
   3. Housing cast aluminum and parts of nonferrous metal, finished in red enamel.
   4. Tamper-proof cover, removed causes which to operate.
   5. For butterfly valves: Appropriate mounting bracket attached to butterfly valve gear housing.
   6. Similar to Notifier.
   7. Required contacts and relay to actuate; see Division 16, ELECTRICAL.

B. Pressure Gauges:
   1. 3-1/2-Inch diameter single spring bronze Bourdon tube type with brass case and CP brass ring with heavy glass.
   2. Provide at floor control assembly and other required locations.

C. Sprinkler heads:
   1. Cast brass, closed, fusible link, spray type with 1/2 in. Discharge orifice.
   2. Quick response type/prison type in Sleeping Rooms
   3. Light hazard to be quick response type, per 1996 NFPA 13.
   4. High temperature rating: where subject to abnormal heating conditions, such as near heaters, per NFPA.
   5. On exposed piping: upright heads wherever possible.
   6. Pendent: satin CP
   7. Sidewall: in all critical areas to eliminate overhead piping with pendant heads.
   8. Provide heavy wire guards for heads placed where liable to be accidentally hit or where indicated.
   9. The following types of sprinklers shall be used:
      a. General Areas (areas not accessible to inmates / inmate areas with ceilings over 12'-0"):
         (1) In finished areas with ceilings; flush pendent head, 160F rating, chrome plated body and ceiling flange.
         (2) In finished areas without ceilings or above finished ceiling: upright, 160F rating, rough brass.
         (3) In storage, janitor, equipment room, etc. with or without ceiling: flush pendent or upright, 160F rating, rough brass.
      b. In areas accessible to inmates (includes corridor):
         (1) In finished areas with ceiling: Institutional type, Star Sprinkler Model S-100, or approved equal.
         (2) In Sleeping Rooms: sidewall institutional type, Star Sprinkler Model S-102, or approved equal.

D. Sprinkler cabinet:
   1. Enameled steel with:
      a. 12 extra sprinkler heads including each temperature rating and type used.
      b. Sprinkler head wrench.

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2.9 PIPE HANGERS, INSERTS AND SUPPORTS

A. Provide sufficient hangers, supports, beam clamps with retainer, supplemental steel, inserts, mounting devices, etc., to support piping in perfect alignment without sagging or interference, permit complete drainage and free expansion and contraction.

B. All hangers, inserts, supports and devices shall be NFPA, and FM approved, and UL listed.

C. All hangers and supports shall be capable of screw adjustment after piping is erected and provided with a locking nut to prevent loss of adjustment.

D. Provide required anchors, sway bracing, blocking and steel to connect to structure to prevent pipe movement due to expansion, contraction thrust, or seismic activity, in accordance with NFPA 3 requirements for earthquake areas.

E. Welding of hanger rods directly to building steel shall be permitted subject to prior approval by structural engineer.

F. All pipe hangers, inserts, supports, supplemental steel, rods, etc., shall be galvanized or zinc dipped.

G. Pipe hanger spacing, rod diameter, etc., shall be in accordance with the requirements of NFPA 13 1996 Edition and local code.

H. Provide in poured reinforced concrete deck, wedge type concrete inserts nailed to wood forms and 1/2 inch reinforcing rod through opening at top of insert. Use light weight concrete insert in light weight concrete decks.

I. For metal deck with concrete fill provide a steel washer plate placed over the metal deck corrugations or reinforcing rod spanning the corrugation. Secure threaded hanger rod to plate with double nut or a threaded eye rod through a reinforcing rod terminating below underside of metal deck at hanger. Details of the installation shall be approved by the Structural Engineer.

J. Tabs in metal deck construction shall not be used to support piping.

K. Perforated band iron, strip iron or wire are not acceptable materials to be used and will not be accepted.

L. Piping shall not be supported from other piping, duct work or conduit.

M. Where required, provide supplemental channels and steel to support work of this section. Cut ends of steel shall be ground smooth free from burrs and sprayed with a galvanized coating.

N. Where several pipes rest on a common trapeze increase hanger rod diameter and decrease spacing in accordance with maximum and minimum pipe sizes respectively.

O. Expansion anchors, self drilling expansion shield, power driven studs and similar devices shall not be installed unless specifically approved in writing from the Architect.
P. Vertical piping shall be supported at the lowest level, at each alternate level above and below offsets and top of the riser by use of riser clamps.

Q. Provide pipe restraints to prevent any movement or upward thrust in the pipe risers.

R. Provide sway bracing in addition to required pipe hangers to maintain pipe alignments.

S. Horizontal piping 3 inches and smaller shall be supported on adjustable swivel pipe rings; piping 4 to 8 inch size shall be adjustable ring hanger with double nut rod connections.

T. Pipe and equipment support system shall be installed so as not to weaken the building structural system.

U. Horizontal piping with grooved mechanical couplings shall not be left unsupported between any two couplings nor shall any pipe be left unsupported wherever a change of line flow direction takes place.

V. Riser clamps supporting or anchoring vertical piping shall have equal arm resting on the slab. Provide supplemental steel when piping occurs in open shafts.

PART 3 EXECUTION

3.1 INSTALLATION OF SPRINKLER SYSTEM

A. GENERAL

1. The work included in this section comprises of the furnishing and installation of a complete automatic wet type sprinkler system throughout the building.

2. Comply with the requirements of the Division 15 sections and all applicable NFPA publications of latest edition for installation of fire sprinkler products.

3. Install fire sprinkler piping products in accordance with the governing codes and regulations and with the manufacturer's written instructions, and in accordance with recognized industry practices to insure that entire fire sprinkler system complies with the requirements and serves its intended purpose.

4. Sprinkler heads shall be located to provide the required density with the water quantity and pressure available. When used on finished ceilings, sprinkler heads shall be centered on the ceiling tiles.

5. Alarm devices requiring supervision are:
   a. Valve position indicator.

3.2 PIPE INSTALLATION

A. General:

1. The word "piping" shall mean all pipes, fittings, nipples, valves and all accessories connected thereto.

2. Run piping generally parallel to the axis of the building, arranged to conform to the building requirements and to suit the necessities of clearance of ducts, flues, conduits and work of other trades and close to ceiling or other construction as practical, free of unnecessary traps or bends.

3. Provide sufficient elbows, swings and offsets to permit free expansion and contraction.

4. Use reducers or increasers. Bushings not permitted.

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5. Ream or file each pipe cut to remove burrs. Inspect each length of pipe and each fittings for workmanship and clear passageway.

6. Make modifications in respect to location of sprinkler heads, as may be required by field conditions or as may be found necessary by the Architect at the time of installation. Valves, fittings, hangers, means of draining systems, alarm and connections as required by the Building and/or the Fire Department or by code. Any changes that may be necessary because of physical conditions or compliance with the standards and requirements of any agency having jurisdiction shall be made without additional cost to the Owner.

7. The sprinkler systems shall be installed so that no part thereof will interfere with doors, windows, heating, plumbing or electrical equipment. Coordinate work with the other sections to avoid any interference with potential effectiveness of the Automatic Sprinkler Systems. When ductwork is relocated for coordination and now interferes with the sprinkler design, and piping without charge to the County, the Architectural, Mechanical, Plumbing and Electrical plans shall be examined in detail and conditions relative to the installation of piping, particularly when concealed behind furring or above hung ceiling.

8. Piping shall be installed, whether indicated or not, to rise and/or drop to clear conduits, lighting fixtures, pipes, ductwork and structural members to maintain the desired clear heights. No exposed horizontal piping shall be installed within the secure areas which can be accessible from below. Consult with the other trades to coordinate the erection of the equipment and piping. Piping shall run straight and as direct as possible, in general, forming right angles with or parallel to walls or other piping. Riser shall be erected plumb and true.

9. Hang piping as close as possible to structure in exposed areas and as indicated on the drawings. Obtain from Architectural drawings ceiling heights and minimum headroom clearances, install work above this height.

10. Drawings are generally diagrammatic, and due to the small scale of drawings, all required offsets, piping, fittings, valves, drains, etc., may not be shown but shall be provided in accordance with NFPA and the Local Codes.

11. Before ordering any material or doing any work, verify field conditions. Extra charges or compensation will not be allowed due to the difference between actual measurements and the dimensions shown on the Drawings. Any such differences which may be found shall be submitted for adjustment, before proceeding with the work.

12. The complete sprinkler system shall be so installed as to give proper and continuous service under all conditions, including construction phase, in accordance with the specifications and with the requirements of the Local Code, and the Fire Department.

13. The riser assemblies and trimmings shall be installed inside the building at the locations shown on the Drawings. Approved devices such as water flow alarms shall be installed such that a flow of water equal to or greater than that from a single sprinkler-head will cause the transmission of a fire signal.

14. Each riser and fire area assembly and its appurtenances shall be so arranged and equipped in an approved manner that the transmission of accidental water flow alarms (due to surges or related conditions) will positively be prevented.

15. The installation shall be accomplished by an experienced specialist in Automatic Sprinkler Systems.

16. Ductwork, greater than four (4) feet in width in areas without hung ceilings, and required to be sprinkled, shall be provided with sprinklers above and below ductwork.

17. Provide and set sleeves in walls, concrete beams and floors as required; use UL sealant rated for Code at fire separations.

18. Direct connections from and drain to any component of the sanitary system shall be prohibited.
19. Pipe openings shall be capped or plugged during construction and all piping shall be flushed out before closing system.
20. Pipe compound or Teflon paste and tape shall be applied to male threads only.
21. Sprinkler heads installed in fittings before piping is erected shall be prohibited.
22. A drain connection shall be provided near the base of each riser, including a control valve.
23. Coordinate with other trades for piping, sleeves and openings.
24. Provide flushing connections for flushing scale and foreign material from sprinkler system.
25. Upon completion of work, prepare the Certificate of Materials and Tests, and secure the final inspection and approval by all agencies having jurisdiction.
26. Control, drain, and test valves, siamese connections, and alarm valves shall be provided with identification signs approved by the Building Code, Fire Department and as recommended by the NFPA.
27. Sprinkler piping shall be installed so that the system may be drained. Wet pipe systems, sprinkler pipes may be installed level. Trapped piping should be drained by auxiliary drains.
28. Upon completion of the work, sprinkler heads shall be free from marks and left in first-class condition. Damaged sprinkler heads shall be replaced at no additional cost to the County.
29. Minimum cover for underground piping shall be at least 3 feet below final grade.
30. Contractor shall accurately align sprinkler heads in hung ceiling areas symmetrically with diffusers, grilles, lighting fixtures and ceiling tiles.

B. Pipe Joint Fabrication:

1. Screwed joints shall be made up tight without the use of wicking. Teflon tape and/or Teflon compound suitable for the type of service shall be applied to male threads.
2. Grooved pipe fittings shall be clean and free from indentations, projections and tool marks in the area from the pipe and to groove for proper gasket sealing. Provide a thin uniform coat of lubricant on the suitable gasket intended for specified service as recommended by the manufacturer. Place the gasket over one pipe end, align pipe ends and bring together positioning the gasket between the groove on each pipe end. Assemble the housing over the gasket with housing key section engaging both grooves. All grooved pipe fittings and couplings shall be by the same manufacturer.
3. Welding of piping shall be performed by welders qualified in accordance with AWS D10.9 level AR3 requirements. Qualification shall be performed by an independent inspection agency and proof of such qualifications shall be submitted for approval.
4. Joints between copper or brass and steel pipe shall be made by using a dielectric coupling.

3.3 COVERING OF WORK

A. No pipe, fittings or other work of any kind shall be covered up or hidden from view before it has been examined or reviewed by the Architect and/or other authority having jurisdiction. Any improper or imperfect work or materials which may be discovered shall be removed and corrected immediately after being condemned and other work and materials shall be provided which shall be satisfactory to the Architect.

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3.4 FILING AND APPROVALS

A. Prepare and submit for review reproducible drawings covering the entire Fire Protection System and obtain required approvals from local fire department and Board of Corrections State Fire Marshall prior to proceeding with work.

3.5 FLUSHING AND TESTING

A. All sections of the piping system and building service shall be thoroughly flushed at flow rated and for a period of time as described in NFPA No. 13, 1996 Edition.

B. All sections of the piping system, including the building services, shall be hydrostatically tested at not less than 200 psi for two hours at the building service or siamese. Test pressure shall be maintained by a small capacity pump to minimize water damage in the event of a break.

C. Test shall conform to the requirements of NFPA No. 13 and 14 or local fire department.

D. With the entire system normal operating pressure, each control valve shall be opened and closed to demonstrate proper operations. Coordinate with fire alarm test.

E. All tests shall be performed in the presence of the County's representative, and all authorities having jurisdiction. Record of all tests and certification shall be made available for the County's inspection as required.

F. Repair defects disclosed by tests, and replace defective materials as required. Provide labor and materials required for the test, and assume all costs, including those for the repair of damage caused by other work, including the work of other trades. Provide written report and certification

END OF SECTION
PART 1  GENERAL

1.1  REFERENCES

A. The General Conditions and Division 1 Requirements shall be included in and made a part of this Section, with special attention to:

1. Section 01400 Quality Control.
2. Section 01600 Material and Equipment.
3. Section 01660 Substitutions.
4. Section 01700 Close Out.

B. Related Work in following Sections:

1. Section 15010: MECHANICAL GENERAL CONDITIONS
2. Section 15140: SUPPORTS AND ANCHORS
3. Section 15280: MECHANICAL INSULATION

C. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2  SECTION INCLUDES

A. Provide all plumbing work as indicated on the Drawings and specified herein. Determine all items and quantities required. At completion of work, all plumbing systems shall be complete, continuous, operational, and functioning in the proper manner. Work includes, but is not necessarily limited to, the following:

B. Sanitary soil, waste, and vent piping.
C. Domestic hot and cold water piping.
D. Gas piping.
E. Hot water heaters, and mixing valves.
F. Pipe insulation.
G. Drains and cleanouts.
H. Pipe identification and valve tags.
I. Pipe hanging and support devices.
J. Standard & ADA plumbing fixtures, and trim.
K. Penal fixtures, and trim.
PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. Waste, and Vent Piping and Fittings:
   1. Above and below ground: Hubless cast iron piping and fittings, conforming to Cast Iron Soil Pipe Institute Standard #301.
   2. Above ground waste and vent:
      b. Hubless cast iron piping and fittings.

B. Water Piping and Fittings:
   1. Copper, Type “L” tubing with ANSI B16.22 wrought copper fittings.

C. Gas Piping & Fittings:
   1. Above ground: Schedule 40 black steel ANSI/ASME B36.10, with threaded fittings.
      a. Galvanized pipe and fittings above the roof.

2.2 VALVES AND COCKS

A. Ball Valves for 2” size and smaller.

B. Gate Valves for 2-1/2” size and larger.

2.3 PRESSURE GAUGES AND THERMOMETERS

A. Weksler, Ashcroft, or approved equal.
   1. Pressure Gauges: AA14P, 1279A, with range such that normal working pressure is at midpoint of range, with 4-1/2” diameter dial, stainless steel movement, phosphor bronze bourdon tube, phenol case, bottom connection and A03B, lOOB siphon and A-II, 1094 lever handle cock at each gauge.
      a. Pressure gauge on incoming gas line shall read 0” to 10” water gauge.
   2. Thermometers: 5S or 5A, 50EI60E, or approved equal, 5 inch diameter dial thermometer, adjustable angle 18-8 stainless steel case with 4” stem, all stainless steel construction, union connections and range of 30° to 240° F.. Install for easy reading from floor with clear sight line. Fill well with appropriate heat transfer oil.

2.4 SHOCK ABSORBERS (WATER HAMMER ARRESTERS)

A. Josam 75000, Zum Z-1700, or approved equal, all stainless steel, with threaded connections, and shall meet P.D.I. standard WH201, and ASSE standard 1010. Shock absorbers shall be sized in accordance with manufacturers directions. Shock absorbers shall be installed in accessible locations behind wall access panels.
2.5 HOSE BIBBS

A. Exterior: Zurn Z-1300, or approved equal, exterior wall hydrant, non-freeze type, integral vacuum breaker, recessed wall box with hinged door and cylinder lock, all bronze. Install accessible ball valve in each hose bibb supply which is not otherwise controlled by other local shut-off valve.

B. Showers: Zurn Z-1335, or approved equal, interior wall hydrant, integral vacuum breaker, recessed wall box with hinged door and cylinder lock, all bronze.

2.6 FLOOR DRAINS AND CLEANOUTS: Zurn, or approved equal, and as otherwise indicated.

A. Floor Drain Drains (FD-1): Zurn ZN-415-P, 2" pipe size, with 5" diameter adjustable strainer, 1/2" trap primer connection, all nickel-bronze secured grate, clamping device, double drainage flange, and tamper proof screws.

1. Trap primer Zurn Z-1022, with access door where not located within Sleeping Room chases

B. Shower Room Drains (FD-2): Zurn ZN-415, 2" pipe size, with 5" diameter adjustable strainer, all nickel-bronze secured grate, clamping device, double drainage flange and tamper proof screws.

C. Cleanouts: Z-1440A, cast iron body, lead seal and raised head bronze threaded plug.

D. Floor Cleanouts: Z-1400, floor level cleanout with round top, cast iron body, neoprene seal, bronze threaded plug and scoriated nickel-bronze cover with tamper proof screws.

E. Wall Cleanouts: Z-1445-4, smooth chromium-plated bronze access cover and frame.

2.7 PLUMBING FIXTURES:

A. General

1. American Standard, white, Acorn Penal-Ware, or approved equal.
2. Point up joints between fixtures and wall or floor with white mastic. Mastic shall have sufficient resiliency to prevent cracking or pulling away from wall due to fixture movement.
   a. In detention areas use pick resistant security sealant.
3. Provide tubing supplies, traps, pipe flanges and wastes to wall of not less than #17 B&S gauge polished chromium-plated brass. Unless noted otherwise, supplies and traps shall be centered, plumb, and perpendicular to wall for lavatories.
4. Chinaware shall be twice fired white vitreous china conforming to ANSI A112.19.2M.
5. Stainless Steel fixtures shall conform to ANSI A112.19.3.
6. All fixtures for handicapped personnel shall be mounted in accordance with ANSI A117.1 handicapped access regulations.

B. Water Closet (WC-1): American Standard #9468.018 "Cadet 17" H" ADA elongated flush valve toilet, with Olsonite #95 open front seat less cover and Sloan Royal #115-3 flush valve.

C. Water Closet (WC-2, Bid Alternate): American Standard "Prison Corbo RF 3.5 inch", rear inlet, wall outlet, round front bowl, angle back and base, vitreous china, blowout flush type, and Sloan Royal #152YV flush valve with vacuum breaker and screwdriver stop.
D. Combination Fixture (C-1): Acorn Penal-Ware 1418-AL/AR-2-BPH-4-FV-PH-SW 18" wide combination Lavatory/Toilet, fabricated from 14 gauge 304 stainless steel.

1. Unit floor mounted, wall outlet waste, plated steel concealed anchor rods and fasteners.
2. Integral elongated seat.
3. Blowout flushing action, 1.6 gpf, Sloan Royal 603-1.5 flush valve.
4. Hot and cold pneumatic valves with hemispherical penal bubbler.
5. Install with security wall sleeve.

E. Combination Fixture (C-2): ADA Compliant, Acorn Penal-Ware 1432-AL/AR-2-BP-4-PH-SW combination Lavatory/Toilet, fabricated from 14 gauge 304 stainless steel.

1. Unit floor mounted, wall outlet waste, plated steel concealed anchor rods and fasteners.
2. Integral elongated seat.
3. Blowout flushing action, 1.6 gpf, Sloan Royal 603-1.5 flush valve.
4. Hot and cold pneumatic valves with penal filler/bubbler.
5. Install with security wall sleeve.

F. Lavatory (L-1): American Standard #0954.000 "Murro" with #7502.170 centerset lever faucet, goose neck, grid drain, and shroud guard #0059.020.

1. Provide adjustable P-trap with cleanout, wall escutcheon, and loose key stops.
2. Mount rim height at ADA 34" with Zurn 2-1224 carrier.


1. Provide steel anchoring nipples for fixture support.
2. Provide 1-1/4 inch waste connection with P-trap and cleanout adapter.

H. Shower (SH-1): Acorn Penal-Ware 1741-3-RD for front mounting with accessible chase; panel fabricated of 14 gauge 304 stainless steel.

1. Recessed soap dish.
2. 30 degree security shower head.
3. Single temperature push button metering valve with strainer/check stop; 2.0 g.p.m. flow.

I. Shower (SH-2): Acorn Penal-Ware 1741-ADA-3-RD-FH handicap shower for mounting with accessible chase; panel fabricated of 14 gauge 304 stainless steel secured to a galvanized steel recessed wall box.

1. Recessed soap dish
2. 30 degree security shower head.
3. Single temperature push button metering valve with strainer/checkstop; 2.0 gpm flow.
J. Drinking Fountain (DF-1): Acorn Penal-Ware 2012-ADA-1-BC-3 front mounted 16 gauge stainless steel.
   1. Heavy duty chrome plated vandal resistant bubbler head.
   2. Security type pushbutton with 0.5 g.p.m. restrictor.
   3. 1-1/2" OD slip joint P-trap.
   4. Mount all drinking fountains at ADA height.

K. Service Sink (SS-1): American Standard Florwell #7741.000 enameled cast iron, corner model, 28"x28"x13", #7745.811 vinyl rim guard.
   1. Faucet #8344.111 with top brace, stops and vacuum breaker.
   2. Drain #7721.038 with strainer and socket for 3" outlet.

L. Stainless Sink (S-1): Elkay Celebrity CR-1721 single Bowl, 20 gauge Type 302 stainless steel, self rim, 17x21, 7" deep, one hole punch, with American Standard #7191.142, Two-Handle Sink Faucet, swivel spout, cross handles.

2.8 HEAT TAPE

A. Furnish and install a UL-listed system of electric self-regulating heating cable and components for maintaining the water temperature in the hot water lines, Raychem HWAT-Plus System.

B. Self regulating cable shall consist of (2) 16-AWG nickel coated copper bus wires embedded in a radiation-crosslinked conductive polymer core, with dielectric jacket and aluminum wrap enclosed in a tinned copper braid, and a polyolefin outer jacket, color coded.

C. System shall maintain nominal temperatures as follows:

   1. Hot water to building, other than service sinks, shall be 105F with straight runs of cable, HWAT-G2 (208V).

      Note: Water lines to Day Room showers shall not be taped beyond the 95F mixing valves!

D. The installation shall be installed in accordance with the manufacturer's instructions; the Plumbing Contractor shall subcontract, and be responsible for, the electrical work. Junction boxes must all be within the cell chases, or accessible attic spaces.

E. The system shall be tested after the pipe insulation is applied; measure the circuit continuity and insulation resistance between the braid and bus wires with a 2500-Vdc megohm meter (megger). The heater circuit shall be continuous and megger readings shall be at least 20 megohms regardless of heater length.

2.9 WATER HEATERS

A Furnish and install two, high efficiency, gas fired, storage type units, Vitraglas vitreous enamel tank lining, U.L. listed, AGA certified, with temperature and pressure relief valve. Tank complete with three extruded magnesium anode rods, and 2" of non-CFC foam tank insulation.

   1. Hot water heater Bradford White Model D-80T-425-3N(A) with a rated storage
capacity of 80 gallon capacity with 425,000 Btu/hr input. First hour gallons available: 936.

2. Tanks shall have sway brace connections and Installed with two straps for seismic restraint (UPC §510.5).

3. Furnish and install a Bell & Gossett PTA-12 ASME expansion tank.

2.10 MIXING VALVES

A. Main Control: Symmons Tempcontrol Hi-Low, #5-500B-102-PRVM, 40 gpm, pre-piped water mixing control system with surface mounted cabinet, complete with piano hinged door and key cylinder lock, thermostatic valve, pressure reducing valve, pressure gauges, check-stops, ball valves, dial thermometer, and interconnecting piping; set mixed water temperature at 105°F.

B. Shower Control: Provide a mixing valve for the group of eight Day Room showers.

1. Symmons Tempcontrol, #5-400, 20 gpm, set for 90°F.

2. Install with shut off valves and dial thermometer.

PART 3 EXECUTION

3.1 SANITARY SOIL, WASTE, VENT, HOT, AND COLD WATER BRANCH PIPING

A. To fixtures shall be as follows, unless otherwise shown on the Drawings and specified herein:

<table>
<thead>
<tr>
<th>FIXTURE</th>
<th>Waste</th>
<th>Vent</th>
<th>Cold Water</th>
<th>Hot Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Closets</td>
<td>4.</td>
<td>2.</td>
<td>1.*</td>
<td></td>
</tr>
<tr>
<td>Lavatories</td>
<td>2.</td>
<td>1-1/2.</td>
<td>1/2.</td>
<td>1/2.</td>
</tr>
<tr>
<td>Service Sinks</td>
<td>3.</td>
<td>2.</td>
<td>3/4.</td>
<td>1/2.</td>
</tr>
<tr>
<td>Sinks</td>
<td>2.</td>
<td>1-1/2.</td>
<td>1/2.</td>
<td>1/2.</td>
</tr>
<tr>
<td>DFs</td>
<td>1.</td>
<td>1-1/2.</td>
<td>1/2.</td>
<td></td>
</tr>
</tbody>
</table>

* Do not run 1" size longer than 3'-0", then increase to 1-1/4".

3.2 PIPING SYSTEMS

A. Sanitary Soil, Waste, and Vent Piping:

1. No piping shall be exposed in inmate accessible areas.

2. Where pipes pass through roofs, they shall be flashed and counterflashed.

3. All floor drains and fixtures shall be trapped and vented.

4. Relief valve discharge piping shall be type "M" copper tubing and wrought copper sweat type fittings. Bracket piping to wall 6'-0" O.C. Terminate discharge with street ell looking down.

5. Set drains 1/2" from finish floor elevation, so to provide positive drainage.
B. Hot and Cold Water Piping:

1. Install shock absorbers in piping upstream of flush and solenoid valves. Each connection to hose bibb, faucet, equipment, or flush valve which is not otherwise protected by a shock absorber, shall have a vertical air chamber 18" long place in a vertical position which shall be one (1) pipe size larger than the branch connection.

2. No piping shall be exposed in inmate accessible areas.

3. All penal lavatories shall have hot water with maximum 105°F.

4. Connect hot and cold water to mixing valves, and extend mixed hot water to penal lavatories and showers.

3.5 PIPE JOINTS & CONNECTIONS

A. Cutting: Cut pipe and tubing square, remove rough edges and burrs

B. Threaded Pipe: Make joints with thread lubricant or joint tape; use no caulking of any type.

C. Copper Tubing: Make all joints with silver brazing alloy, 1100°F melting point or greater, ASTM B-260, except that water piping 1" and smaller and Type DWV plumbing piping may be made with 95-5 tin-antimony, ASTM B-32, Grade 5A solder.

D. Cast Iron Soil Pipe: Make up No-Hub joints with torque wrench. Ty-Seal, Dual-Tite, or approved equal pipe and fittings may be used.

3.6 PIPE SUPPORTS

A. As specified in Sections 15140

3.7 INSULATION

A. As specified in Section 15250.

1. Insulate all cold and hot water piping.

3.8 CLEANING

A. Clean plumbing fixtures with soap and water. Remove marks and labels. Clean and polish chrome. Remove all foreign materials.

B. Clean all drains of dirt and debris.

C. All equipment and materials furnished under this Section shall be completely dust and paint free, clean and rust free and freshly painted or polished.

D. Thoroughly clean and flush interior and exterior of all piping systems (wet systems, and drainage systems) of any nature of all pipe contaminates such as cuttings, filings, lubrication, rust, scale, grease, solder, flux, welding residue, debris, etc., and thoroughly flush out with clear clean water until clean.

END OF SECTION
PART 1  GENERAL

1.1  REFERENCES

A. The General Conditions and Division 1 Requirements shall be included in and made a part of this Section, with special attention to:

1. Section 01400 Quality Control.
2. Section 01600 Material and Equipment.
3. Section 01660 Substitutions.
4. Section 01700 Close Out.

B. Related Work in following Sections:

1. Section 15010: MECHANICAL GENERAL CONDITIONS
2. Section 15140: SUPPORTS AND ANCHORS.
3. Section 15950: CONTROLS

C. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2  SECTION INCLUDES

A. All heating, ventilating and air conditioning equipment, including roof top gas fired air cooled air conditioners and exhaust fans.

1.3  QUALITY ASSURANCE

A. Provide all work in conformance with the following:

2. California Energy Commission Energy Efficiency Standards ('Title 24').
3. Air Movement & Control Association (AMCA 210).
6. Underwriters Laboratories (UL).
7. American Society of Heating Refrigeration & Air Conditioning Engineers (ASHRAE).

1.4  PRODUCT HANDLING

A. Procedure: In accord with PRODUCT HANDLING AND PROTECTION requirements of Division 1.

B. Follow any special storage and handling requirements of the manufacturer.

PART 2  PRODUCTS

2.1  ROOFTOP AIR CONDITIONING UNIT

A. General: Furnish and install new air-cooled, rooftop-mounted, high efficiency, cooling units with gas fired heater section, utilizing fully hermetic reciprocating compressors, Carrier Model 48HJ, with capacities as shown on the Drawing.

1. Units AC-1 and AC-2 shall have integrated economizers.
2. Unit rated in accordance with ARI Standards 210/240 or 360 and 270.
3. Unit designed to conform to ASHRAE 15, latest revision, and in accordance with UL1995.
4. Unit shall be UL listed and CSA or ULC certified as a total package for safety requirements.
5. Unit casing shall be capable of withstanding Federal test method Standard No. 141 (Method 6061) 500-hour salt spray test.

B. Equipment: Factory assembled, single piece cooling unit with wiring, piping, controls, refrigerant charge (R22) and special features as hereinafter described:

1. Cabinet: Constructed of galvanized steel, bonderized and coated with a baked enamel finish on all externally exposed surfaces. Evaporator fan cabinet insulated with -inch fiberglass.
2. Fans: Indoor blower (evaporator fan) shall be adjustable belt driven, double inlet, forward curved centrifugal type; bearings shall be sealed, permanently lubricated, ball-bearing type. Condenser fan shall be direct driven propeller type with aluminum blades.
3. Compressors : Fully hermetic type, on independent circuits.
4. Refrigerant Coils: Copper with aluminum plate fins mechanically bonded.
5. Heating Section: Induced draft combustion type with direct spark ignition system, redundant main gas valve, and 2-stage heat. The heat exchanger shall be of the tubular section type constructed of a minimum of 20 gauge steel coated with a nominal 1.2 mil aluminum-silicone alloy for corrosion resistance, and shall have a 10-year warranty.
6. Filter Section: Standard filter section with 2-inch throwaway filters, Farr 30/30 (25-30% efficiency, 90-92% arrestance), with a face velocity not exceeding 500 fpm; filters shall be accessible through a hinged access door, requiring no panel or screw removal.
7. Motors: Compressor motors refrigerant cooled. Evaporator fan motor shall have permanently lubricated bearings. Condenser fan motor totally enclosed with permanently lubricated bearings.
8. Integrated Economizer (Units AC-1 & AC-2): Integrated incremental-modulating type capable of simultaneous economizer and compressor operation. Capable of introducing 100% outside air, with barometric relief.
9. Convenience Outlet: Factory installed and internally mounted and accessible from outside the unit.
10. Gas Piping: Piping shall be Schedule 40 black steel with threaded fittings; provide dirt leg and flexible connector; piping above roof shall be galvanized.

2.4 EXHAUST FANS

A. Roof Fans

1. Centrifugal fans shall be Penn Domex, direct or V-belt drive, as shown on the Schedule, Penn Ventilator or approved equal. Fan housings shall be one piece, seamless, spun heavy gauge aluminum. Backwardly inclined, robotically welded wheels shall be spark resistant, non-overloading and statically and dynamically balanced to ISO 1940 standards, AMSI S2.19, level G6.3.
   a. Fans complete with UL safety disconnect switch, gravity backdraft dampers, aluminum screen with an 85% minimum free area, hinged sub-base.
   b. Furnish fans with Penn unibeam prefabricated curbs with cant strip and 1.3lb insulation; curb for Kitchen Exhaust shall be vented type.
   c. Provide manual or magnetic across-the-line starters with melting alloy relays.

LRS Architects, Inc
d. Provide security bars in all openings except where noted otherwise.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mount roof top exhaust fans on factory curbs in accordance with Equipment Schedule and manufacturer's recommendations.

B. Roof top air conditioners and roof top heating and ventilating units shall be mounted on factory furnished curbs.

1. This Contractor shall furnish and install security bars in all roof duct openings.

3.2 TESTING, ADJUSTMENT, AND START-UP

A. Start-up shall be by the manufacturer's service personnel.

B. Test and adjust completed installation to insure proper operation.

1. Check operation of all gas burner and refrigeration cycles.
2. Check operation of gas burner ignition safeties, and refrigeration short cycle protectors, crankcase heaters, and refrigerant low pressure switches.
3. Check operation and rotation of all fans
4. Check operation of all controls.

END OF SECTION
PART 1  GENERAL

1.1  REFERENCES

A. The General Conditions and Division 1 Requirements shall be included in and made a part of this Section, with special attention to:

1. Section 01400 Quality Control.
2. Section 01600 Material and Equipment.
3. Section 01660 Substitutions.
4. Section 01700 Close Out.

B. Related Work in following Sections:

1. Section 15010: MECHANICAL GENERAL CONDITIONS
2. Section 15140: SUPPORTS AND ANCHORS.

C. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2  SECTION INCLUDES

A. All duct systems related to heating ventilating and air conditioning as indicated on the Drawings and specified herein. Determine all items and quantities required. Provide complete, continuous, operational, and functioning systems, fully coordinated with work of other Sections.

B. Work includes, but is not necessarily limited to, the following:

1. Ductwork.
2. Duct Accessories.
3. Air Inlets and Outlets, including Security Grilles.
4. Fire Dampers.
5. Type B Gas Vents

1.3  SYSTEM DESCRIPTION

A. Duct pressure classification shall be as recommended in SMACNA publications for 2 inches water gauge, positive or negative.

1.4  QUALITY ASSURANCE

A. Perform all work in accordance with the following:


LRS Architects, Inc
1.5 SUBMITTALS
   A. Procedure: Submit in accord with SUBMITTALS requirements of Division 1.
   B. Provide appropriate brochures, data, etc., as required.

1.6 PRODUCT HANDLING
   A. Procedure: In accord with PRODUCT HANDLING AND PROTECTION requirements of Div. 1.
   B. Follow any special storage and handling requirements of the manufacturer.

PART 2 PRODUCTS

2.1 DUCTWORK
   A. Sheet Metal for Ducts: G90 galvanized steel sheets conforming to ASTM A-525 and A-527, lockforming grade, of gauges as specified hereinafter, except where another material is specifically indicated. See PART 3 - EXECUTION - DUCTWORK, for duct construction requirements.
   B. Type B Gas Vents: Hot water heater flues shall be UL Listed Type B Gas Vents, installed with storm collar, flashing and cap.

2.2 DUCT ACCESSORIES
   A. Turning Vanes: Shall be 90 degree, non-adjustable double thick turning vanes fabricated and installed in accordance with SMACNA "HVAC Duct Construction Standards", 1985, Figures 2-3 and 2-4. Vanes shall run full diagonal dimension of elbow with first vane tight in heel corner.
   B. Duct Sealant: United Duct Sealer, 3M #800, or approved equal, non-flammable, U.L. labeled.
   C. Tape Sealing System: Hardcast two part system. Tape DT-5400, minimum 4" wide. Adhesive FTA20 for indoor applications, RTA-50 for indoors or outdoors.
   D. Fire Dampers: Install fire dampers and smoke/fire dampers with access doors, where shown on the Drawings, and where required, in accordance with all governing regulations listing requirements, and manufacturers recommendations; Ruskin or approved equal.
      1. Dampers shall be California Fire Marshall Approved.

2.3 GRILLES & REGISTERS
   A. Security Grilles: Grilles in the Sleeping Rooms shall be Kees Model SG-9 of the sizes as shown on the Plans and Schedule. Grilles shall have a 3/16" thick steel face with 3/16" diameter holes on 1/4" staggered centers. Sleeve shall be 3/16" thick and shall be stitch welded to the face and along the entire length of all sleeve seams.
      1. Grilles in the Shower Rooms shall be Kees Model SG-9SS of the sizes as shown on the Plans. Grilles shall have a 10 gauge Type 304 stainless steel face with 3/16" diameter holes on 1/4" staggered centers.
PART 3 EXECUTION

3.1 DUCTWORK

A. Where not otherwise specified herein, shown, noted, or required by codes, work shall conform to "HVAC Duct Construction Standards, Metal and Flexible," First Edition, 1985, as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

B. Duct Placement and Fittings:

1. Form transitions with uniform taper not exceeding 15 degree included angle, unless shown otherwise on Drawings.
2. Offsets over 15 degrees shall have two radius turns or square turning vanes.
3. Where it is not possible to insulate ducts after installation, ducts shall be insulated before final installation. Tightness of work will not be accepted as a reason for omitting any insulation.
4. Install ducts true to line and grade.
5. Make changes of direction by curved sections with inside radius equal to duct width or square elbows with turning vanes as shown. Where square elbows are definitely shown, radius turns may not be used.
6. Closely fit and accurately place ducts and coordinate with work of other trades. Ducts must be so placed that piping, ceiling support grid, ceilings, and light fixtures may be installed without warping, springing or deforming ducts.

C. Low Pressure Rectangular Ductwork:

1. Longitudinal seams: Flat crimped Pittsburgh lock with internal RTV Sealant, 3M #800, or 4" Hardcast tape applied over seam.
2. Transverse joints: Pocket lock, or standing seam on all four sides. Tape all joints airtight.
3. Alternate Joints: Ductmate with specified gasket may be used for all joints.
4. Cross break or bead all sides.

D. Round Ductwork:

1. Single wall, spiral lockseam, galvanized steel, United McGill Uni-Seal. Final diffuser connections may be made with Young Aluminum Flex II, BUT NOT EXCEEDING 4 FEET.

E. Duct Support:

1. Attachments to Structure: See 15140 - Supports and Anchors.
2. Suspend horizontal rectangular ductwork from structural construction by 1-1/4" x 18 gauge galvanized strap hangers screwed 8" o.c. to ducts and suspended from construction. Use three screws minimum per strap. Bend strap under duct and screw into bottom of duct. Double fold strap at attachment to structure. Space Hangers not over 96" on center for ducts smaller than 18" in largest dimension.
3. Suspend horizontal round ductwork up to 10-inches in diameter with 12 ga. wire; use 1/4-inch rods and 1-inch x 22 ga straps for ducts up to 24-inches. Space hangers not over 12 ft on centers.

F. Registers & Grilles:

1. Except where indicated, angular offsets, box connections, and other irregular connections at diffusers and registers are prohibited. Where location of diffusers and registers is governed by work in other Sections, such as ceilings, set diffusers and registers to dimensions taken from Section performing the other work.

G. Duct Accessories:

1. Duct Access Doors: Install in ducts and in plenum walls where shown and where required for cleaning and for access to equipment and devices in ducts. Doors shall be airtight.
2. Fixed Turning Vanes: Install specified vanes in square elbows. Vanes shall run full diagonal dimension of elbow with first vane tight in heel corner. When turning vanes are installed in duct with internal insulation, install 20 gauge hat channels of same depth as insulation, and secure vane runners to channels.

H. Cleaning:

1. Clean all air ducts so that no dirt or dust is present in any system.
2. Examine air handling systems and clear any obstruction and debris. With dampers wide open and exposed, run fan systems and check for air leaks.
3. Patch, repair or replace ductwork as required. All ductwork shall be made absolutely air tight.

3.2 TESTING, ADJUSTING & BALANCING

A. Quality Assurance:

1. Testers' Qualifications: A specialist certified by the National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC) with at least 3 years of experience and who is not the installer of the system to be tested and is otherwise independent of the project.
2. Codes & Standards:
   a. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).
   b. NEBB or AABC: Comply with NEBB's "Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems" or comply with AABC MN-1 "National Standards" as applicable to mechanical air and hydronic distribution systems, and associated equipment and apparatus.

B. Submittals: Provide certified test reports, signed by the test and balance supervisor who performed the work. Submit copies to Architect. Submit the certified individual qualifications of all persons responsible for supervising and performing the actual work.

C. Test Instruments: Utilize instruments and equipment of type, precision, and capacity as recommended in the standards of NEBB and AABC.
D. Air System Data: All air systems shall be balanced to provide the air quantities shown on the Plans. After completion of the balancing, certified report to include the data listed hereafter:

1. Equipment (Roof Top Units & Fans)
   a. Installation Data
      1) Manufacturer, Model Number & Size
      2) Motor horsepower, voltage, phases, and full load amps
   b. Fan Test Data
      1) CFM
      2) Static Pressure at Unit discharge
      3) Static Pressure at Unit inlet

2. Duct Systems
   a. CFM at all outlets
   b. CFM, total supply
   c. Outside Air CFM

END OF SECTION
PART 1  GENERAL

1.1  REFERENCES
A. The General Conditions and Division 1 Requirements shall be included in and made a part of this Section, with special attention to:

1. Section 01400 Quality Control.
2. Section 01600 Material and Equipment.
3. Section 01660 Substitutions.
4. Section 01700 Close Out.

B. Related Work in following Sections:

1. Section 15010: MECHANICAL GENERAL CONDITIONS
2. Section 15140: SUPPORTS AND ANCHORS.
3. Section 15780: HVAC EQUIPMENT

C. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2  SECTION INCLUDES
A. This Section includes complete system of automatic temperature control applied to the heating, ventilating, air conditioning system, and auxiliary systems as required to maintain inside space conditions, including all interlock, life safety, and control wiring for heating, ventilating and air conditioning equipment.

1.3  SYSTEM DESCRIPTION
A. The control system shall be electric-electronic and shall consist of all thermostats, controllers, dampers and damper operators, switches, control panels, accessory control equipment, and a complete system of wiring to fulfill the intent of the sequence of controls and provide for a complete and operable system.

1.4  QUALITY ASSURANCE
A. After completion of the installation, Contractor shall completely adjust all control equipment and place the system in operation.

B. The internal automatic heating ventilating and air conditioning controls are furnished with the equipment specified in Section 15780 - HVAC Equipment.

PART 2  PRODUCTS

2.1  THERMOSTATS & CONTROLLERS
A. Sensors shall have adjustable sensitivity and be provided with concealed adjustment, set point indicator, and wall-mounting plate when required.

1. System shall be Yamas/Barber Colman CP-8161 controller and TS-81031 space sensor, or approved equal.

B. Covers for all sensors shall be blank type with locking device.
2.2 DUCT SMOKE DETECTORS

A. Detectors shall detect combustion gases, fire and smoke in heating and ventilating duct systems in compliance with Underwriters' Laboratories, Inc., Standard U.L. 167, and Uniform Mechanical Code. They shall contain an ionization type detector and air sampling chamber with sampling tubes extending through the width of the air duct. Alarm status indicating lights shall be visible on the front of the detector.

B. All duct smoke detectors shall be furnished by the Electrical Contractor.

PART 3 EXECUTION

3.1 INSTALLATION

A. All items necessary to satisfy the functional requirements shall be provided as part of this work. The system shall be complete in all respects, put into operation and calibrated under operating conditions. Final adjustment and calibration of controls shall be made by the manufacturer's authorized representative.

B. Installation Standards:

1. All control wiring shall be installed by this Contractor in accordance with all applicable sections of Division 16, and all local and national electrical codes.
   a. All low voltage wiring in masonry walls shall be installed in conduit.

2. All control wiring shall be installed in an organized fashion and shall be arranged to run in straight paths.

3. Control devices shall be set level and in accessible location so that scales are easily readable. All penetrations into ducts for controls and thermocouples shall be completely sealed.

3.2 SEQUENCE OF OPERATION

A. AC Units Serving the two Day Rooms (AC-1, AC-2)

1. Supply fan will run continuously. Programmable electronic controller shall control the cooling, gas heating in two stages, and economizer to meet the space heating and cooling setpoints as sensed at the remote room sensor. Heating and cooling setpoints will be set on the controller in the main temperature control panel located as directed.

2. The controller will also position the outside air control damper to a minimum position of 1,600cfm. An increasing cooling call will shut down the gas heating in two stages; a further increase in cooling demand shall proportionally further open the outside air damper, open the exhaust damper and close the return air damper to utilize outside air for cooling in addition to direct expansion cooling.

3. Sleeping Room chase exhaust fans run continuously.

4. Smoke detector in unit discharge shall shut down the respective supply fan on smoke detection.
B. AC Units Serving the Two Academic Areas (AC-3 & AC-4)

1. Occupied Operation
   a. Supply fan will run continuously. Programmable electronic controller shall control the cooling and gas heating in two stages to meet the space heating and cooling setpoints as sensed at the remote room sensor. Heating and cooling setpoints will be set on the controller in the main temperature control panel located as directed.
   b. The controller will also position the outside air control damper to an adjustable minimum position. An increasing cooling call will shut down the gas heating in two stages; a further increase in cooling demand shall cycle the direct expansion cooling.

2. Unoccupied Operation
   a. Supply fan shall cycle on setback heating temperature; programmable electronic controller shall control the gas heating in two stages, cooling shall be off, and outside air damper shall be closed. Unoccupied heating setpoints will be set on the controller in the main temperature control panel.

END OF SECTION
PART 1 GENERAL

1.1 REFERENCES

A The General Conditions and Division 1 Requirements shall be included in and made a part of this section, with special attention to:
1. Section 01400 Quality Control.
2. Section 01600 Material and Equipment
3. Section 01660 Product Substitution Requirements.
4. Section 01700 Closeout Procedures.

B Related Sections: The following sections contain requirements that relate to this section:
1. Division 1 Section 1010 "SPECIAL PROCEDURES HAZARDOUS MATERIALS.
2. Division 15 Section "ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT," for factory-installed motors, controllers, accessories, and connections.
3. Division 16 Section "BASIC ELECTRICAL MATERIALS AND METHODS," for materials and methods common to the remainder of Division 16, plus general related specifications including:
   a. Access to electrical installations.
   b. Excavation for electrical installations within the building boundaries and from building to utility connections.
4. Division 17 Section Electronic Systems

C Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SECTION INCLUDES

A This Section includes general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:
1. Submittals.
2. Coordination drawings.
3. Record documents.
5. Rough-ins.
6. Electrical installations.
7. Cutting and patching.
8. Electrical Identification

1.3 QUALITY ASSURANCE

A Worker's Qualifications: All electrical work shall be performed by licensed electricians or under the direct supervision of a licensed electrician.
B  Codes and Regulations:

1. All work shall meet requirements of governing codes and regulations, NFPA 70-1990 (NEC), NESC, and other national fire codes of NFPA. Advise the Architect of conflicting codes or conflicts between codes and drawings and specifications. When the requirements of specifications or drawings are more stringent than the codes, regulations, or standards, the specifications or drawings shall prevail.

2. The electrical installation shall meet the requirements of NECA Standard of Installation, except where otherwise specified.

3. All work and materials shall comply with the latest rules, codes and regulations, including but not limited to the following:
   a. Occupational Safety and Health Act (OSHA).
   b. California Electrical Code (CEC).
   d. California Fire Code (CFC).
   e. California Administrative Code, Title 24 and Title 15.
   f. Americans with Disabilities Act (ADA) as applicable to equipment mounting heights and alarm systems.
   g. NFPA Standards, as applicable, including Fire Alarm Systems.
   h. Applicable Federal, State and local laws and regulations.
   i. Code compliance is mandatory. Nothing in these Standards implies acceptance of work not conforming to these codes. Items that exceed minimum code requirements shall comply with the Standards.
   k. Rules and Regulations of Pacific Bell.

C  UL Listing: All electrical materials and equipment shall meet requirements of the applicable standards of UL if UL standards exist for such materials and equipment. The UL authorized listing mark is acceptable as evidence that the materials meet this requirement. In lieu of UL authorized listing mark, the Contractor may submit independent proof satisfactory to the Architect that the materials meet the published standards. Materials and equipment shall be

1. Section 01450 Quality Control.
2. Section 01600 Product Requirements
3. Section 01630 Product Substitution Requirements.
4. Section 01770 Closeout Procedures.

D  used only for their intended use.

E  Standard Products: Provide materials and equipment that are products of manufacturers regularly engaged in the manufacture of the products and are the latest standard design.

F  Finished surfaces of existing facilities that are marred, scratched, or damaged shall be refinished to match original condition. Building surfaces that have been altered for the proper installation of electrical equipment shall be restored by skilled personnel of the trades involved at no additional expense to the contract price.

1.4  INTENT OF CONSTRUCTION DRAWINGS

LRS Architects, Inc.
A Electrical drawings do not attempt to show complete details of building construction that affect installation. Diagrams are schematic only and do not necessarily show physical arrangement of equipment. Refer to drawings of other trades for additional details which affect work.

B Conduit and ground connections are shown diagrammatically only. Layout does not necessarily show total number of conduits or conductors for circuits required and should not be used for obtaining quantities for linear runs of conduits or wires. Locations of indicated runs are not intended to show actual routing of conduits. Provide additional conduits and wire wherever needed to complete installation of specific equipment furnished.

C Locations of outlets on drawings are approximate and may be distorted for clarity in representation.

D Install electrical outlets and other equipment clear of and in proper relation to radiators, ducts, grilles, pipes, and other equipment, and items such as cabinets and counters.

E Changes such as offsetting conduit runs, moving outlets, or other minor changes necessary to facilitate installation shall be made at no additional expense to the contract price.

1.5 SUBMITTALS

A General: Follow the procedures specified in Section 01330 "SUBMITTAL PROCEDURES."

1.6 COORDINATION DRAWINGS

A Prepare coordination drawings in accordance with Division 1 Section "PROJECT COORDINATION," to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Indicate the proposed locations of major raceway systems, equipment, and materials. Include the following:
   a. Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
   b. Exterior wall and foundation penetrations.
   c. Fire-rated wall and floor penetrations.
   d. Equipment connections and support details.

2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

4. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, sprinklers, and other ceiling-mounted devices.

1.7 RECORD DOCUMENTS

LRS Architects, Inc.
A Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, indicate installed conditions for:

1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.8 MAINTENANCE MANUALS

A Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions.

1.9 DELIVERY, STORAGE, AND HANDLING

A Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

1.10 ELECTRICAL IDENTIFICATION

A Nameplates: Laminated sheet plastic, approximately 1/16 inch-thick, with engraved white letters on a black background, with adhesive backing and mounting-screw holes. Minimum height of letters, 5/16 inch. Card holders are not acceptable.

B Legend Plates: Type KN-3 standard legend plates, Square D, Palatine, Illinois, or approved equal.

C Labels or Stencils: Minimum 1/4 inch-high letters. Embossed tape labels are acceptable.

D Control Wire Markers: Pressure-sensitive or heat shrink sleeve types, manufactured by W. H. Brady Company, Milwaukee, Wisconsin, or approved equal.

PART 2 PRODUCTS (Not applicable)
PART 3 EXECUTION

3.1 ROUGH-IN
A Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
B Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.2 ELECTRICAL INSTALLATIONS
A General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
9. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
10. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 CUTTING AND PATCHING
A General: Perform cutting and patching in accordance with Division 1 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:
1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
   a. Uncover Work to provide for installation of ill-timed Work.
b. Remove and replace defective Work.
c. Remove and replace Work not conforming to requirements of the Contract Documents.
d. Remove samples of installed Work as specified for testing.
e. Upon written instructions from the Architect, uncover and restore Work to provide for Architect observation of concealed Work.

2. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

3. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

4. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

5. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
   a. Refer to Division 1 Section "DEFINITIONS AND STANDARDS" for definition of experienced "Installer."

END OF SECTION
PART 1 GENERAL

1.1 REFERENCES

A The General Conditions and Division 1 Requirements shall be included in and made a part of this section, with special attention to:
1. Section 01400 Quality Control.
2. Section 01600 Materials and Equipment
3. Section 01660 Product Substitution Requirements.
4. Section 01700 Closeout Procedures.

B Related Work Specified Elsewhere:
1. Earth Work: Section 02200
2. Concrete Formwork: Section 03100
3. Concrete Reinforcement: Section 03200
4. Fire Protection: Section 15300
5. Plumbing System: Section 15400
6. HVAC System: Section 15500
7. Dentition Electronics: Section 17000

C Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SECTION INCLUDES

A All electrical work under all sections of Division 16 - Electrical, for the furnishing of all materials, supplies, tools, and equipment, labor, and services necessary for the installation of all electrical equipment as indicated on the drawings and specified, complete, tested, operable and ready for service.

1.3 QUALITY ASSURANCE

A Reference Standards: See Section 16010.

1.4 SUBMITTALS

A General Requirements:
1. Comply with applicable provisions of Section 01300.

B Submit Shop Drawings and Product Data for:
1. Raceways and fittings
2. Wires and cables
3. Wire connections, devices and plates
4. Grounding materials
5. Motor and circuit disconnects

LRS Architects, Inc.
6. Molded-case circuit breakers
7. Terminal cabinets
8. Outlet boxes
9. Manual and magnetic starters
10. Splicing materials
11. Enclosed circuit breakers

PART 2 PRODUCTS

2:1 RACEWAYS

A Conduit:
2. Rigid Steel: Hot dip galvanized or sherardized steel, conforming to UL 6 and ANSI C80.1.
3. Electric Metallic Tubing: Electro-galvanized conforming to UL 797. Manufacturers, same as rigid.
4. Liquid-tight Flexible Metal Conduit: Acceptable manufacturers, American Brass, Sealtight or equal. Type - Spirally wound galvanized steel strip with successive convolutions securely interlocked and jackets with liquid-tight plastic covering, conforming to UL 1.
5. Plastic Conduit: Acceptable manufacturers Krayloy, Stauffer, Carlon or equal. Type - Schedule 40 polyvinyl chloride, heavy wall rated for use with 90 degrees C conductors conforming to UL 651-77.
6. Wrapped Conduit: Rigid steel conduit and fittings with factory-applied 20 mil thickness of polyvinyl chloride coating bonded to the zinc conduit surface.
7. No aluminum conduits are allowed.

B Fittings:
1. Fittings for outdoor work and exposed indoor work shall be of cast or malleable iron and shall have threaded hubs. Aluminum fittings shall not be used.
2. Fittings for rigid metallic conduit and electrical metallic tubing shall conform to UL 514 for nonhazardous areas only. Locknuts shall be extra-heavy electro-galvanized steel for sizes though 2". Locknuts larger than 2" shall be electro-galvanized malleable iron with insulating collar. Grounding bushings shall be locking type and shall be provided with a feed-through compression lug. Unions shall be electro-galvanized ferrous alloy, type UNF or UNY. Expansion fittings in exposed runs shall be weatherproof units with external bonding jumper. Expansion fittings in embedded runs shall be watertight with internal bonding jumper and shall permit 3/4" movement in any direction. Liquid-tight hubs with insulated throats shall be provided for all connections to sheet steel enclosures. Rigid conduit shall be used with threaded fittings only.
3. Watertight, raintight, and oiltight connectors, where required, shall be Myers hubs, Midwest Sealing locknuts or equal.
4. Fittings for Electrical Metallic Tubing (EMT): EMT fitting shall be steel, Duro, Thomas & Betts or equal as approved, shall be "driven-on" (push-on), or wrench tightened compression type, which shall provide pull-on force resistance and electrical continuity as required by UL 514. Drive-on fittings shall contain grips which engage the conduit as the
fits are forced on. Fittings shall have plastic-insulated throats. Indentor or set screw shall not be used.

5. Junction boxes and covers shall conform to UL 514 for nonhazardous areas.
6. All outlet boxes shall not be less than 4" square. Exposed exterior boxes shall be of cast construction with threaded hubs and gasketed covers.
7. Escutcheon and ceiling plates shall be chrome finished.
8. Concealed outlet boxes and wiring device boxes in unfinished areas shall be galvanized processed steel utility boxes with appropriate cover.

C Raceway Supports:
1. Conduit Clamps: conduit clamps and backs shall be one hole design of cadmium plated malleable iron.
2. Ceiling Hangers: Ceiling hangers shall be adjustable wrought iron pipe hangers. Strap or hangers of plumber’s perforated tape will not be acceptable. Hanger rods shall be 1/4”-gauge minimum hot-dip galvanized after fabrication. Channels attached directly to building surfaces shall be 14 gauge minimum material 1-5/8 inches wide by 13/16 inches deep. All other channels shall be 12 gauge minimum material 1-5/8 inches wide by 1-5/8 inches minimum deep.
3. For individual conduit runs not directly fastened to the structure, use rod hangers manufactured by Caddy, Unistrut, Powerstrut or equal.
4. For multiple conduit runs, use Unistrut, Powerstrut or equal trapeze type conduit support designed for maximum deflection not greater than 1/8-inch.

D Raceway Support Fasteners:
1. To Concrete or Concrete Block: Bolts in threaded metal inserts, metal expansion shields or metal anchors: Philips Redhead or equal.
2. To Steel: Metal clamps or machine screws or bolts in drilled and tapped holes.
3. To Wood: Brass screws, or steel plated for corrosion resistance.

E Conduit Penetration Sealants:
1. Through exterior walls and vault: Refer to details in drawings.
2. Through plenums: Crouse Hinds EYS series or equal.
3. Through interior walls and floors: Refer to details on drawings.

F Conduit Sleeves: Pipe Shields, Inc., Model F3000 at walls and F3000G floors or equal. Shall be UL listed.


2.2 WIRES AND CABLES - BUILDING TYPE

A General: Insulated conductors and cable shall comply with UL 83 and UL 44. Conductors shall have Class "B" stranding, and shall be copper unless otherwise noted. Minimum conductor size shall be No. 12 AWG for interconnecting wiring.
1. Acceptable Manufacturers: Okonite, Anaconda, General Electric, General Code, Simplex, or equal conforming or exceeding applicable IPCEA standard.

LRS Architects, Inc.
2. For power and lighting systems 600V or less:
   a. Conductor: Minimum size: #12 AWG-all sizes-stranded.
   b. Insulation type:
      (1) #12 to #1 AWG: THWN for wet or underground locations and THHN for dry locations.
      (2) #1/0 through #4/0 AWG: XHHW (55 mils).
   c. High temperature wire: NEMA type AF or SFF-2 stranded for fixture wires and circuit runs within fixtures.
   d. Grounding Wire: TW

3. For signal and communications circuits:
   a. Special cables shall be as specified on Specification Section 16700 and 17000.
   b. Conductors for general use: Stranded copper conductor, #16AWG minimum, with THWN insulation for underground or wet locations and THHN insulation for dry locations.

4. High Temperature Wire: NEMA type AF or SFF-2 stranded for fixture wires and circuit runs within fixtures.

5. Color Coding: Insulated conductors shall be color coded as follows:

<table>
<thead>
<tr>
<th>Conductors</th>
<th>208/120V</th>
<th>480/277V</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Black</td>
<td>Brown</td>
</tr>
<tr>
<td>B</td>
<td>Red</td>
<td>Orange</td>
</tr>
<tr>
<td>C</td>
<td>Blue</td>
<td>Yellow</td>
</tr>
<tr>
<td>Neutral</td>
<td>White</td>
<td>White or gray</td>
</tr>
<tr>
<td>All Ground Wires</td>
<td>Green</td>
<td>Green</td>
</tr>
</tbody>
</table>

   The same color shall be connected to the same phase throughout the building. On Cable No. 4 AWG and larger, black may be used with color tape, Scotch No. 35, Plymouth "Slipknot" 37, or equal. Tape at each end and at all terminations and in pullboxes.

6. Pull Wires: Shall be galvanized steel, copper HD12 AWG or nylon pull cord having not less than 200 - pound tensile strength.

1.3 WIRE CONNECTIONS AND DEVICES

A  Cable Ties: Scotchflex #760, T&B Ty-Rap or equal.

B  Insulating Tape: Conforming to UL 510 where applicable.

C  Motor connections: Ringe tongue-compression terminals, base of varnish cambric tape, Scotchfill, Plymouth 2002, followed by 4 layers as required of Scotch 33+, Plymouth 4353 or equal.

D  Power Conductor Terminations: Burndy "Hylug", O.Z., 3M or equal. Compression lugs conforming to UL 486.

E  Splices in Power Conductors: Burndy "Hylink", O.Z., 3M or equal, with Scotchfill and Scotch 33+ tape, Plymouth 2002 and Plymouth 4353, or equal.

LRS Architects, Inc.
F Lighting and 120 volt receptacle wires shall be connected with Scotchlok "Y, R, G, B" electrical spring connectors, T&B, PT 1, 2, 3 or equal.

2.4 OUTLET BOXES AND COVERS

A In general: Galvanized one-piece type, number of gangs as required, and with box cover to suit finish.

B Junction Boxes for Interior Work: Standard outlet boxes (4-inches square minimum) where possible. Where other than standard outlet boxes are required, use code gauge sheet steel box with screw cover of type to suit. Depth of box to suit. Use concrete masonry boxes for concealed work in CMU walls.

C Junction Boxes for Exterior Work: Cast steel alloy with corrosion free epoxy powder coated type with neoprene gasketed covers. Crouse-Hind, Appleton or equal.

D Floor Boxes: Cast iron, watertight, fully adjustable, round type complete with service fittings and 4-inch round floor plates and trim with aluminum finish. Style as noted on Drawings. Steel City, Walker, Hubbell Cole or equal.

E Manufacturers: Steel City, Raco, Bowers, Appleton, Crouse-Hinds, Killark or equal.

2.5 SPlicing AND TERMINATING MATERIAL

A For wire up to #8: Pre-insulated connectors, twist-on color coded with expandable spring grip, steel shell and PVC insulator. 3M type "Y, R, G, or B"; Ideal, Panduit or equal.

B For wire #6 and larger: Solderless connectors, T&B Locktite, with "Scotchfill" or two layers of filler tape and plastic electrical tape as hereinafter specified, or UL approved splicing kits, T&B, 3M or equal.

C TAPE: Vinyl plastic, 7 mil, flame retardant rated for use from 18 degrees C to 105 degrees C, meets requirements of ASTM-D-3005-72, Type 1, UL 510 and HHI-595-C. Apply three (3) layers half-lapped (minimum) for 1200/208V circuits. Manufacturers: 3M #33+, Ideal, Paranite or equal.

D Motor connections where made with lugs and bolts (#6 and larger wire): Use copper or brass lugs (T&B, "Locktite", Burndy "Qilslug" or equal) with durium bolts, nuts and lockwashers or use compression lugs with recommended bolt and insulate with T&B #M179 series, 3M or equal splice insulators.

E Butt Splices: Use compressor lugs and insulate with 3M type PST connector insulators or T&B type HTC insulation covers or equal.

F Terminal Lugs:
1. For #10 AWG and smaller: Compression ring terminals with nylon shield. T&B "STA-KON", AMP, 3M, Ideal or equal.
2. For #8AWG and larger: Cast bronze set screw, single or multi-barrel type with internal cable strand saddle: T&B "Locktite", Burndy, Penn-Union, Blackburn, OZ or equal. Compression Type, heavy duty cast copper: T&B 53000 Series, Burndy, Penn-Union, Blackburn or equal.

G Wiring Devices:
1. General: All wiring devices shall conform to UL 20 and NEMA WDI for current and voltage indicated. They shall be a heavy-duty specification grade. All devices shall be brushed stainless steel.
2. Receptacle, Duplex or Single 20A. 120V. 3PG, shall be NEMA 5-20.
   d. Duplex Locking Type, Hubbell 82000
3. Receptacle Single: 30A 120/208V. 5PG Shall be NEMA L21-30R Hubbell 2810 ACH.
5. Wall Switches:

H Device Plates: Provide all with tamperproof security screws.
1. Interior Finishes Areas: 0.040 inch satin finish stainless steel, tamperproof screws. Ratings for use as detention security devices.
2. Surface Mounted Devices, Indoor: Galvanizes metal to fit box.
3. Outdoor Weatherproof: General Electric 9226-5, Bell #245, or equal.

2.6 COLOR (or as noted on plans)
A Ivory except as noted.
B Orange for devices connected to isolated ground.

2.7 MANUAL MOTOR STARTING SWITCHES
A Westinghouse Type MS, Square D, G.E., Cutler Hammer, Allen Bradly or equal.

2.8 DISCONNECT SWITCHES
A Disconnect Switches:
1. NEMA HD heavy-duty; horse-power rated, enclosure to suit. Provide fused type where shown or required by Code. Units of roof or exposed to weather: Enclosure NEMA 3R.

2.9 ENCLOSED CIRCUIT BREAKERS

LRS Architects, Inc.
A. Therma-magnetic types; Westinghouse, G.E., ITE, Square D, or equal. Enclosure to suit.

2.10 MAGNETIC STARTERS

A. Across-the-line Type 3-phase ambient compensated bi-metallic overloads. NEMA Size 1 (minimum). 120 volt rated coils. Provide with 480-120 volt control transformer where required, magnetic motor circuit protector, and with devices as shown. Provide enclosure of size and type to suit control devices and atmospheric conditions. Westinghouse Class A206, Square D, G.E., ITE, Cutler-Hammer, Allen Bradley or equal.

2.11 FRAMING AND HANGER SYSTEM

A. Strut: Formed, hot-rolled steel A-570 Grade C, electro-zone galvanized with Di-chromate or equal conversion coat to permit paint finish without field degreasing or metal prepping.

B. Nuts, Bolts, Rod and Threaded products:
   1. Clamp nuts: Mild steel and cyanide hardened.
   2. Cap screws, bolts, nuts and washers: Carbon steel.
   3. Finish: Electrogalvanized and chemically treated to a zinc chromate surface.

C. Special fittings as shown on Drawings.


2.12 ANCHORS

A. Drilled Wedge Type expansion anchors for sized 3/8 inch diameter and larger. Ramset "Trubolt", RedHead WS Series or equal.

B. Drilled Sleeve Type expansion anchors for 1/4 inch diameter. Ramset "Dynabolt", RedHead or equal.

C. Embedment per UBC or as directed by the Owner's Representative.

D. Powder Actuated Fastening Systems for 3/16 or 1/4 inch fasteners may be used where specifically permitted by the Owner's Representative.

2.13 GROUNDING MATERIALS

A. Acceptable device manufacturers: Burndy, O.Z., Appleton and Cadweld.

B. Ground system devices and equipment:
   1. Cable connections accessible: Burndy or equal.
   2. Grounding bushings: O.Z. type BI or equal.
   3. Enclosure connector: O.Z. type QG or KG or equal.
   4. Feed through lug: Burndy type Q2B or equal.

LRS Architects, Inc.
5. Pipe connectors: O.Z. type ABG or equal
6. Bare copper ground cable: Medium hard drawn copper conductor, stranded, size as shown on the drawings.
7. Ground rods 3/4" diam. minimum 10'-0" long. Copperweld or equal.
8. Thermit welds: Cadweld

C Ground Conductors: Insulated or bare copper conductors shall be medium hard drawn, stranded, size as shown on drawings.

2.14 MOLDED-CASE CIRCUIT BREAKERS

A Devices shall be UL listed and meet NEMA Standards AB1. This Specification covers circuit breakers which are not installed in switchboards, panelboards, motor control centers and combination motor starters. Circuit breakers shall be as manufactured by G.E., or equal with individual enclosures NEMA 1 or NEMA 3R depending on application, and shall have ratings as shown.

B Circuit breakers shall be quick-make and quick-break on manual or automatic operation, and the handle mechanism shall be tripfree to prevent holding contacts closed against a short circuit sustained overload. The circuit breaker contacts shall be of the high-pressure butt type and shall be made of a silver-alloy material.

C Automatic operation of the circuit breaker shall be obtained by means of thermal or electronic tripping devices located in each pole of the breaker. The thermal device shall provide time-delay tripping on overloads, and the magnetic device shall provide instantaneous tripping on short circuits. The instantaneous magnetic trip shall be adjustable and accessible from the front of the breaker on frame sizes above 100 amperes.

1. Minimum interrupting rating of molded-case circuit breaker shall be as follows:

<table>
<thead>
<tr>
<th>System Voltage</th>
<th>Frame Size</th>
<th>Amperes Symmetrical</th>
</tr>
</thead>
<tbody>
<tr>
<td>120/208</td>
<td>All</td>
<td>10,000</td>
</tr>
<tr>
<td>277/480</td>
<td>100 Amperes</td>
<td>14,000</td>
</tr>
<tr>
<td>277/480</td>
<td>225 Amperes</td>
<td>22,000</td>
</tr>
<tr>
<td>277/480</td>
<td>400 - 800 Amperes</td>
<td>42,000</td>
</tr>
</tbody>
</table>

2.15 FLOOR BOXES

A Adjustable, flush unit. Provide carpet flanges where installed in carpet areas. Numbers used are those of Walker. Equivalent Hubbell, Steel City, or Lew or equal products are acceptable.

B Surface type shall be Steel City, 601 series with P-60 hinged floor plate and standard duplex receptacles or equal.

2.16 TERMINAL CABINETS

LRS Architects, Inc.
A Fabricate from code gauge steel to match branch circuit panelboards, size as indicated on drawings, with flush latch and concealed hinge. Where size is not indicated, minimum size shall be 20 inches W X 24 inches H X 4 inches D. Finish shall be ANSI 61 light grey enamel.

B Provide inside terminal cabinet 3/4 inch thick plywood backboard and terminal strips, one terminal point for each wire within the terminal cabinet.

PART 3 EXECUTION

3.1 GENERAL

A Repair by spray or brush painting, after properly preparing the surface, all scratches or defects in the finish of the equipment. Only identical paint, furnished by the equipment manufacturer, shall be used for such purposes.

B Locate all wall and floor openings for passage of conduits and cable entrances to electrical enclosures from suppliers’s equipment data.

C Exercise care during construction to avoid damage or disfigurement of any kind. All equipment shall be protected from dust and moisture during construction. The equipment shall be covered with a heavy polyethylene plastic sheet or laminated kraft paper having a moisture barrier during all stages of construction. Concrete finish, painting, or similar work in electrical rooms shall not proceed if unprotected equipment is installed.

D Failure to protect the equipment as outlined herein shall be grounds for rejection of the equipment.

E Joints will not be permitted except in outlet boxes, pull boxes and panelboard gutters.

3.2 SEISMIC RESTRAINTS

A Provide the work in compliance with Title 24.T22 and the Uniform Building Code, but with the requirements herein as minimum standards.

Provide seismic restraints for the listed materials and equipment. The attachments shall resist forces applied to the center of gravity of the component. Criteria shall be the operating weight of the item times 0.5g for horizontal forces and 0.33g for vertical forces. Design for the horizontal force to be applied in any direction. Wall-mounted or suspended components shall, in addition, resist a downward force of 200 pounds minimum added to the operating weight.

1. Suspended lighting fixtures.
2. Lighting fixtures integral with ceiling or directly mounted to ceiling.
3. Suspended conduit hangers and trapezes.

3.3 IDENTIFICATION

A Provide engraved laminoid nameplates for switchgear, panels, motor starters, disconnect switches...
and all associated devices.

B Provide Dymo labels on all light switches and convenience and special purpose receptacles to show panel and circuit number to which the device is connected.

C Provide label on all motors: "CAUTION. AUTOMATIC EQUIPMENT. MAY START AT ANY TIME."

3.4 CONDUIT

A Minimum size conduit shall be 3/4"c. except for lighting raceways. All lighting homeruns shall be 3/4"c. minimum.

B Installation Schedule:

<table>
<thead>
<tr>
<th>Location or Use</th>
<th>Conduit Permitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposed outdoors</td>
<td>Rigid galvanized steel, liquid-tight flex.</td>
</tr>
<tr>
<td>Under building slab or concrete exterior slab</td>
<td>PVC Schedule 40</td>
</tr>
<tr>
<td>Underground</td>
<td>PVC Schedule 40</td>
</tr>
<tr>
<td>Exposed indoors or concealed in furred walls or ceiling space</td>
<td>EMT, galvanized flex.</td>
</tr>
<tr>
<td>In concrete slabs or walls, concrete masonry block walls</td>
<td>PVC with rigid steel elbows when risers are exposed from concrete slab.</td>
</tr>
</tbody>
</table>

C General:

1. In general, conduit in finished areas including all detention areas shall be run concealed in chases, concrete masonry unit walls, stud walls, furring or in suspended ceilings.
2. Run exposed conduit on supports spaced not more than 8' apart, with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceiling. No conduit shall approach closer than 6" to any object operating above the rated temperature of its cable insulation.
3. Space conduit supported directly from concrete structure out at least 1/4" using one-hole malleable straps with pipe spacers or, if three (3) or more conduits are located in a parallel run, they shall be spaced out from the wall approximately 5/8" to 1" by means of framing channel. Runs of individual conduit suspended from the ceiling shall be supported with galvanized wrought-steel pipe hangers. Where three (3) or more conduits are suspended from the ceiling, suitable steel racks shall be constructed subject to loading acceptance by the Owner's Representative.
4. Secure conduit racks by means of cast-in-place anchors; die-cast, rustproof-alloy expansion shields; or cast flush anchors. Wooden plugs plastic inserts, or gunpowder driver inserts shall not be used as a base to secure conduit supports.
5. Welding, brazing, or other heating of the conduit is not permitted.
6. When required for ease of cable pulling and as necessary to meet code, provide cast-metal LRS Architects, Inc.
conduit fittings of pull boxes even though not shown. Bends and offsets shall be avoided where possible but, where necessary, shall be made with approved hickey or conduit-bending machine. Turns shall consist of cast-metal fittings or symmetrical bends.

7. Secure all conduit entering sheet-steel boxes or cabinets by locknuts on both the interior and exterior of the device. Provide an insulating bushing constructed over the conduit end. All conduit entering NEMA 12 boxes shall be terminated with a raintight hub having an insulated liner. All surface-mounted cast boxes shall have threaded hubs. All joints shall be made with standard couplings to specified unions. Running threads shall not be used in lieu of conduit nipples, nor shall excessive thread be used on any conduit. The ends of all conduit shall be cut square, reamed, and threaded with straight threads. Rigid steel conduit shall be made up tight and without thread compound.

8. Plug or cap all unused conduit openings with a suitable device designed for the purpose. Caulking compound shall not be used for plugging conduit openings.

9. Empty conduit shall have pull lines installed. The pull line shall be nylon or plastic having not less than 200 pound tensile strength. No less than 24" of slack shall be left at each end of the pull line.

10. Provide escutcheon plates at exposed wall and ceiling penetrations.

11. The interior of all raceways shall be thoroughly clean and free from cement, paint, grease, plaster, and dirt. Protect all underground ducts against damage during pouring of concrete or backfill.

12. Work is not to be covered up until it has been inspected by the Owner's representative. Give at least three (3) working days notice of intention to cover up work to permit such inspection and survey.

13. Roof penetrations shall be flashed and counter-flashed with galvanized sheet metal, and caulked to form a watertight penetration.

14. Buried depth of conduit unless otherwise noted shall be as follows:
   a. Direct buried conduit: 24 inches minimum to top of conduit.
   b. Conduit under building: The minimum depth shall be 18 inches below bottom of floor slab.

15. Make all risers to grade with rigid steel conduit and fittings only.

16. Use flexible conduit in the following applications:
   a. Recessed lighting fixtures
   b. Motor connections
   c. Connection between fan plenum and structure.
   d. At expansion joints
   e. At transformers and other equipment which produces vibration.
   f. At wet locations, flexible conduit shall be liquid-tight type.

17. Make field bends cold and in a manner to assure smooth bends free from kinks and indentations. Radius of bends shall not be less than as required by NEC or 9 x the conduit diameter. Bends, 1-1/4 inch and above shall be factory made.

18. Provide pull fittings to facilitate proper wire and cable installation. DO not exceed 400 feet of straight conduit run, with 50 feet deducted for each 90 degree bend, or portion thereof, between pull fittings.

19. Conduit entrances through exterior concrete walls shall be watertight. Provide pipe sleeves in the concrete with 1/2 inch minimum clearance around the conduit and an entrance seal; O.Z. type FSK or equal.

LRS Architects, Inc.
3.5 WIRE AND CABLE (600V AND BELOW)

A Cable shall be looped and racked in all pull boxes.

B Splicing of wires #10 and smaller use plastic insulated caps Buchanan, 3-M Scotch-Lok, or equal. Larger size conductors use approved compression connectors. Do not split bolt type. All splices shall be made in outlet or pull boxes. All splices in underground wiring system shall be epoxy encapsulated with Scotch splice kit, flooded shrink tubing or equal.

C Pull no wire into any portion of the conduit system until all construction work which might damage the wire has been completed.

D Install all wire continuous from outlet to outlet or terminal to terminal. Splices in cables when required shall be made in handholes, pull boxes or junction boxes. Make branch circuit splices in outlet boxes with 8" of correctly color-coded tails left in the box.

E Soapstone, talc, or UL approved pulling compound only will be permitted in pulling cables the raceway construction shall be complete and protected from the weather before cable is pulled into it. Swab conduits before installing cables and exercise care in pulling to avoid damage to conductors.

F Incoming wire and cables in panels, No. 6 AWG and smaller, shall be bundled and laced at intervals not greater than 6" and neatly spread into trees and connected to their respective terminals. Sufficient slack shall be allowed in cables for alterations in terminal connections. Lacing shall be done with plastic cable ties or linen lacing twine.

G Cables crossing hinges shall be made up into groups not exceeding twelve (12) and shall be so arranged that they will be protected from chafing when the hinged member is moved.

H Cables shall be numbered at both ends with marker tags.

I Install feeder cables in one continuous length.

J Install Brady wire markers where number of conductors in a box exceed four.

K Make all ground, neutral and line connections to receptacle and wiring device terminals as recommended by manufacturer. Provide ground jumper from outlet box to ground terminal of devices when the device is not approved for grounding through the mounting screws.

L Do not bend cables to smaller radius than the spool on which it was delivered. Install feeder cables in one (1) continuous length, unless splices are approved.

M Bends in cables shall be made so that the insulation will not be injured and the radius of the curve of the inner edge of any bend shall not be less than five (5) times the diameter of the cable.

N Vertical runs of cable in conduit shall be supported where required with multiple segment plug type

LRS Architects, Inc.
3.6 OUTLET BOXES AND FITTINGS

A. Do not install boxes back to back within same stud space. Where shown back to back, offset outlets a minimum of one stud space and fill connecting conduit with hydroseal for sound control.

B. Flush mounted boxes provided with galvanized raised ring, depth as require by finish surface.

3.7 MOUNTING HEIGHTS OF DEVICES

A. Unless otherwise noted on drawings, mounting heights of devices shall be as follows:

- switches: 48"
- receptacles: 18" U.O.N. on drawings. Install receptacles uniformly with "U" ground slot down.
- Telephone & EDP Outlets: 18" U.O.N. on drawings
- Fire Alarm Pull Stations: 48"
- Other devices: As shown on Drawings

3.8 CONNECTION TO EQUIPMENT

A. General:

1. Furnish and install required power supply conduit and wiring to all equipment. See below for other wiring required.
2. Furnish and install a disconnect switch immediately ahead of and adjacent to each magnetic motor starter or appliance unless the motor or appliance is located adjacent and within sight of the serving panelboard, circuit breaker or switch. Verify all equipment nameplate current ratings prior to installation.
3. Mount all motor starters and provide all power wiring to them, including those furnished under other sections of specifications.
4. Install all rough-in work for equipment from approved shop drawings to suit the specific requirements of the equipment.
5. Furnish and install all magnetic motor starters that are shown on the electrical drawings or specified under other Divisions to be furnished under this Division of work. Verify equipment nameplate ratings prior to installation and furnish adequately rated starter for the loads.
6. Furnish and install manual thermal protection for all motors not integrally equipped with thermal protection.
7. Furnish 120 volt power to each control panel and time clock requiring a source of power to operate.
8. Coordinate exact method of connections to equipment provided under other Divisions and Division 16, Electrical. Provide additional labor, aerials required for complete connections. Determine exact stub-up locations and outlet heights from equipment installers and shop supports.
B Heating, Ventilating and Air Conditioning Equipment:
1. Line and low voltage temperature control and interlock wiring and conduit and required connections thereto are a part of other Divisions unless specifically shown or noted on the electrical drawings as to be furnished under this Section.
2. Provide 120 volt power supply to temperature control panels furnished and installed under other Divisions of work.

C Plumbing and other Contractor-Furnished:
1. All required power and control conduit, wiring and connections are included under this Section of work. Control sensing and alarm devices will be furnished under the respective Section of the contract supplying the equipment unless noted otherwise. Where these are located in pipes, ducts, vessels, tanks, etc., they will be mounted in place by the Contractor furnishing the devices. All others shall be mounted under this Section of work.
2. Control panels for packaged equipment will be furnished under the respective Section of the contract supplying the equipment unless otherwise noted. Installation and connection of the control panels are under this Section of work.

3.9 EQUIPMENT GROUNDING

A The equipment ground conductors shall be copper sized in accordance with the National Electric Code Table 250-94a for panelboards and the Table 250-90 for other equipment, except that the minimum size wire shall be No. 12, or as specified.

B The grounding system, or additions to an existing grounding system as applicable, includes installation of grounding grid cable, ground rods, and all connections as shown on the drawings. Connections as applicable, shall be made to equipment, structures and steel conduit.

C Dimensions shall be approximately those indicated on the drawings or as obtained by scaling the drawings if other indication is lacking.

D There shall be a 6 inch minimum clearance between the grounding system and any underground iron or steel objects such as iron piping and steel conduits except at the point at which the grounding grid attaches to such underground objects.

E Connections of ground cables to steel structures and equipment shall be securely made with mechanical or solder type connectors. Connections to conduits shall be made by means of grounding type bushings. Ground leads shall be run up over the footings where indicated on the drawings, and up the structures in a neat and workmanlike manner.

Ground cables run on steel members or on concrete surfaces shall be securely fastened by means of pipe straps. Holes necessary for attaching pipe straps or connectors shall be drilled by the contractor.

F In all cases where connections to the ground mat are stubbed out at equipment footings in advance
of equipment installation, care shall be taken that sufficient length of cable, plus a reasonable margin, is left, so the lead may be trained up along the wall of the footing and made to follow all surfaces closely in routing cable to the point of connection.

G All underground cable connections shall be made with silver solder, as shown on the grounding details drawing, or the thermit-produced heat type welding process will be acceptable provided the joints are left neat and clean. All taps and crosses shall be thoroughly cleaned so that the conductivity of the resulting joint is not less than that of the cables. All connections shall be approved by the Owner's Representative.

H When the thermit-produced heat type welding process is used, extra care and safety precautions shall be used to insure that moisture is not present in molds at time of ignition.

I System neutral ground by connection to ground bus at main switchboard as shown on drawing. At all other locations system neutral shall have 600 volt insulation unless otherwise noted.

J Provide code rated copper ground jumper at all flexible conduit and locations where raceway system is electrically discontinuous.

K Ground the neutral conductor of each transformer or generator.

L Lighting fixtures shall be securely connected to equipment ground conductors.

M Motors shall be connected to equipment ground conductors with a conduit grounding bushing and with a bolted solderless lug connection on the metal frame.

N Waterproof Sealant: Use Kearney "Aqua Seal" mastic sealant on all below grade clamp or compression type connections.

O Provide 3/4"c. with #6 AWG insulated green wire to telephone backboard from same ground source as power (i.e., cold water pipe, euffer, panel ground bus, ground rod, etc.)

3.10 TELEPHONE/DATA/CABLE TELEVISION RACEWAY SYSTEMS

A Refer to specification Section 16700 for more accurate outlet box information.

B All raceway free and clear, all with nylon pull cords. Minimum size raceways 3/4 inch.

C Telephone outlets flush 4 inch box with single plaster ring without cover plate.

3.11 INSPECTIONS AND TESTS

A General: The electrical installation shall be inspected and tested to insure safety to building occupants, operating personnel, conformity to Code authorities and subcontract documents.

B The contractor shall follow recognized safety procedures and techniques during energizing and de-
energizing of all equipment to ensure employee safety and protect the work.

C Tests: Field tests shall be performed and reports submitted. Approval tests shall include the following:

1. Low Voltage Systems:
   a. A written report of the test results shall be submitted and approved by the Owner's Representative before the systems are placed in service.
   b. Switchboard and distribution panels: The following tests shall be made using a 500 volt DC megger on the main bus and all power and control circuits.
   c. All measurements shall be recorded on test forms furnished by the Owner's Representative. Any measurement of less than 10 megohms shall be immediately called to the attention of the Owner's Representative for final decision of acceptability.
   d. Check insulation resistance on all power and control wiring installed by the Subcontractor and all equipment supplied either by the Owner or the Subcontractor.
   e. Check all control switches, alarm devices, and indicating instruments for proper operation.
   f. Check the thermal overload heaters for each motor and the reset mechanism.
   g. Check the motor nameplate full-load current as the basis for checking the heat selection.
   h. The thermal overload heaters shall be in accordance with the starter enclosure.

i. Phase Rotation: The following tests shall be carried out:
   (1) The connections of all equipment shall be checked for current-phase rotation.
   (2) The NEMA and ANSI Standard phase rotations are A, B and C counting from front to back, to top to bottom, and left to right, as viewed from the operating mechanism side.

j. Circuit Breakers: The following tests shall be carried out:
   (1) Inspect each circuit breaker
   (2) Check for loose connections
   (3) Operate each circuit breaker manually.

k. Motor Insulation Testing: each 460 volt motor shall have its insulation resistance to ground measured with 500 volt DC megger prior to connection. Values of resistance of less than 10 megohms shall not be acceptable.

2. Grounding Systems: The ground connection on each piece of equipment shall be checked for tightness, and the entire system shall be checked for continuity. The resistance of each ground system shall be measured with a ground ohmer tester. The maximum ground resistance shall be 3 ohms.

3. Control and alarm circuits: Demonstrate the operation of all control and alarm devices and circuits.

4. Overload Protective Devices (Thermal): For each motor, complete the following data in neatly tabulated form. Data shall be obtained from the equipment as provided on the job.
   a. Equipment driven
   b. Complete motor nameplate data
   c. Overload device heater catalog number and ampere rating.

LRS Architects, Inc.
This information shall be filed prior to start-up of any equipment. Overload heaters for motors with power factor correction shall be sized accordingly. Heaters shall be replaced at no increase in Contract Price if found to be the incorrect size to protect the motor.

5. Transformers: Adjust transformer tap settings for proper voltage levels.

END OF SECTION
PART 1 GENERAL

1.1 REFERENCES

A The General Conditions and Division 1 Requirements shall be included in and made a part of this section, with special attention to:
   1. Section 01450 Quality Control.
   2. Section 01600 Product Requirements
   3. Section 01630 Product Substitution Requirements.
   4. Section 01770 Closeout Procedures.

B Related Work in following Sections:
   1. Section 02225 - Earthwork
   2. Section 16400 - Service and Distribution
   3. Section 16050 - Basic Materials and Methods
   4. Section 16740 - Telephone/Data/Cable Television

C Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SECTION INCLUDES

A This section specifies equipment and installation of underground duct banks, pullboxes and conduits.

1.3 REFERENCES

A American Association of State highway Officials (AASHO): Standard Specifications

B California Code of Regulations (CCR): Title 8

C Institute of Electrical and Electronic Engineers (IEEE): Standard 48

D National Electrical Safety Code

1.4 SUBMITTALS

A General: The following information shall be submitted to the Owner's Representative approval in accordance with Section 01300, Submittals:
   1. Catalog Information:
      a. Conduit
      b. Pull Boxes
      c. Sealing Materials for Underground Pull box.
      d. Cables
      e. Underground Duct bank

1.5 DELIVERY, STORAGE AND HANDLING

A General:

LRS Architects, Inc.
1. All wire and cable shall be delivered to the job site in unbroken packages.
2. All conduit shall be delivered to the job site in the original bundles.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A Conduit
1. Rigid Plastic Conduit: Schedule 40 PVC listed for use as electrical conduit: NEMA TC2 and TC3 (Fittings). Fittings shall be of the same manufacturer.
2. Risers from below grade shall be rigid wrapped galvanized steel or schedule 80 PVC.

B Underground Duct Bank
1. The underground service conduits shall be installed in a compacted trench, sand or pea gravel backfill per Section 02225.
2. All conduits shall be schedule 40 PVC. Risers from below grade shall be rigid wrapped galvanized steel.
3. The number of conduits in each duct bank shall be determined by the requirements shown on the drawings.
4. Conduits shall be sloped to drain to pullboxes.
5. All conduits, including those with new cables installed, shall have a nylon pull rope installed.
6. All ends of conduit shall be provided with bushings or "bells."

C Concrete Pullboxes
1. Provide separate precast concrete pullboxes, with lids labeled "COMMUNICATIONS" (for TV, telephone, data, fire alarm) or "POWER".
2. Pullboxes for site power and communications shall be 3' X 5' x 3' deep, minimum. Pullboxes shall have concrete bottoms and galvanized steel lids.
3. Pullboxes in traffic areas and along roads shall be designed and installed for H20-44 loading.
4. Pullboxes shall be installed to minimize surface drainage entry as follows:
   a. Pullboxes should not be located in paths or streets. If such location cannot be avoided, pullboxes should not be located in low spots or drainage channels.
   b. Pullboxes not located in paths or streets should be installed so that the top is approximately 2" above final grade.
5. All cables in pullboxes shall be tie-wrapped to racks with rack arms attached to the sides of the pullboxes.

PART 3 EXECUTION

3.1 UNDERGROUND DUCT INSTALLATION

A General:
1. The term "conduit" refers to the individual tube designed to carry power cable. The term "duct" refers to the complete cable-carrying installation comprised of one or more conduits.
2. The top of the duct shall be not less than 24, or as noted on plans, inches below grade, and shall have a minimum slope of 3 inches in each 100 feet away from buildings and toward manholes and other necessary drainage points where a change in direction is necessary.

3. Except at conduit risers, changes in direction of duct runs exceeding a total of 10 degrees, either vertical or horizontal, shall be accomplished by long sweep bends. Sweep bends shall be made up of one or more curves or straight sections or combinations thereof. Joint deflection shall not exceed the maximum values recommended by the manufacturer. Manufactured bends shall have a minimum radius of 18 inches for conduits less than 3 inches in diameter and a minimum radius of 36 inches for ducts of 3 inches in diameter and larger. There shall be no shoulder or unevenness at joints along the duct interior.

4. Conduits shall terminate in bushings or end-bells where duct lines enter pullboxes, or spliceboxes. The joints of the conduits shall be staggered by rows and layers to provide a duct line having maximum strength.

5. During construction, partially completed duct lines shall be protected from entrance of debris such as mud, sand, and dirt by means of suitable conduit plugs. As each section of duct line is completed, a testing mandrel not less than 12 inches long and with a diameter 1/4 less than the size of the conduit shall be drawn through each conduit, after which a brush equipped with stiff bristles and sized to match the diameter of the conduit shall be drawn through until the conduit is clear of all particles of earth, sand, and gravel. A 150 pound test plastic pull rope with at least 3 feet of spare at each end shall be provided in all conduits.

B Underground duct:

1. Conduit shall be PVC Schedule 40 or PVC Wrapped Rigid Conduit.

2. Conduit shall be 4 inches in diameter for conductors 250 MCM and larger and 2 inches for other conductors. The duct bankl be rectangular in cross-section and shall be separated by a minimum concrete thickness of 2 inches, except light and power conduits shall be separated from control, signal, and telephone conduits by a minimum of 3 inches.

3. Duct spacers shall be installed on 5-foot centers maximum. Conduits shall be secured prior to back filling with sand or pea gravel.

3.2 PULLBOX INSTALLATION

A Pullbox

1. Pullboxes shall be precast reinforced to withstand H-20 loading in accordance with AASHO Standard Specification for highway bridges. A 6 inch sand or gravel bed shall be provided on well tamped or undisturbed earth for all pullboxes.

2. Pullboxes shall be supplied with knockouts, inserts, pulling irons, risers, sump channels, Quickset NPB4500, Brooks or equal.

3. All joints in pullbox walls, risers, and duct entrances shall be grouted with cement or gasket seal applied between precast sections to provide a water proof structure.

4. Pullbox, where splices occurred, shall be supplied with 1 inch diameter by 10 feet long ground rod in one corner.

END OF SECTION
PART 1 GENERAL

1.1 REFERENCES

A The General Conditions and Division 1 Requirements shall be included in and made a part of this section, with special attention to:
1. Section 01400 Quality Control.
2. Section 01600 Material and Equipment
3. Section 01660 Product Substitution Requirements.
4. Section 01700 Closeout Procedures.

B Related Sections: All electrical work under all sections of Division 16 - Electrical, for the furnishing of all materials, supplies, tools, and equipment, labor, and services necessary for the installation of all electrical equipment as indicated on the drawings and specified, complete, tested, operable and ready for service.

C Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SECTION INCLUDES

A This section specifies equipment and installation related to the transmission, distribution and control of electric power 600 volts and below to and within the project, including switchboards, panelboards, bus ducts, transformers and motor controls.

1.3 QUALITY ASSURANCE

A Section 16010 Electrical General Requirements applies to work in this Section.

1.4 SUBMITTALS

A General Requirements: Comply with applicable provisions of Section 01300.

B Submit Shop Drawings and Product Data for:
1. Distribution and branch circuit panelboards.
2. Terminal cabinets
3. Dry type transformers

PART 2 PRODUCTS

2.1 MANUFACTURER

A All power distribution equipment and components including circuit breakers, motor starters, and switches shall be as manufactured by General Electric (G. E.), Square "D", Westinghouse or equal.

2.2 PRODUCTS

LRS Architects, Inc.
A Branch Circuit Boards

1. All multi-pole breakers shall be common trip. Bus sequence shall start at the top left phase bus of the interior of both top and bottom fed panels. Provisions or space for future breakers shall be located at the bottom of the panel and be fully bussed complete with all necessary mounting hardware less the breaker. Locate next to each breaker or make provisions for an individual number button with an engraved or depressed number. Numbering tape, painted numbers, or use of more than one number per breaker is unacceptable.

2. Bus Bars: Shall be supported by glass-filled polyester-type insulators. All bolts used to connect current carrying parts together shall be accessible for tightening from the front of the panel. The neutral bars, when required, shall be insulated and furnished with a solderless cable connector for each circuit breaker and each space in the panelboard. A separate copper ground bus shall be solidly bolted to the cabinet at the bottom and drilled and tapped for twenty (20) 1/4 inch #20 machine screws. A solderless connector for No. 2 to No. 4/0 cable shall be bolted to the ground bus. All bussing shall be copper.

3. Panel Enclosure: Provide door-in-door construction made of not less than 20 inches wide and fabricated from code gauge galvanized or galvannealed steel. The panel front shall be surface or flush as indicated on the drawings, fabricated from cold-rolled steel, given a rust inhibiting treatment, and painted with an ANSI-61 light grey baked-on enamel except flush panel covers shall be prime coat for painting in the field. The front shall be of the tamper proof type with concealed hinges, trim clamps, and flush lock requiring a milled key (one key to be supplied with each front). A 8 1/2 inch x 11 inch metal frame with clear plastic cover for panel schedule welded to the inside of the door shall be provided for branch circuit panels. Both trim and door shall open to the right, unless specified otherwise. Enclosures provided without "knockouts".

4. All lugs, terminal, connections of distribution and panelboards shall be color coded to match conductor color coding.

5. Circuit Breakers:
   a. 120/208 volt branch circuit panelboards: Quick-make, quick-break, molded case bolt-on type designed for 120/208 volt, three phase, four wire service with minimum 10,000 amperes rms symmetrical short circuit rating, unless otherwise noted on single line or panelboard schedule.
   b. 277/480 volt branch circuit panel boards: Molded case bolt-on type designated for 277/480 volt three phase, four wire service with minimum 14,000 amperes and rms short circuit rating except as noted on Single Line Drawing or Panel board Schedule.
   c. Breakers shall have center-tripped position in addition to the ON and OFF positions.
   d. Provide lockouts for all circuits, as indicated on plan, that should not be inadvertently tripped.


7. Provide screwed-on (no adhesives) engraved bakelite nameplate identification on outside of each panel showing panel designation voltage and phase in minimum 1/4" high letters.

8. Provide typewritten panel directory on inside of door with clear plastic cover.

9. Provide panelboard as shown on panelboard schedules. Full description of panelboard "type" is as follows:
   AE: Medium/small 480 volt lighting distribution panels, G. E. type AE, Westinghouse, Square D or equal.
AQ: 208 volt receptacle and lighting distribution panels, G. E. type AQ, Westinghouse, Square D or equal. Panels directly fed from transformers shall have main circuit breakers.

B Distribution Panelboards:
1. Dead-front, front accessible NEMA 1 enclosure, as indicated, designed for use on a three phase, four wire, 120/208 or 277/480 volt system.
2. Construction: Code gauge galvanized steel fully flanged for strength and rigidity. Doors and trim shall be cold-rolled steel, code gauge. Provide concealed butt hinges and 3-point catch and lock. Provide separately hinged or bolted vertical access doors over lug and wiring spaces.
3. Finish: Finish all exposed parts with one coat rust inhibitor and two coats of light grey enamel.
4. Bus Bars: Shall be used throughout and shall be hard-rolled, electrolytic copper of 98% conductivity. Bars shall be factory pre-drilled complete with hardware to accept future field installation of 2 or 3 pole circuit breakers in any combination, complete with adjacent mounting hardware and structural supports. Brace all bus bars for minimum short circuit rating of 42,000 amperes rms symmetrical.
5. Provide 1/2 capacity ground bus with terminal lugs for each feeder shown.
6. Minimum interrupting rating of molded-case circuit breakers shall be at least values shown on single line diagram.
7. Provide handle locking devices for all circuit breakers.
8. Provide engraved bakelite nameplates with minimum 1/4" high letters screwed to panel front and for each circuit protective device in panel. Adhesive not permitted.
10. Distribution panels to be provided for panels up to and including 1200 amps. Panels larger than 1200 amps should be group mounted free standing switchboard construction per UL 891.

C Dry Type Transformer
1. KVA and voltage rating as shown on plans. Ventilated dry type.
2. G. E. type QHT, Westinghouse, Square D or equal insulated, 3 phase, 3 wire, 480 volts "delta" connection on primary and 120/208 volts, 3 phase, 4 wire "wye" connection on secondary. Provide with four (4) 2 1/2% full rated taps, two above and two below rated voltage on primary side.
3. Transformer shall be capable of operating at 100% of nameplate rating continuously while in an ambient temperature not exceeding 40 degrees C.
4. Transformer shall meet the daily overload requirements of ANSI Standard C57.96.
5. Vibration Isolation: Provide neoprene rubber pads to isolate core and coil assembly from transformer enclosure.
6. Provide 1 inch thick fiberglass pads to isolate transformer from floor or platform.
7. Use flexible conduits at least 24 inches long for electrical connections.
8. Provide engraved lamacoid nameplate for each transformer.
9. Anchor transformer securely with minimum 1/2 inch diameter bolts. Strength of bolts used to secure the transformer shall be sufficient to resist shear and uplift produced by force equal to one half of the equipment mass applied horizontal at center of gravity.

PART 3 EXECUTION

LRS Architects, Inc.
3.1 GENERAL

A Coordinate the installation with work of other divisions and as shown in the drawings.

B Install equipment in conformance with manufacturer's instruction.

C Inspect for physical damage and repair.

D Inspect for proper alignment, anchorage and grounding.

E Check tightness of accessible bolts by calibrated torque wrench method. Refer to manufacturers' recommended instructions. A mark shall be placed on each tightened bolt to insure completeness.

F Arrange for delivery and installation of all electrical equipment prior to construction of major walls and/or roof, or provide for suitable openings to properly install center. No allowance will be made for failure to comply with this requirement. All necessary correction shall be at no additional cost to the Owner.

3.2 DISTRIBUTION SWITCHBOARDS AND PANELBOARDS

A Visual and Mechanical Inspection:
   1. Inspect for physical damage.
   2. Compare equipment nameplate information with latest single line diagram and report discrepancies.
   3. Inspect for proper alignment, anchorage and grounding.
   4. All doors, panels, and sections shall be inspected for paint, dents, scratches, cleanliness and fit.

3.3 TRANSFORMERS

A Floor mounted units on Korfund, Mason Industries Inc. or equal vibration isolators. Conduits entering transformer isolated from case with oversize hole, ground wire and rubber grommet.

B Transformers shall have a minimum of 9" clearance between transformer ventilation openings and adjacent structure. All transformer connections shall be made with flexible metallic conduit.

3.4 TESTING

A General
   2. Current tests performed by direct current injection through the devices.
   3. Coordinate schedule of testing with Owner's Representative to permit their witnessing of the testing.
   4. Switchgear/equipment manufacturer representatives shall be present during testing to verify any defective equipment and expedite repair of replacement of defective equipment. Retest all replaced equipment.
   5. Torque all bus breaker and cable connections and mark.
   6. Testing procedures shall be complete and in full conformance with NEMA Standards for the
applicable equipment.

7. Provide the necessary field service engineering at the job site to ensure proper installation, on-site testing, calibration and operation of equipment.

8. All tests shall be conducted as specified herein as a minimum. Results of tests shall be certified in writing and shall be submitted to Owner's Representative. Where tests fail or are determined to be marginal by Owner's Representative, repair or replace equipment and retest. All operating systems shall not be accepted without Owner's Representative's written approval.

9. Switchgear Grounding System, Bus Duct and Motor Control Center shall be inspected by an approved independent testing agency or equipment manufacturer. Secure the services of an independent testing agency to test and certify in writing all components of the power distribution system. Provide all testing until acceptance by Owner's Representative.

10. Testing agency shall be NETA certified and shall submit test results on their standard forms.

B Distribution Panelboards:

1. Dead-front, front accessible NEMA 1 enclosure, as indicated, designed for use on a three phase, four wire, 120/208 volt system.

2. Construction: Code gauge galvanized steel fully flanged for strength and rigidity. Doors and trim shall be cold-rolled steel, code gauge. Provide concealed butt hinges and 3-point catch and lock. Provide separately hinged vertical access doors over lug and wiring spaces.

3. Finish: Finish all exposed parts with one coat rust inhibitor and two coats of light grey enamel.

4. Bus Bars: Shall be used throughout and shall be hard-rolled, electrolytic copper of 98% conductivity. Bars shall be factory pre-drilled complete with hardware to accept future field installation of 2 or 3 pole circuit breakers in any combination, complete with adjacent mounting hardware and structural supports. Brace all bus bars for minimum short circuit rating of 42,000 amperes rms symmetrical.

5. Provide 1/2 capacity ground bus with terminal lugs for each feeder shown.

6. Minimum interrupting rating of molded-case circuit breakers shall be at least values shown on single line diagram.

7. Provide handle locking devices for all circuit breakers.

8. Provide engraved bakelite nameplates with minimum 1/4" high letters screwed to panel front and for each circuit protective device in panel. Adhesive not permitted.


END OF SECTION
PART 1 GENERAL

1.1 REFERENCES
A. The General Conditions and Division 1 Requirements shall be included in and made a part of this section, with special attention to:
   1. Section 01400 Quality Control.
   2. Section 01600 Material and Equipment
   3. Section 01660 Product Substitution Requirements.
   4. Section 01700 Closeout Procedures.
B. Related Sections: Division-16 Basic Electrical Materials and Methods sections apply to work specified in this section.
C. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SECTION INCLUDES
A. Extent, location, and details of interior lighting fixture and control system work are indicated on drawings and in schedules.
B. Types of interior lighting fixtures and control equipment in this section include the following:
   1. High-intensity-discharge (HID).
      a. Metal-halide.
   2. Fluorescent.
   3. Incandescent.
   4. Low voltage remote control relay panel (Level 1A).
   5. Low voltage switches and plat

1.3 SUBMITTALS
A. Product Data: Submit manufacturer's product data and installation instructions on each type interior building lighting fixture, lighting control system and components.
B. Shop Drawings: Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in "luminaire type" alphabetical or numerical order, with proposed fixture and accessories clearly indicated on each sheet. Submit details indicating compatibility with ceiling grid system. Submit dimension drawings of all lighting control system components and accessories.
C. Wiring Diagrams: Submit wiring diagrams for interior lighting fixtures showing connections to low voltage relay switching and occupancy sensors controllers. Differentiate between portions of wiring which are manufacturer-installed and portions which are field-installed. Submit typical wiring diagrams for all components including, but not limited to, relay panel, relay and low voltage switches.
D. One Line Diagram: Submit a one line diagram of the low voltage switching system configuration

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proposed if it differs from that illustrated in the riser diagram included in the drawings.

E. Maintenance Data: Submit maintenance data and parts list for each interior lighting fixture and accessory, including "trouble-shooting" maintenance guide. Include that data, product data, and shop drawings in a maintenance manual, in accordance with general requirements of Division 1.

1.4 QUALITY ASSURANCE

A. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC Articles 220, 410, and 510 as applicable to installation, and construction of interior building lighting fixtures and NEC as applicable to electrical wiring work.

2. NEMA Compliance: Comply with applicable requirements of NEMA Stds Pub/No.'s LE 1 and LE 2 pertaining to lighting equipment. Comply with applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.

3. IES Compliance: Comply with IES RP-1 pertaining to office lighting practices and RP-15, regarding selection of illuminance values for interior office lighting.

4. UL Compliance: Comply with UL standards, including UL 486A and B, pertaining to interior lighting fixtures. Provide interior lighting fixtures and components which are UL-listed and labeled. Remote panels are to be UL listed under UL 916 Energy Management Equipment.

5. CBM Labels: Provide fluorescent lamp ballasts which comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

6. FCC Emissions: All assemblies are to be in compliance with FCC emissions standards specified in Part 15 Subpart J for Class A application.

7. Component Pretesting: All components and assemblies are to be factory pretested and burned-in prior to installation.

8. System Support: Factory applications engineers shall be available for telephone support.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver interior lighting fixtures in factory-fabricated containers or wrappings, which properly protect fixtures from damage.

B. Store interior lighting fixtures in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, laid flat and blocked off ground.

C. Handle interior lighting fixtures carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged units or components; replace with new.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate with other work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of interior lighting fixtures with other work.

B. Sequence interior lighting installation with other work to minimize possibility of damage and soiling during remainder of construction.

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PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to that shown on the Fixture Schedule. 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.

2.2 FIXTURES

A. General: Provide lighting fixtures, of sizes, types and ratings indicated; complete with, but not limited to, housings, energy-efficient lamps, lamp holders, reflectors, energy efficient ballasts, starters and wiring. Ship fixtures factory-assembled, with those components required for a complete installation. Design fixtures with concealed hinges and catches, with metal parts grounded as common unit, and so constructed as to dampen ballast generated noise. Ballast must be certified by the California Energy Commission.

B. Wiring: Provide electrical wiring within fixture suitable for connecting to branch circuit wiring as follows: NEC Type AF for 120 volt, minimum No. 18 AWG.

C. Fluorescent Lamp Ballasts: Provide solid state electronic fluorescent lamp ballasts, capable of operating lamp types indicated; with high power factor, rapid-start, and low-noise features; Type 1; Class P; sound-rated A. Electronic ballast shall have a sound rating of 90% minimum power factor and 87% maximum ballast factor, two (2) lamp or three (3) lamp ballasts only, parallel-wired, instant-start operation of T8 lamps.

D. High-Intensity-Discharge Lamp Ballasts: Provide HID lamp ballasts, capable of operating lamp types with ratings indicated; reactor type, high power-factor, core and coil assembly encapsulated in non-melt resin; install capacitor outside ballast encapsulated for easy field replacement.

E. Lamps:
   1. Provide fluorescent lamps of energy saving, T8 RE730SP35 color.
   2. Provide clear/phosphor coated metal halide lamps in wattage indicated.

F. Interior Lighting Fixture Types: As shown on Fixture Schedule.

2.3 LOW VOLTAGE LIGHTING CONTROL

A. Low voltage switching system shall consist of relay panel assemblies, low voltage switches as well as their associated wiring.

B. The relay panels shall be mounted as indicated on the drawings. The numbered relays in the panel shall be wired to control the power to each load as indicated on the Wiring Schedules included on the diagram in the drawings.

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C. Low voltage switches shall be mounted in the spaces as indicated on the plans. Low voltage wiring from the switches and sensors to the relay panels shall be CLASS 2 or CLASS 2P (plenum rated) as required by the National Electrical Code and local standards. Each low voltage wire shall be labeled with the relay number (1-12) at each switch. Use only properly color coded, stranded #20 AWG (or larger) wire as indicated on the drawings. All relays and switches shall be tested after installation to confirm proper operation and the loads recorded on the directory card in each panel.

D. Modular relay panels shall be UL listed and consist of the following:
1. Tub: Empty NEMA 1 enclosure sized to accept an interior with 1-12, GE RR9P relays.
2. Interior: Bracket and circuit board backplane with pre-mounted GE RR9P relays. Interiors shall be sized to accept 1-12 relays. Each relay shall be capable of direct ON/OFF control by a low voltage switch. Relays shall be momentary-pulsed mechanically latching contactors rated at 20 amps, 120 VAC. They shall attach to the interior by a single plug-in connector.
3. Power Supply: Transformer assembly with two 40VA transformers with separate secondaries; one providing power to relays and associated low voltage switches and sensors, the second providing power for accessory devices. Transformers include internal overcurrent protection with automatic reset and metal oxide varistor protection against power line spikes. 120 VAC, 60 Hz, ±10%.
4. Cover: Flush with captive screws in a hinged, lockable configuration. A wiring schedule directory card shall be affixed to the cover's back to allow identification of circuits/relays/loads controlled when the door is open.

E. Work Station Switchbank "A"
1. Provide specification grade standard, configuration momentary pushbutton type switches as shown on drawings.
2. Provide matches specification grade plates as shown on drawings.
3. Provide low voltage switches as follows:
   c. Switches in Detention Electronics Control Panels per Section 17000.

2.4 OCCUPANCY SENSORS
A. As noted on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION
A. Examine areas and conditions under which lighting fixtures are to be installed, and substrate for supporting lighting fixtures. Notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF INTERIOR LIGHTING FIXTURES
A. Install interior lighting fixtures at locations and heights as indicated, in accordance with fixture

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manufacturer’s written instructions, applicable requirements of NEC, NECA’s “Standard of Installation,” NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.

B. Provide fixtures and/or fixture outlet boxes with hangers to properly support fixture weight. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Architect.

C. Install flush mounted fixtures properly to eliminate light leakage between fixture frame and finished surface.

D. Fasten fixtures securely to indicated structural supports; and ensure that pendant fixtures are plumb and level. Provide individually mounted pendant fixtures longer than 2 feet with twin stem hangers. Provide stem hanger with ball aligners and provisions for minimum one inch vertical adjustment. Mount continuous rows of fixtures with an additional stem hanger greater than number of fixtures in the row. See mounting details on Drawings.

E. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer’s published torque tightening values for equipment connectors. Where manufacturer’s torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B, and the National Electrical Code.

F. Support surface mounted fixtures greater than 2 feet in length at a point in addition to the outlet box fixtures stud. Security fixtures shall conform to manufacturer’s mounting requirements.

3.3 FIELD QUALITY CONTROL

A. Replace defective and burned out lamps for a period of one year following the Date of Substantial Completion.

B. At Date of Substantial Completion, replace lamps in interior lighting fixtures which are observed to be noticeably dimmed after Contractor’s use and testing, as judged by Architect.
   1. Refer to Division-1 sections for the replacement/restoration of lamps in interior lighting fixtures, where used for temporary lighting prior to Date of Substantial Completion.

C. Low Voltage Panel:
   1. Inspect for defects and physical damage, labeling, and nameplate compliance with current single line diagram.
   2. Exercise and perform operational tests of all components and other operable devices in accordance with manufacturer’s instruction manual.

3.4 ADJUSTING AND CLEANING

A. Clean interior lighting fixtures of dirt and construction debris upon completion of installation. Clean fingerprints and smudges from lenses.

B. Protect installed fixtures from damage during remainder of construction period.

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C. Upon completion of installation, inspect and clean low voltage panel. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

3.5 GROUNDING

A. Provide equipment grounding connections for interior lighting fixtures as indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounds.

3.6 DEMONSTRATION

A. Upon completion of installation of interior lighting fixtures, and after building circuitry has been energized, apply electrical energy to 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 with retesting.

END OF SECTION
PART 1 GENERAL

1.1 REFERENCES

A The General Conditions and Division 1 Requirements shall be included in and made a part of this section, with special attention to:
1. Section 01400 Quality Control.
2. Section 01600 Materials and Equipment
3. Section 01660 Product Substitution Requirements.
4. Section 01700 Closeout Procedures.

B Related Sections: The following sections contain requirements that relate to this section:
1. See Mechanical Drawings - Liquid Fuel Systems
2. Section 16050 - Basic Electrical and Methods

1.2 SECTION INCLUDES

A The work of this section consists of furnishing engine generator, transfer switch and fuel tank for use as standby power.

1.3 QUALITY ASSURANCE

A Manufacturer's Qualifications: Firms regularly engaged in manufacture of diesel engine-driven generator units and ancillary equipment, of types, ratings and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.

B Codes and Standards:
1. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC Articles 517, 700, 701, and 702 pertaining to construction and installation of emergency and standby systems.
3. UL Compliance: Comply with applicable requirements of UL 486A 1994, "Wire Connectors and Soldering Lugs for use with Copper Conductors," UL 142 fuel tanks.
7. Provide certified test record prior to engine-driven generator set being shipped from factory to project location.
8. The engine generators shall be equipped with the necessary devices to meet current Bay

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Area Air Quality Management District regulations for the operation of a standby diesel generator. Contractor shall obtain a general permit registration number to submit application, pay for, and obtain a BAAQMD permit to construct and operate the standby generators.

1.4 SYSTEM DESCRIPTION

A Extent of diesel generator set work is indicated by drawings and schedules, and is hereby defined to include, but not by way of limitation, diesel engines, electrical generators, engine starting system including batteries, instrument control panels, day fuel tank, annunciator panel, exhaust silencer pipe, fuel piping, weatherproof enclosure, and accessories.

B Types of generator sets required for the project include the following:
   1. Diesel engine-driven generator.

C Concrete and grout for engine-driven generator pads, foundations, frames and bedplates are specified in "Concrete" sections.

D Refer to sections for concrete and grout work required in connection with engine-driven generator sets; not work of this section.

E Vibration control for diesel engine-driven generator units including pads, springs, rails, bases, hangers, and connectors are specified and require structural engineer's certified calculations pertaining to vibration control and isolation.

F Fuel oil tank, piping and associated accessories required for installation of diesel engine-driven generator units are specified in this section.

1.5 SUBMITTALS

A Product Data: Submit manufacturer's data on diesel engine-driven generator sets and components. Include manufacturer's standard product warranty, for duration of not less than one-year, for replacement of materials and equipment used in diesel generator systems.

B Shop Drawings: Submit layout drawings of diesel engine-driven generator units and accessories including, but not limited to, fuel line piping, remote start-stop stations, and instrumentation. In addition, show diesel generator set unit and their spatial relationship to associated equipment. Allow adequate clearance space for removal of engine generator elements for maintenance purposes.

C Wiring Diagrams: Submit wiring diagrams for diesel engine-driven generator unit showing connections to electrical power panels, feeders, automatic transfer switches, and ancillary equipment. Differentiate between portions of wiring that are manufacturer-installed and portions that are field-installed.

D Agreement to Maintain: Prior to time of final acceptance, the Contractor shall submit 4 copies of an agreement for continued service and maintenance of diesel engine-driven generator set, for Contracting Officer's possible acceptance. Offer terms and conditions for furnishing parts and providing continued testing and servicing, including replacement of materials and equipment, for one-year period with option for renewal of Agreement by Contracting Officer.
E  Certifications: Provide diesel engine-drive generator sets certified test record of the following final production testing:
2. Transient and steady-state governing.
3. Safety shutdown device testing.
4. Voltage regulation.
5. Rated power.
6. Maximum power.

F  Vibration isolation certified calculations for Zone 4 installations.

G  General Permit Registration for "pre-permitting" engine generator with Air Quality Management District

1.6 DELIVERY, STORAGE AND HANDLING:

A  Deliver diesel engine-driven generator properly packaged and mounted on pallets, or skids to facilitate handling of heavy items. Utilize factory-fabricated type containers or wrappings for engine-generator and components which protect equipment from damage.

B  Store diesel engine-driven generator equipment in original packaging and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.

C  Handle diesel engine-driven generator equipment carefully to prevent physical damage to equipment and components. Do not install damaged equipment; remove from site and replace damaged equipment with new.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A  Available Manufacturers: Subject to compliance with requirements, manufacturers offering diesel generator sets which may be incorporated in the work include, but are not limited to, the following:
2. Cummins Engine Co. - Cummins West, Inc. 1601 Aurora Dr., San Leadro, CA 94577, tel (510) 351-6101
3. Kohler Co. - Sierra Power Products, 1755 Adams Ave. San Leandro, CA 94577, tel (510) 635-8991
4. Onan Corp; Div of McGraw-Edison Co. - Cummins West, Inc.
5. Waukesha-Engine Div; Dresser Industries Inc. - Sierra Power Products

2.2 RATINGS

A  The generator set shall be diesel powered, 1800 RPM, rated for continuous standby operation at 125 KW, 156 KVA, .80 RF, 277/480, 3 phase, 4 wire. 375 amperes at 3300 feet altitude, 85 degrees F. (29 deg. C.).

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B The generator set shall be capable of picking up 100% load in one step in accordance with NFPA Standard 110, 1996.

C The generator set shall produce no more than ± 0.5% deviation from rated generator terminal voltage on one step application of 100% rated generator set capacity.

D Generator set shall deliver 120 KVA at 10% sustained RMS voltage drop at near zero power factor.

2.3 ENGINE AND EQUIPMENT

A Engine shall be four cycle only, 6 cylinder, 1800 RPM, 103 BHP powered by #2 diesel, water cooled and turbo-charged/after cooled as required. Cylinder block shall have replaceable wet liners.

B Metering:
1. Oil pressure
2. Water temperature
3. Oil temperature
4. Engine speed (rpm)
5. Hours starts counter
6. Engine starts counter
7. DC voltage

C Positive displacement, full pressure, lubrication oil pump. Full flow lubrication oil filters with replaceable spin-on canister elements and dipsticks.

D Engine driven positive displacement fuel pump. Fuel filter with replaceable spin-on canister element. Replaceable dry element air cleaner with restriction indicator.

E Engine mounted battery charging alternator, 65 ampere minimum, and solid-state voltage regulator.

F Jacket water heater, 1500 watts, 120 volt. Thermostatically controlled.

G Electronic governor with adjustable control. Frequency regulation shall be isochronous under varying loads from no load to full load. Frequency variation shall be ± 0.25 percent of rated speed.

H Provide engine mounted radiator including belt-driven pusher fan, water pump and thermostat. Cooling system be rated for full rated load operation in 122°F ambient conditions. Include a duct adapter flange for attachment of an air duct. Guarded rotating parts against accidental contact.

I The engine and generator shall be mounted on a heavy duty steel base with a battery tray with battery holdown clamps within the base. Electrical and fuel stub up shall be within the base rails. Direct-connect generator to fly wheel by semi-flexible steel disk coupling.

2.4 ENGINE STARTING

A Electric starter.

B Control cranking with three crank attempts with rest periods, 75 second minimum. Lock out controls after third attempt.

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C Battery, 24 VDC, lead acid type. Batteries shall provide sufficient capacity to provide 100 seconds cranking. Provide insulated stranded copper conductors to connect batteries to generator starter. Provide with battery heaters.

D Battery charge 120 VAC, 10 amp, 24 VDC, voltage regulated mounted in generator enclosure. Equipment with adjustable float and manual equalize charge settings, and DC voltmeter and ammeter. Provide contact and wiring for indication of low battery voltage on control panel. Charger voltage regulator shall be temperature compensated to prevent thermal damage to batteries.

E DC voltage monitor to detect sustained low voltage (15 VDC or less) during cranking and indicated low or weak battery warning on control panel.

2.5 GENERATOR

A The generator shall be single bearing, four pole, two-thirds pitch, dripproof, and air cooled. The rotor shall have amortissuer windings and be dynamically balanced.

B The subtransient reactance shall not exceed 0.138%.

C Total harmonic distortion shall not exceed 5% of rated voltage; no single harmonic shall exceed 3% of rated voltage.

D The exciter shall be brushless, three phase, with full wave silicon diodes, surge suppressor and exciter circuit breaker.

E Provide permanent magnet generator (PMG) for isolation and sustained 300% short circuit current for 10 seconds. Electronic current boost methods or CT boost methods are not acceptable.

F The insulation system for rotor, stator, exciter and PMG shall be Class H per NEMA MG1-1.66. Temperature rise at full load shall not exceed 130 C at 35kw.

G The voltage regulator shall be 3 phase RMS sensing, temperature compensated, pulse width modulated and ± 0.5% regulation. The regulator shall allow frequency to decline to 58 Hz before correcting the output voltage in a linear volts/hertz manner.

H Shield generator, exciter and regulator to prevent radio frequency interference per provisions of BS.800 and VDE Class G and N.

2.6 GENERATOR CONTROL

A Provide NEMA 1 enclosed control panel mounted on the generator. Include panel light with switch. The control of IEEE-587 1996 for voltage surge resistance. The control panel shall be mounted on the generator and the enclosure door gasketed.

B Control system micro processor based genset monitoring and metering.

C Provide three position RUN/OFF/AUTO switch. In the OFF position, provide a signal light "NOT In AUTO."

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D  Provide the necessary relays, controls and wiring to initiate shutdown upon:
1. Overcrank
2. Overspeed
3. Low oil pressure
4. High engine temperature/low coolant level
5. Overvoltage of 110% for ten seconds
6. Undervoltage below 85% for ten seconds
7. Underfrequency below 90% for twenty seconds

E  Provide digital display to indicate the following alarm and shutdown conditions; provide RESET switch to clear fault:
1. Not in Auto  flashing light
2. Low oil pressure  pre-alarm
3. High engine temperature  pre-alarm
4. Low engine temperature  pre-alarm
5. Low fuel  pre-alarm
6. Low DC voltage  alarm
7. Low voltage (weak battery)  alarm
8. Overload  alarm
9. Circuit breaker (trip or off)  alarm
10. Low oil pressure  shutdown
11. High engine temperature  shutdown
12. Low coolant level  shutdown
13. Overcrank  shutdown
14. Overspeed  shutdown
15. Overvoltage  shutdown
16. Undervoltage  shutdown
17. Underfrequency  shutdown
18. 2 spares (user designated)  alarm or shutdown

F  Metering shall be RMS indicating, 0.5% accuracy, digital.
1. Voltmeter
2. Ammeter
3. Frequency meter
4. Kilowatts
5. Power factor
6. Phase to phase and phase to neutral selector switch

G  Provide voltage and frequency raise and lower ±5%.

H  Provide distribution circuit breaker as shown on drawings. Breaker shall be UL listed molded case, with overload and overcurrent trip. Provide auxiliary contacts for "OFF" and "TRIP" position wired to control panel for alarm.

I  Provide network communication for future remote monitoring of all the indications and audible alarms called for be NFPA Standard 110 as provided on the engine-generator set control panel.

J  In addition provide indications for low fuel shutdown, high battery voltage, battery charger malfunction, alarm silencer and lamp test switches.

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2.7 FUEL OIL TANK


B Provide above ground oil fuel tank constructed of welded steel and pressure tested to 3 PSI, minimum for outdoor use. Interior of tank shall be finished with a rust preventative coating. Tank shall be complete with rupture basin, level gauge, low-level fuel alarm contacts, high-level fuel alarm contacts, fuel in rupture basin alarm contacts, basin drain, threaded pipe connections for fuel lines, manual fill, fuel strainer, strain valve, vent, UL label, weatherproof and other items necessary to comply with local codes.

C All signals and warnings shall be indicated by lights as well as dry contacts for audible alarm. Provide On, OFF, and TEST pushbuttons. Provide fuel oil cooler for engine return fuel.

D Provide check valve for supply line to prevent loss of fuel prime.

E Fuel supply and return lines.
1. Flexible Double-wall Piping System as manufactured by Enviroflex or approved equal.
2. The Double wall piping system shall consist of a UL/ULC listed flexible inner primary pipe contained within a ULC listed flexible outer containment pipe, each making connection within a series of surface access containment chambers. All piping runs shall be continuous, whereby there shall be no fittings or piping connections, for either the primary or secondary containment pipe which are not visible or accessible from above ground. The secondary containment piping shall be sized to allow complete removal of the primary piping without excavation. The secondary containment system shall provide watertight containment of the tank's piping and its associated fittings.
3. All the components of the double-wall piping system shall be compatible with the products to be stored.
4. All components of the double-wall piping system shall be made of non-corrosive materials, or if metallic, such as the fittings and couplings, isolated from corrosion causing agents.
5. The outer secondary containment system shall be of such design and materials to have sufficient strength to withstand the maximum underground burial load and tested in accordance with AASHTO M294. The flexible inner primary piping system shall be capable of withstanding liquid pressure five times greater than the design operating pressures.
6. The outer secondary containment system shall undergo an air pressure hold test (3 to 5 psi) after installation and before the final backfill. The flexible inner primary piping system shall be subject to 60 psi air pressure hold test prior to final backfill.
7. The design of the secondary containment system shall permit any leak in the primary piping system to flow from its source to a surface containment chamber.

2.8 EXHAUST SILENCER

A Provide insulated critical grade silencer as recommended by the generator set manufacture; mounted so the weight is not supported by the engine. Size to assure full load operation without excessive back pressure. Make provisions as required for pipe expansion and contraction. Provide the following:
1. Stainless steel flexible connection between the engine and exhaust line.
2. Condensation drain with manual valve to prevent water from entering the engine.

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3. Exhaust piping through the housing and rain cap.

2.9 VIBRATION ISOLATORS AND SEISMIC CONTROL

A Provide anchor bolts and galvanized steel, of types and sizes indicated.
   1. Furnish anchor bolts to concrete formwork installer with installation drawings and instructions.

B Vibration Isolators
   1. Manufacturers: Caloym, 5572 Alhambra Ave. Los Angeles, CA 90032, tel (213) 223-3882 and or approved equal.
   2. Steel spring vibration isolators shall incorporate the following:
      a. Isolator and restraints shall be of a steel weldment. Cast iron frames are not acceptable.
      b. Reserve deflection (from loaded to solid height) 50 percent of rated deflection with leveling device.
      c. Minimum 1/4 inch thick neoprene acoustical base pad on underside of frame.
      d. Design and installation such that ends of springs remain parallel.
      e. Built-in resilient vertical limit stops and seismic restraint in all directions in accordance with UBC Seismic Zone 4 requirements.
      f. Seismic Calculations signed by a California State Registered Professional Engineer verifying the integrity of the isolator restraint and the anchor shall be provided.

2.10 WEATHERPROOF / RAINTIGHT ENCLOSURES RATED NEMA 3RS.

2.11 LEAK DETECTION SYSTEMS

A Leak detection system furnished with fuel tank.

2.12 TANK FUEL LEVEL INDICATOR AND ALARM SYSTEM:


B Level Indicator
   1. Backlighted digital readout, minimum 0.7 inches high, showing tank level in gallons, smallest reading one gallon.
   2. Tank and fuel characteristics contained in preprogrammed non-volatile field-replaceable databases. Protected power supply.
   3. Locate all indicators, selector switches, alarms on face of fuel tank control panel.

C High and low level alarm system
   1. Automatic continuous on-line monitoring of all tanks.
   2. Visual and audible indicators combined with level indicator panel. Identify the tank which is in alarm condition.

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4. Interface with engineering control system to indicate tank level and alarm conditions.

5. Remote visual and audible high level alarms adjacent to tank fillbox locations (tank identification not required).

6. Low level alarm actuation adjustable 0-25 percent of tank capacity. High level alarm actuation adjustable 75-100 percent of tank capacity.

D  Float type mounted level sensors
1. Permitted only for diesel oil tanks where instrument air is not available.
2. Float shall be designed for installation and removal through a two inch diameter vertical pipe mounted in the top of the tank.

E  Performance: Resolution 0.07 inch of fluid height, accuracy ±0.25 inch of fluid height. Not sensitive to fuel temperature changes (except when float-type level sensors are permitted).

F  Code Conformance: NFPA-70 1996

2.13 AUTOMATIC TRANSFER SWITCH (ATS)

A  Manufacturers: Subject to compliance with requirements, provide ATS of one of the following:
1. Russelectric - Harold Wells, Assoc. 6375 Clare Ave., Suite 102, Dublin, CA 94568, tel (510)829-1010
2. Automatic Switch Co. (ASCO) - Sierra Sales, Eng. 5690 Sonoma Dr. Pleasanton, CA 94566, tel (510) 484-2250.
3. Onan Corp; Div. of McGraw-Edison Co. - Cummins West Inc. 1601 Auroa Dr., San Leandro, CA 94577, tel (510)351-6101

B  Provide 200 amp, 277/480 V, 3 pole, UL 1008 listed automatic transfer switch with close and withstand rating not less than 42,000 RMS symmetrical amperes for use with circuit breaker. Rating shall be obtained without contact welding. The close and withstand rating shall be verified by UL witnessed test on representative test samples and shall be the rating in UL listing procedures for the transfer switches supplied.

C  Provide by-pass isolation capability for ATS.

D  Connect ATS emergency source to engine generator and normal source to Lassen Municipal Utility Dept. powered through main switchboard "SB"

E  Provide IN Main Switchboard line up enclosure with lockable doors. Enclosing dead front construction with control devices mounted on dead front enclosure.

F  ATS Construction:
1. 600 volts, contractor type, over-center mechanism, double-throw construction, positive electrically and mechanically interlocked to prevent simultaneous closing, and mechanically held in both normal and emergency positions. Transfer switch using interlocked circuit breaker or molded case switch are not acceptable.
3. Contacts shall be a high-pressure, silver alloy with separate arching contacts. Arc chutes shall be made of heat absorbing material and include metal leaves and arc chutes insulating

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4. Neutral contact shall be of the same design and have the same steady state, withstand and closing rating as phase contacts. Neutral and phase contacts shall be mounted on a common crossbar arranged for simultaneous switching.

5. Provide fully rated lugs for normal, emergency, load and neutral conductors inside cabinet. Power switching contacts and cable connections shall have transparent protective cover for protection and visual inspection.

6. By-pass isolation switch shall be rated for full load manual operation. Mount in same enclosure as ATS.

G ATS automatic controls:

1. Provide electronic controls, front accessible, mounted inside the cabinet door. All adjustable voltage sensors and time delays shall be solid state. Provide control disconnect plugs to de-energize control circuits for service and testing. Controls shall meet IEEE-587-1980 requirements for surge withstand.

2. Utility voltage sensors shall be a close differential type that monitor each phase individually. Voltage averaging is not acceptance. Monitor shall be temperature compensated; pick-up shall be adjustable from 85% to 98% of nominal voltage, set at 90%; dropout shall be adjustable form 75% to 98% of pick-up, set at 85%.

3. Generator voltage sensors shall be close differential type that monitor each phase individually. Frequency sensors shall monitor emergency source with pick-up set at 95% of nominal frequency.

4. Operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred. Maximum transfer time in either direction shall be six (6) cycles unless otherwise specified.

5. Provide the following time delays and components:
   a. Start delay 0 to 5 seconds set at 2.
   b. Transfer to emergency delay set at 0 seconds.
   c. Retransfer to normal delay 0 to 30 minutes set at 10.
   d. Retransfer delay by-pass, key operated.
   e. Unloaded running delay, 0 to 10 minute set at 5.
   f. Delay transition, both directions, isolating load from both sources, 0.5 - .5 seconds, set at 1 second.
   g. Test switch, key operated with and without transfer.
   h. Four pilot lights for ATS position and source available.
   i. Engine start contacts wired to terminal block.
   j. Auxiliary contacts on both normal and emergency wired to terminal block.
   k. Electronic exerciser 7 day, load/no load transfer.

H Controls for ATS shall automatically transfer load to emergency source if normal source fails and close engine start contacts for engine generators. Retransfer load to normal source when normal source is available.

PART 3 EXECUTION

3.1 EXAMINATION

A Examine areas and conditions under which diesel engine-driven generator is to be installed and
notify the Contracting Officer in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLATION OF DIESEL ENGINE-DRIVEN GENERATOR SETS AND TRANSFER SWITCH

A Install diesel engine-driven generator units as indicated, in accordance with the equipment manufacturer's written instructions, and with recognized industry practices, to ensure that engine-generator units fulfill requirements. Comply with NFPA and NEMA standards pertaining to installation of engine-generator sets and accessories.

B Coordinate with other work, including raceways, electrical boxes and fittings, fuel tanks, piping and accessories, as necessary to interface installation of engine-generator equipment work with other work.

C Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A, B and the National Electrical Code.

D Install units on vibration isolators in accordance with Division-15 section; and comply with manufacturer's indicated method of installation.

E Connect fuel oil piping to alternative generator equipment as indicated, and comply with manufacturer's installation instructions.

F Align shafts of engine and generator within tolerances recommended by engine-generator unit manufacturer.

3.3 GROUNDING

A Provide equipment grounding connections for diesel engine-driven generator units as indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounding.

3.4 FIELD QUALITY CONTROL

A Start-up Testing:

1. Engage local equipment manufacturers representative to perform start-up and building load tests upon completion of installation, with the Contracting Officer in attendance; provide certified test record. Tests are to include the following:
   a. Check fuel, lubricating oil, and antifreeze in liquid cooled models for conformity to the manufacturer's recommendations under environmental conditions present.
   b. Test prior to cranking engine for proper operation, accessories that normally function while the set is in a standby mode. Accessories include: engine heaters, battery charger, generator strip heater.
   c. Check, during start-up test mode, for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and phase rotation.
d. Test, by means of simulated power outage, automatic start-up by remote-automatic starting, transfer of load, and automatic shut-down. Prior to this test adjust, for proper system coordination, transfer switch timers. Monitor throughout the test, engine temperature, oil pressure, battery charge level, generator voltage, amperes, and frequency.

2. Upon completion of installation demonstrate capability and compliance of system with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting. Initial testing and retesting to be at no cost to Government.

3.5 PERSONNEL TRAINING

A Building Operating Personnel Training: Train Government's building personnel in procedures (minimum 2 hours) for starting-up, testing and operating diesel engine-driven generator sets. In addition, train Government's personnel in periodic maintenance of batteries.

3.6 Leak Test

A Test carrier pipes with air pressure at 100 pounds per square inch gage, and test the containment piping with air pressure at eight pounds per square inch gage. Systems shall hold the pressure for 30 minutes. Repair all leaks and retest.

3.7 INSTALLATION, TANK FUEL LEVEL INDICATOR AND ALARM SYSTEM

A Wiring shall conform to NFPA-70 1996.

B Level indicator and alarm panel mounted on fuel tank control panel.

C High level alarm mounted on fuel tank control panel.

END OF SECTION

LRS Architects, Inc.
PART 1 GENERAL

1.1 REFERENCES

A The General Conditions and Division 1 Requirements shall be included in and made a part of this section, with special attention to:

1. Section 01400 Quality Control.
2. Section 01600 Material and Equipment
3. Section 01660 Product Substitution Requirements.
4. Section 01700 Closeout Procedures.

1.2 SECTION INCLUDES

A Provide microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, auxiliary control devices, annunciators, and wiring.

B System shall be connected to existing Notifier System 5000 Control Panel.

1.3 SUBMITTALS

A As specified in Sections 01300 and 01730.

B Submit manufacturer's literature for detectors, manual stations, control panel including all required modules, alarm bells, horns, wire and raceway, detector removal tool, detector tester, batteries, and telephone dialer.

C Submit operation and maintenance data in accordance with Section 01730.

D Shop Drawings:
1. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts. Point-to-point diagram shall be project specific and a complete system layout including floor plans and programming matrix.
2. Show annunciator layout, configurations, and terminations.
3. Show interface requirements for existing Fire Alarm System to new Fire Alarm Control.
4. Provide programming matrix for fire alarm control panel and network communications system.

1.4 QUALITY ASSURANCE

A The system and all individual components shall meet the requirements of NEC, NFPA, and UL. Individual components shall be UL listed.

B The complete commercial system shall be provided by one manufacturer.

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C References:

1.5 PROJECT REQUIREMENTS

A System shall be programmed by Owner’s Agent and final connections to existing system shall be under Owner’s Agent.

1.6 CLOSEOUT SUBMITTALS

A As specified in Section 01700 and 01730. Submit operation and maintenance data listing equipment; technical data sheet; wiring diagrams of internal wiring for each piece of equipment and point-to-point diagram interconnections between the items of equipment; as-built drawings. Provide documentation of programming entered into the fire alarm panel and network communication computer.

2 PRODUCTS

2.1 MAIN DETECTOR SYSTEM

A Provide Notifier (Northford, Ct. 06472, Tel. (208)484-7161) Model AFP-200 microprocessor based Central Processing Unit (CPU) or approved equal. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, annunciators, and other system controlled devices.

B General Operation
1. Use existing Fire Alarm Control Panel.

C Display (existing):
1. Provide all the controls and indicators used by the system operator to program all system operational parameters.
2. Display status information and custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
3. Provide an 80-character back-lit alphanumeric Liquid Crystal Display (LCD). It shall also provide 5 Light-Emitting-Diodes (LEDs), that will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, SIGNAL SILENCED, SUPERVISORY, and PRE-ALARM.
4. Provide a 21-key touch key-pad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
5. Provide the following operator functions: SIGNAL SILENCE, RESET, DRILL, and ACKNOWLEDGE.
D Signaling Line Circuit (SLC):
1. The SLC interface shall provide power to and communicate with up to 99 intelligent detectors (Ionization, Photoelectric, or Thermal) and 99 intelligent modules (monitor or control) for a system capacity of 198 devices. This shall be accomplished over a single SLC loop and shall be capable of NFPA 72 Style 4, Style 6, or Style 7 wiring.
2. The Loop Interface Board shall receive analog information from all intelligent detectors that shall be processed to determine whether normal, alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector’s desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
3. Detector software shall meet NFPA 72, chapter 7 requirements and be certified by UL as a calibrated sensitivity test instrument, and allow manual or automatic sensitivity adjustment.
4. All manual stations shall be keyed for a CAT 15 key system.

2.2 SYSTEM COMPONENTS

A Programmable Electronic Sounders
1. Notifier Model #PA400R mini horn, flush mounted 24 VDC nominal. Electronic Sounders shall be field programmable without the use of special tools, to provide slow whoop, continuous, or interrupted tones with an output sound level of at least 90 dBA measured at 10 feet from the device.

B Strobe Lights:
1. Notifier Model #PS412 24 VDC.
2. Shall meet the requirements of the ADA as defined in UL standard 1971 and shall meet the following criteria:
   a. The maximum pulse duration shall be 2/10ths of one second.
   b. The strobe intensity shall meet the requirements of UL 1971.
   c. The flash rate shall meet the requirements of UL 1971.
   d. The appliance shall be placed 80 inches (2,030 mm) above the highest floor level within the space, or 6 inches (152 mm) below the ceiling, which ever is the lower.

C Audible/Visual Combination Devices: Notifier Model #PA400R/PS424 mini-horn/strobe.

D Addressable Devices - General:
1. Addressable Devices shall use simple to install and maintain decade (numbered 1 to 10) type address switches. Devices which use a binary address setting method, such as a dip switch are not acceptable.
2. Detectors shall be Intelligent and Addressable, and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuits.
3. Addressable smoke and thermal detectors shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.
4. Smoke detector sensitivity shall be set through the Fire Alarm Control Panel.

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5. Using software in the FACP, detectors shall automatically compensate for dust accumulation.

6. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. An optional base shall be available with a built-in (local) sounder rated at 85 DBA minimum.

7. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

8. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

E Addressable Pull Box (manual station):
1. Notifier #BGX-1011 Addressable Pull Boxes shall, on command from the Control Panel, send data to the panel representing the state of the manual switch.

2. Manual Stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.

3. Stations shall be suitable for semiflush mounting as shown on the plans.

F Intelligent Ionization Smoke Detector
1. Notifier #CPX551 detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

G Intelligent Ionization Duct Smoke Detector
1. Duct Detector Notifier #DCPX551. Coordinate with Division 15000.

H Water flow Switches:
1. Notifier flow switches shall be integral, mechanical, non-coded, non-accumulative retard type.

2. Flow switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30 – 45 seconds.

3. Flow switches shall be located a minimum of one (1) foot from a fitting that changes the direction of the flow and a minimum of three (3) feet from a valve.

I Sprinkler Valve Supervisory Switches:
1. Each sprinkler system water supply control valve riser or zone control valve, and each system riser control valve shall be equipped with a supervisory switch.

2. Each Post Indicator Valve (PIV) or main gate valve (O.S.&Y.) shall be equipped with a supervisory switch.

3. Switch not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

4. The mechanism shall be contained in a weatherproof aluminum housing, that shall provide a 3/4 inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.

5. Switch housing to be finished in red baked enamel.

6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

J Intelligent Thermal Detectors:
1. Model FDX-551 detectors shall be intelligent addressable devices rated at 135 degrees fahrenheit (58 Celsius) and have a rate-of-rise element rated at 15 degrees F. (9.4 C.) per minute. It shall connect via two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 99 intelligent heat detectors may connect to one SLC loop.
2. The detectors shall use an electric sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.
3. An optional intelligent heat detector shall be available for applications which do not require a rate-of-rise element.

2.3 WIRE
A Wiring shall not be less than 18 AWG (1.02mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63mm) for Notification Appliance Circuits.
B Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop.
C All field wiring shall be completely supervised.
D The Fire Alarm Control panel shall be capable of T-Tapping Class B (NFPA Style 4) Signaling Line Circuits (SLC's).
E Mixed Category Circuitry not permitted for Initiating circuits (manual, smoke, water flow). Mixed Category Circuitry permitted for Signaling Devices connected to intelligent reporting (horns, strobes).
F Provide separate dedicated branch circuit 120 volts, 20 ampere to FACP.

2.4 BATTERIES
A Shall be 12 volt, Gel-Cell type (two required).
B Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
C The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

2.5 KEY OPERATED DEVICES
A Provide keyed for CAT 15 keyed system.

LRS Architects, Inc.
3 EXECUTION

3.1 INSTALLATION

A Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

3.2 TEST

A Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
3. Verify activation of all flow switches.
4. Open initiating device circuits and verify that the trouble signal actuates.
5. Open and short signaling line circuits and verify that the trouble signal actuates.
6. Open and short Notification Appliance Circuits and verify that trouble signal actuates.
7. Ground all circuits and verify response of trouble signals.
8. Check presence and audibility of tone at all alarm notification devices.
9. Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.
10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
11. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

END OF SECTION

LRS Architects, Inc.
PART 1 GENERAL

1.1 REFERENCES
A The General Conditions and Division 1 Requirements shall be included in and made a part of this section, with special attention to:
   1. Section 01400 Quality Control.
   2. Section 01600 Materials and Equipment
   3. Section 01660 Product Substitution Requirements.
   4. Section 01700 Closeout Procedures.
B Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SECTION INCLUDES
A The work of this section consists of furnishing and installing a complete system.
B Communications System wiring complete as shown and specified.
   1. Telephone System
   2. Data System
C Provide an internal communications distribution raceway system with cabling and outlets as shown on Drawings.
D Provide outlet connectors as herein specified and as shown on Drawings.
E Existing main telephone/data distribution frame (MDF) with incoming service cables furnished and installed by the Owner.

1.3 COORDINATION:
A Coordinate all work with Division 17000 and telephone company.
B Owner to provide:
   1. Incoming service cables via the existing site pull boxes and conduits (See E-2).
   2. All telephone instruments.
C Main terminal plywood backboard supplied and installed under Section 16740.

1.4 QUALITY ASSURANCE
A Section 16010. The telephone data communication raceway and cabling system and other facilities shall meet the requirements of the local telephone company.

1.5 SUBMITTALS

LRS Architects, Inc.
A As specified in Section 01300. Submit Shop Drawings, manufacturer's literature for outlet boxes, cable, connectors and all covers.

B Closeout Submittals: As specified in Section 01700 and 01730. Submit operation and maintenance data for outlets and cable.

1.6 DEFINITION

A Bedding and backfill material types are defined in Section 02221.

PART 2 PRODUCTS

2.1 GENERAL

A New and proper type of systems and conform to Section 16050: Basic Materials and Methods of this specification and as shown on Drawings.

B Color code all wiring in an approved manner. Tag all wires in terminal cabinets with T&B #TY5532M inch TY-RAP inch, Panduit (Tinley Park, Ill. 60471, Tel. (708) 532-1800) or approved equal. Tag on wire with inked identification. Use terminal blocks for cable terminations at plywood backboard.

C Outlet Boxes: As specified in Basic Materials and Methods Section 16050 or as noted on Drawings or herein.

2.2 TELEPHONE/DATA SYSTEMS

A Cable from terminal blocks to individual phone and data outlets shall be solid annealed copper four (4) for phone and four (4) data individual twisted pairs #24AWG. Overall jacket shall be PVC, beige for data wiring and gray for telephone wiring. The colors of the wire pairs shall be blue, orange, green and brown. Type CM for general use and type CMR for riser per NEC 800. The telephone/data cable shall be AT&T (San Francisco, CA 94105, Tel. (415) 543-6979) #DIW 24 W1000, Belden (Richmond, IN 47375 Tel. (317) 983-5200) or approved equal.

B Telephone/Data cables shall be level 5 rated with the following characteristics:
  Max. attenuation per 1000 ft. - 17/30db (4/10MHz)
  Min. near end cross talk per 1000 ft. - 36/26db (4/10MHz)
  AT&T #1010 comm-code 106 300 106, Anixter or approved equal.

C Above slab, interior distribution cable shall be PVC insulated, 24 AWG for telephone and 22 AWG for data, solid copper, unshielded, CMR and/or CMP rated as applicable. REA PE 71, Bell Lab specification L780011, Anixter (San Francisco, CA 94105 Tel. (415) 543-6070), CMR XXX22 or 24EAA or approved equal.

D Stand alone telephone outlets (except wall mounted telephone outlets) shall consist of an Amp (Harrisburg, PA, Tel. (800) 722-1111), modular communication outlet system. Provide an unshielded connector housing and two edge connectors, Amp 555600-1. Connect bottom edge connector to telephone cable. Top edge connector is not to be terminated at this time. Mount on 4 inch square
x 2-1/8 inch deep with 1 inch K.O. and double gang ring, flush box. Install double gang faceplate with right side blank (Amp 556340-1) and 2 blank inset covers (Amp 555644-1).

E Wall telephone outlets shall be 6 wire with provisions for installing a modular wall telephone set. Outlet shall consist of stainless steel faceplate with metal cadmium plated mounting bracket and 6 position modular jack. Arringer (San Francisco, CA. 94105, Tel. (415)543-6070) model AA-630A6, AT&T or approved equal. Utilize 3-pair cable.

F Combined telephone/data outlets shall consist of an Amp modular communications outlet system. Provide an unshielded connector housing and two edge connector to telephone cable and top edge connector to data cable. Mount on 4-1/16 inch square x 2-1/8 inch deep with 1-1/4 inch K.O. flush box with double gang ring. Install double gang faceplate with right side blank (Amp 556340-1) and 2 blank inset covers (Amp 555644-1). Utilize 4-pair cable for telephone and 4-pair cable for data.

G Data only outlets—same as telephone only outlets above except connect 4-pair cable to top edge connector and leave bottom edge connector unterminated.

H Data outlets, non-wall telephone outlets and telephone/data outlets shall consist of a modular system in which cables are connected to a connector rather than directly to a jack or other outlet device. Each outlet shall provide two connector positions and it shall be possible to mount two outlet boxes side-by-side in a double gang box. The following jacks shall be able to plug into the connector: single RJ-11; dual (4 wire) RJ-11; RJ-45; BNC with balun IEEE 802.5, or approved equal. The outlet system shall be Amp Inc. communications outlet model 555600-1 with jacks 555611-1 (single RJ-11) or 555614-1 (dual RJ-11).

I At public phones provide 3/4 inch conduit with 3 pair 24 AWG wire.
   1. Stub out at 48 inches from floor.
   2. Provide mounting hardware as required by telephone company.

PART 3 EXECUTION

3.1 INSPECTION

A Examine systems which required interfacing.

B Ascertain wiring requirements to assist in preparation of point-to-point diagrams.

3.2 INSTALLATION

A Telephone and Data Wiring:
   1. Main trunks run in conduit as shown on drawings.
   2. Field device outlets run in metal raceway from outlet to terminals as shown.
   3. Terminate 4 pair wiring at each phone and data outlet per color code below. On combined telephone/data outlets, the telephone line shall be connected to the bottom jack.

<table>
<thead>
<tr>
<th>Amp. Edge Connector</th>
<th>RJ-11 Wire</th>
<th>Terminal No.</th>
<th>Station Wire Conductor Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>1</td>
<td>White with Blue Stripe</td>
<td></td>
</tr>
</tbody>
</table>

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4. All twisted pair cables shall be terminated on punch blocks at the cable closet.

**B** Data and Telephone: Each conductor shall be tested for continuity and transpositions between outlet and termination block.

**C** Test all other systems for correct operation and demonstrate to contacting officer as required.

**D** Twisted pair distribution: Each conductor in multipair cables shall be tested for continuity, transpositions, shorts, grounds/FEMF (Foreign Electromotive Force).

### 3.3 GROUNDING

**A** Install one ground conductor in 1/2-inch conduit from the telephone cabinet or terminal board to the electrical service ground source. Provide grounding bushings and ground conduit to grounding conductor at each end of conduit. Provide a 48-inch loop of conductor at multiple services data terminal end.