

Ned O'Brien Ice Rink
Refrigeration Equipment &
Mechanical Room
Renovation

PROJECT MANUAL

ICE RINK CONSULTANT
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SECTION 01731 - CUTTING AND PATCHING

1.1 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.

1.2 DEFINITIONS

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 3. Products: List products to be used and firms or entities that will perform the Work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 - 1. Water, moisture, or vapor barriers.
 - 2. Membranes and flashings.
 - 3. Equipment supports.
 - 4. Piping, ductwork, vessels, and equipment.

- D. site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.

- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 3. Excavating and Backfilling: Comply with industry standards for backfill and compaction prior to patching concrete slab. Install where required by cutting and patching operations.
 - 4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 5. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

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2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors: Install and compact backfill in compliance with industry standards. Replace vapor barrier by lapping onto existing and taping with min 6" overlap. Drill #4 dowels into side of existing slab edge 24" oc with 8" embedment. Install galvanized mesh in slab above vapor barrier. Apply concrete sealer when slab is cured. Concrete patch to be #3,000 mix.

END OF SECTION 01731

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Reinforcing steel.
 - 4. Masonry joint reinforcement.
 - 5. Ties and anchors.
 - 6. Miscellaneous masonry accessories
 - 7. Miscellaneous loose steel lintel angles and plates
- B. Products installed, but not furnished, under this Section include the following:
 - 1. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section Steel Doors and Frames.

1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following net-area compressive strengths (f_m) at 28 days. Determine compressive strength of masonry by testing masonry prisms according to ASTM C 1314 UBC Standard 21-17.
 - 1. For Concrete Unit Masonry: $f_m = 2500$ psi.

1.5 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- B. Shop Drawings: Show fabrication and installation details for the following:
 - 1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.

2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
 - C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
 - D. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
 1. Each type of masonry unit required.
 - a. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
 2. Mortar complying with property requirements of ASTM C 270.
 - E. Hot Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with hot-weather requirements.
- 1.6 QUALITY ASSURANCE
- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.
 - B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
 - C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
 1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.
 - B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
 - C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
 - D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

- A. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:
 - 1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
 - 2. Provide bullnose units for outside corners, unless otherwise indicated.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
 - 2. Weight Classification: Normal weight.
 - 3. Provide Type I, moisture-controlled units.
 - 4. Size (Width): Manufactured to the following dimensions:
 - a. 8 inches nominal; 7-5/8 inches actual.
 - 5. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.2 MORTAR AND GROUT MATERIALS

- A. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
- B. Masonry Cement: ASTM C 91.
- C. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- D. Aggregate for Grout: ASTM C 404.
- E. Water: Potable.
- F. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

G. Products: Subject to compliance with requirements, provide one of the following:

1. Mortar Cement:
 - a. Magnolia Superbond Mortar Cement; Blue Circle Cement.
 - b. Lafarge Mortar Cement; Lafarge Corporation.

2.3 REINFORCING STEEL

A. Uncoated Steel Reinforcing Bars: ASTM A 617/A 617M, Grade 60.

2.4 MASONRY JOINT REINFORCEMENT

A. General: ASTM A 951 and as follows:

1. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
2. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
3. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.

B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c.

2.5 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.

B. Mill Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 641, Class 1 coating.

C. Wire: Fabricate from 3/16-inch diameter, hot-dip galvanized steel wire.

2.6 RIGID ANCHORS

A. General: Fabricate from steel bars as follows:

1. 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.
2. As indicated.
3. Finish: Hot-dip galvanized to comply with ASTM A 153.

B. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Type: Chemical anchors.
2. Type: Expansion anchors.

3. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
4. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.
 1. Provide units with either two loops or four loops as needed for number of bars indicated.

2.8 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270 Property Specification.
 1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
 2. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement, mortar cement, and lime.
 3. For interior non-load-bearing partitions; a use Type N or RN.
- D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

2.10 SOURCE QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:
 1. Payment for these services will be made by Owner.
 2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
- B. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
 1. Mix units from several pallets or cubes as they are placed.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 20 feet, nor 1/4 inch maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/8 inch in 10 feet, nor 1/4 inch maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 20 feet, nor 1/4 inch maximum.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
 - 1. One-half running bond with vertical joint in each course centered on units in courses above and below.
- C. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- D. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
- E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- F. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.

3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- C. Cut joints flush for masonry walls to receive painted finish.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 1. Space reinforcement not more than 16 inches o.c.
 2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 LINTELS

- A. Install 8" x 8" re-enforced precast concrete lintel above new doorway in masonry wall.
- B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
 1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by the same method used for concrete masonry units.
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.8 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
 1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

- B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 .
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
 - 1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.9 FIELD QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform field quality-control testing indicated below.
 - 1. Payment for these services will be made by Owner.
 - 2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
- B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.
- C. Mortar properties will be tested per ASTM C 780.
- D. Grout will be sampled and tested for compressive strength per ASTM C 1019.
- E. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.
- F. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.
- G. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM C 1314, and as follows:
 - 1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

3.10 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.11 MASONRY WASTE DISPOSAL

- A. Recycling: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Disposal as Fill Material: Dispose of clean masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
- C. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04810

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes sealants for the following applications, including those specified by reference to this Section:
- B. This Section includes sealants for the following applications:
 - 1. Fire caulk & Sealant:
 - a. Fire caulking / sealant at perimeter of framed, rated ceiling construction and at penetrations in masonry walls and gypsum board ceiling.
 - 2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Perimeter joints between interior wall surfaces and frames of interior doors.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
 - 2. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified in the sealant schedules at the end of Part 3.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

2.4 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type C: Closed-cell material with a surface skin.
 - 2. Type O: Open-cell material.
 - 3. Type B: Bicellular material with a surface skin.
 - 4. Type: Any material indicated above.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

JOINT SEALANTS

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
- F. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealants from surfaces adjacent to joint.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.
 - 5. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without

deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.6 PRODUCTS

- A. Mildew-Resistant Silicone Sealant : provide products formulated with fungicide that are intended for sealing interior ceramic tile joints and toilet fixtures and sinks that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:
 - 1. Products: Available products include the following:
 - a. 786 Mildew Resistant; Dow Corning.
 - b. 898 Silicone Sanitary Sealant; Pecora Corporation.
 - c. Tremsil 600 White; Tremco.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 25.

- B. Fire Caulking: provide products formulated to provide one hour separations in masonry walls and perimeter of gypsum board walls that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:
 - 1. Products: Available products include the following:
 - a. 3M Fire Barrier Sealant
 - b. Hilti FS1 Max

END OF SECTION 07920

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

pSteel doors.

- 2. Steel door frames (one double pair; 3'-0" x 7'-0")
- 3. Fire-rated door and frame assemblies.

1.3 DEFINITIONS

- A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.4 SUBMITTALS

- A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
- B. Shop Drawings: Show the following:
 - 1. Elevations of each door design.
 - 2. Details of doors including vertical and horizontal edge details.
 - 3. Frame details for each frame type including dimensioned profiles.
 - 4. Details and locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, accessories, joints, and connections.
 - 7. Coordination of glazing frames and stops with glass and glazing requirements.
- C. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.
- D. Oversize Construction Certificates: For door assemblies required to be fire-protection rated and exceeding size limitations of labeled assemblies.

1.5 QUALITY ASSURANCE

- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
 - 1. Test Pressure: Test at atmospheric pressure.
 - 2. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.
- C. Store doors and frames at building site under cover. Place units on minimum **4-inch** high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum **1/4-inch** spaces between stacked doors to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel **Doors and** Frames:
 - a. Amweld Building Products, Inc.
 - b. Benchmark Commercial Doors; a division of General Products Co., Inc.
 - c. Ceco Door Products; a United Dominion Company.
 - d. Curries Company.
 - e. Pioneer Industries Inc.
 - f. Republic Builders Products.

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

2.3 DOORS

- D. Doors: Provide galvanized doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

2.3 FRAMES

- A. General: Provide steel frames with details indicated for type and profile. Conceal fastenings, unless otherwise indicated. All frames, frames to be galvanized.
- B. Frames of 0.067-inch thick steel sheet for:
 - 1. Level 3 steel doors
- C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.
- D. Plaster Guards: Provide 0.016-inch thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.
- E. Supports and Anchors: Fabricated from not less than 0.042-inch thick, electrolytic zinc-coated or metallic-coated steel sheet.
 - 1. Wall Anchors in Masonry Construction: 0.177-inch diameter, steel wire complying with ASTM A 510 may be used in place of steel sheet.
- F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

2.4 FABRICATION

- A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
- B. Door Construction: fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.

- C. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.
- D. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:
 - 1. Rigid mineral-fiber board.
- E. Single-Acting, Door-Edge Profile: Beveled edge
- F. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- G. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- H. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- I. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
- J. Frame Construction: Fabricate frames to manufacturers standard shapes.
 - 1. Provide welded frames with temporary spreader bars.
- K. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- L. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

2.5 FINISHES

- A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Place frames before construction of enclosing walls and ceilings.
 - 2. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.

3. Install fire-rated frames according to NFPA 80.
- C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
 1. Fire-Rated Doors: Install within clearances specified in NFPA 80.

3.2 ADJUSTING AND CLEANING

- A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

SECTION 08330 – INSULATED ROLL-UP DOOR

1) PART 1 GENERAL

1.1 SUMMARY

- A Section Includes: Manual overhead insulated rolling doors.

1.2 SYSTEM DESCRIPTION

A Design Requirements:

- 1 Wind Loading: Supply doors to withstand up to 50 psf maximum wind load.
- 2 Cycle Life:
 - a Design doors of standard construction for normal use of up to 20 cycle per day maximum.
- 3 Insulated Door Slat Material Requirements:
 - a Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84.
 - b Minimum Sound Transmission Class (STC) rating of 26 as tested per ASTM E90.
 - c Minimum R-value of 8.0 (U-factor of 0.125) as calculated using the ASHRAE Handbook of Fundamentals.
 - d Insulation to be CFC Free with an Ozone Depletion Potential (ODP) rating of zero.

1.3 SUBMITTALS

A submit the following items:

- 1 Product Data.
- 2 Shop Drawings: Include special conditions not detailed in Product Data. Show interface with adjacent work.
- 3 Quality Assurance/Control Submittals:
 - b Provide proof of manufacturer and installer qualifications - see 1.4 below.
 - c Provide manufacturer's installation instructions.
- 4 Closeout Submittals:
 - a Operation and Maintenance Manual.
 - b Certificate stating that installed materials comply with this specification.

1.4 QUALITY ASSURANCE

A Qualifications:

- 1 Manufacturer Qualifications: aa minimum of five years experience in producing doors of the type specified.
- 2 Installer Qualifications: Manufacturer's approval.

1.5 DELIVERY STORAGE AND HANDLING

- B Follow manufacturer's instructions.

1.6 WARRANTY

- A Standard Warranty: Two years from date of shipment against defects in material and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURER

A Manufacturer: Cornell Iron Works, Inc., Crestwood Industrial Park, Mountaintop, PA 18707. Telephone: (800) 233-8366, Fax: (800) 526-0841. Underwriters Laboratories, Inc. (UL), ISO 9001:2008 Registered.

B Model: ESD20

2.2 MATERIALS

A Curtain:

- 1 Slat Material: No. 6F, (Listed Exterior/Interior):
 - a Galvanized Steel/Galvanized Steel: 20/24, 18 gauge, Grade 40, ASTM A 653 galvanized steel zinc coating.
 - b Insulation: 7/8 inch foamed-in-place, closed cell urethane.
 - c Total Slat Thickness: 15/16 inch.
 - d Slats have a Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84.
 - e Slat has an R-value of 8.0 and an STC rating of 26.
- 2 Bottom Bar: Reinforced extruded aluminum interior face with full depth insulation and exterior skin slat to match curtain material and gauge.
- 3 Fabricate interlocking sections with high strength cast iron endlocks on alternate slats each secured with two 1/4" rivets. Provide windlocks as required to meet specified wind load.
- 4 Exterior Slat Finish:
 - a GalvaNex™ Coating System to include an ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation of a chemical bonding, light gray baked-on polyester base coat and a light gray baked-on polyester finish coat. The scientific organic material composition and chemical bonding process of GalvaNex™ produces a superior finish against corrosion and abrasion. GalvaNex™ components include a limited two year finish warranty.
- 5 Interior Slat Finish:
 - a GalvaNex™ Coating System to include an ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation of a chemical bonding, light gray baked-on polyester base coat and a light gray baked-on polyester finish coat. The scientific organic material composition and chemical bonding process of GalvaNex™ produces a superior finish against corrosion and abrasion. GalvaNex™ components include a limited two year finish warranty.
- 6 Curtain Configuration
 - a Standard Curtain configuration.
- 7 Bottom Bar Finish:
 - a Exterior Face: Match slats.
 - b Interior Face: Powder coat to match slats.
- 8 Bottom Bar Configuration:
 - a Standard Bottom Bar Configuration.

B Guides: Fabricate with minimum 3/16 inch structural steel angles. Provide windlock bars of

same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar.

- 1 Finish:
 - 2 Configuration:
 - a Standard Guide Configuration.
- C Counterbalance Shaft Assembly:
- 1 Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot of width.
 - 2 Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lb. Provide wheel for applying and adjusting spring torque.
- D Brackets: Fabricate from minimum 3/16 inch steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
- 1 Finish:
 - a Steel: Phosphate treatment followed by a light gray baked-on polyester powder coat; minimum 2.5 mils cured film thickness.
- E Hood: 24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch steel intermediate support brackets as required to prevent excessive sag.
- 1 Finish:
 - a GalvaNex™mark Coating System to include an ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation of a chemical bonding, light gray baked-on polyester base coat and a light gray baked-on polyester finish coat. The scientific organic material composition and chemical bonding process of GalvaNex™mark produces a superior finish against corrosion and abrasion. GalvaNex™mark components include a limited two year finish warranty.
- F Weatherstripping:
- 1 Bottom Bar: Replaceable, bulb-style, compressible EDPM gasket extending into guides.
 - 2 Guides: Replaceable vinyl strip on guides sealing against fascia side of curtain.

2.3 ACCESSORIES

- A Locking:
- 1 Crank Hoist: Padlockable slide bolt on coil side of bottom bar at each jamb extending into slots in guides.

2.4 OPERATION

- A Manual Chain Hoist: Provide chain hoist operator with endless steel chain, chain pocket wheel and guard, geared reduction unit, and chain keeper secured to guide.

PART 3 EXECUTION

3.1 EXAMINATION

- A Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
- B Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

- A General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.
- B Follow manufacturer's installation instructions.

3.3 ADJUSTING

- A Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

3.4 CLEANING

- A Clean surfaces soiled by work as recommended by manufacturer.
- B Remove surplus materials and debris from the site.

3.5 DEMONSTRATION

- A Demonstrate proper operation to Owner's Representative.
- B Instruct Owner's Representative in maintenance procedures.

END OF SECTION

SECTION 08710
FINISH HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes

- 1. Furnishing and installation of all mechanical and finish hardware necessary for all doors, and hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware. Installation shall include field modification and preparation of existing doors and/or frames for new hardware being installed. Provide necessary fillers, Dutchmen, reinforcements, and fasteners for mounting new hardware and to cover existing door/frame preps.

B. Related Sections

- 1. Division 8 Section - Hollow Metal Doors and Frames

1.03 REFERENCES

- A. Applicable state and local building codes and standards.

B. FIRE/LIFE SAFETY

- 1. NFPA - National Fire Protection Association
 - a. NFPA 80 - Standard for Fire Doors and Fire Windows
 - b. NFPA 101 - Life Safety Code

C. UL - Underwriters Laboratories

- 1. UL 10B - Fire Test of Door Assemblies

D. Accessibility

- 1. ADA - Americans with Disabilities Act
- 2. Massachusetts Architectural Access Board Regulation – 521 CMR

E. DHI - Door and Hardware Institute

- 1. Sequence and Format for the Hardware Schedule

2. Recommended Locations for Builders Hardware

F. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 requirements. Prior to submittal field verify existing doors and/or frames receiving new hardware and/or existing conditions receiving new openings. Verify new hardware is compatible with the existing door/frame preparation and/or existing conditions. Advise architect within the submittal package of incompatibility or issues.
- B. Catalog Cuts: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Final Hardware Schedule Content: Submit schedule with hardware sets in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, Include the following information:
 1. Opening Lock Function Spreadsheet; list locking device and function for each opening.
 2. Type, style, function, size, and finish of each hardware item.
 3. Name and manufacturer of each item.
 4. Mounting locations for hardware.
 5. Door and frame sizes and materials.
- D. Key Schedule: Key door to existing master key system
- E. Templates: After final approval of the hardware schedule, provide templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware.

1.05 QUALITY ASSURANCE

- A. Substitutions: Products are to be those specified to ensure a uniform basis of acceptable materials.
 1. Items specified as "no substitute" shall be provided exactly as listed.
 2. If no other products are listed in a category, then "no substitute" is implied.
- B. Supplier Qualifications: A recognized architectural hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware.

- C. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, exit devices, closers, etc.) from a single manufacturer.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwrites Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Tag each item or package separately with identification related to the final hardware schedule, and include installation instructions with each item or package.
- B. Each article of hardware shall be individually packaged in manufacturer's original packaging.
- C. Contractor will provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Items damaged in shipment shall be replaced promptly and with proper material and paid for by whomever did the damage or caused the damage to occur.
- E. Hardware shall be handled in a manner to avoid damage, marring, or scratching. Irregularities that occur to the hardware after it has been delivered to the Project shall be corrected, replaced, or repaired by the Contractor. Hardware shall be protected against malfunction due to paint, solvent, cleanser, or any chemical agent.

1.07 WARRANTY

- A. Provide manufacturer's warranties as specified in Division 1 and as follows:
 - 1. Closers: 10 years
 - 2. Exit Devices: 3 years
 - 3. Locksets: 3 years, except electrified locksets, 1 year.
 - 4. Other hardware: 1 year.
- B. No liability is to be assumed where damage or faulty operation is due to improper installation, improper use, or abuse.
- C. Products judged to be defective during the warranty period shall be replaced or repaired in accordance with the manufacturer's warranty, at no additional cost to the Owner.

1.08 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Approval of manufacturers other than those listed shall be in accordance with paragraph 1.05.A.
- B. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.

Item	Scheduled Manufacturer	Acceptable Substitute
Hinges	Ives (IVE)	Hager, McKinney
Continuous Hinges	Ives (IVE)	Markar, Stanley
Double Lipped Strikes	Donjo (DON)	Hager, McKinney
Surface Bolts & Coordinators	Ives (IVE)	Burns, Rockwood
Locksets & Deadlocks	Best (BES)	Schlage, Corbin-Russwin
Door Closers	LCN (LCN)	Norton, Yale
Protection Plates	Ives (IVE)	Burns, Rockwood
Stops & Holders	Ives (IVE)	Burns, Rockwood
Silencers	Ives (IVE)	Burns, Rockwood
Cylinders & Keying	Best (BES)	Schlage, Corbin-Russwin

- C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- D. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Architect's approval.

2.02 MATERIALS

- A. Fasteners
 - 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 - 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
 - 3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work

adequately to fasten the hardware securely. Review door specification and advise Architect if thru-bolts are required.

4. Hardware shall be installed with the fasteners provided by the hardware manufacturer.

B. Hinges

1. Provide five-knuckle, ball bearing hinges of type, material, and height as outlined in the following guide for this specification:
 - a. heavy weight, bronze/stainless steel, 5 inches high
2. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
3. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Non-Ferrous Hinges: Stainless steel pins
4. The width of hinges shall be 4-1/2 inches at 1-3/4 inch thick doors. Adjust hinge width as required for door, frame, and/or wall conditions to allow proper degree of opening.
5. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.
6. Acceptable manufacturers and/or products: Ives 5BB series, Hager BB series, McKinney TA/T4A series.

C. Flush Bolts

1. Provide manual surface bolts with forged bronze face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch steel or brass rods at doors up to 90 inches in height. Top rods at manual bolts for doors over 90 inches in height shall be increased by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

D. Cylindrical Locks - Grade 1

1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 1. Cylinders: Refer to 2.04 KEYING.
2. Provide locks with a standard 2-3/4 inches backset, unless noted otherwise, with a 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
4. Lever trim shall be solid cast levers without plastic inserts, and wrought roses on both sides. Locksets shall be thru-bolted to assure proper alignment.
 - a. Lever design shall be Determined by Architect.

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- b. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
5. Acceptable manufacturers and/or products: Best 93K series, Schlage ND series, Corbin-Russwin CL3300 series.

E. Door Closers

1. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacture code.
2. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder, and shall utilize full complement bearings at shaft. Cylinder body shall be 1-1/2 inch diameter, and double heat-treated pinion shall be 11/16 inch diameter.
3. Provide hydraulic fluid requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.
4. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force as required by accessibility codes and standards. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
5. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
6. Closers shall not incorporate Pressure Relief Valve (PRV) technology.
7. Closer cylinders, arms, adapter plates, and metal covers shall have a powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or shall have special rust inhibitor (SRI).
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other finish hardware items interfering with closer mounting.
9. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
10. Door closers meeting this specification: LCN 4010/4110 series, Sargent 281/281P10 series factory assembled (without PRV).

F. Protection Plates

1. Provide kick plates of 0.050 inch thick as schedrnish with machine screws, finished to match plates. Sizes of plates shall be as follows:

- a. Kick Plates – 10 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

G. Door Stops and Holders

1. Provide door stops in accordance with the following requirements:
 - a. Provide dome type floor stops of the proper height.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

2.03 FINISHES

- A. Finish of all hardware shall be US26D (BHMA 626/652) with the exceptions as follows:
 1. Hinges at Exterior Doors: US32D (BHMA 630).
 2. Push Plates, Pulls, and Push Bars: US32D (BHMA 630).
 3. Protection Plates: US32D (BHMA 630).
 4. Overhead Stops and Holders: US32D (BHMA 630).
 5. Door Closers: Powder Coat to Match.
 6. Stops: US32D (BHMA 630).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation of any hardware, examine all doors, frames, walls and related items for conditions that would prevent proper installation of finish hardware. Correct all defects prior to proceeding with installation.

3.02 INSTALLATION

- A. Coordination:
 1. Prior to installation of hardware, schedule and hold a meeting for the purpose of instructing installers on proper installation and adjustment of finish hardware. Representatives of locks, exit devices, closers, automatic operators, and electrified hardware shall conduct training; provide at least 10 days notice to representatives. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.
- B. Hardware will be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance if necessary, installers may contact the manufacturer's rep for the item in question, as listed in the hardware schedule.

- C. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
- D. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.
- E. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.
- F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- G. Operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.

3.03 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.
- B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- C. Clean adjacent surfaces soiled by hardware installation.
- D. Instruct Owner's personnel in the proper adjustment, lubrication, and maintenance of door hardware and hardware finishes.

3.04 FIELD QUALITY CONTROL

- A. Prior to Substantial Completion, the installer, accompanied by representatives of the manufacturers of locks, exit devices, closer, and any electrified hardware, shall perform the following work:
 - 1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
 - 2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
 - 3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
 - 4. Prepare a written report of current and predictable problems of substantial nature in the performance of the hardware.
 - 5. At completion of project, a qualified factory representative for the manufacturers of locksets, closer, exit devices, and access control products shall arrange and hold a training session to instruct the Owner's personnel on the proper maintenance, adjustment, and/or

operation of their respective products. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.

3.05 PROTECTION

- A. Provide for the proper protection of complete items of hardware until the Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

3.06 HARDWARE SCHEDULE

- A. Provide hardware for each door to comply with requirements of Section "Finish Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.
- B. It is intended that the following schedule includes complete items of finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for a frame, door or fire codes, the preamble will be the deciding document.
- C. Locksets, exit devices, and other hardware items are referenced in the Hardware Sets for series, type, and function. Refer to the preamble for special features, options, cylinders/keying, and other requirements.

END OF SECTION

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior gypsum board panels for ceilings
 - 2. Non-load-bearing steel framing.

1.3 DEFINITIONS

- A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.
- C. Samples: For the following products:
 - 1. Trim Accessories: Full-size sample in 12-inch- long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory. Retain paragraph and subparagraph below for STC-rated assemblies.
- B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
 - 1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steel Framing and Furring:
 - a. Clark Steel Framing Systems.
 - b. Consolidated Systems, Inc.
 - c. Dale Industries, Inc. - Dale/Incor.
 - d. Dietrich Industries, Inc.
 - e. MarinoWare; Division of Ware Ind.
 - 2. Gypsum Board and Related Products:
 - a. G-P Gypsum Corp.
 - b. National Gypsum Company.
 - c. United States Gypsum Co.

2.2 STEEL CEILING FRAMING

- A. Components, General: Comply with ASTM C 754 for conditions indicated.

2.3 STEEL PARTITION AND SOFFIT FRAMING

- A. Components, General: As follows:
 - 1. Comply with ASTM C 754 for conditions indicated.
 - 2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with manufacturer's standard corrosion-resistant zinc coating.
- B. Steel Joist Framing: ASTM C 645.

1. As indicated on Drawing
 2. As indicated on Drawing
- C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base Metal Thickness: 0.0312 inch.
 2. Depth: 7/8 inch.
- D. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.4 INTERIOR GYPSUM WALLBOARD

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Gypsum Wallboard: ASTM C 36.
1. Type X:
 - a. Thickness: 5/8 inch.
 - b. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Bullnose Bead: Use at outside corners.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
 - c. L-Bead: L-shaped; exposed long leg receives joint compound; use where indicated.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound;
 - e. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape:
1. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING STEEL FRAMING, GENERAL

- A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
- B. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
 - 1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
 - 2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
- C. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.3 INSTALLING STEEL CEILING FRAMING

- A. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch from the plane formed by the faces of adjacent framing.

- B. Install steel joists so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

3.4 APPLYING AND FINISHING PANELS, GENERAL

- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
- B. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- F. Attach gypsum panels to framing provided at openings and cutouts.
- G. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- I. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
 - 1. Space screws a maximum of 12 inches o.c. for vertical applications.
- J. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.5 PANEL APPLICATION METHODS

- A. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.

- b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
- 2. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.6 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings.

3.7 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
 - 1. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

3.8 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

END OF SECTION 09260

SECTION 09511 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes materials as required to modify and install the existing ceiling system to fit to the new walls.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Samples for Verification: Full-size units of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
 - 1. 6-inch square samples of each acoustical panel type, pattern, and color.
 - 2. Set of 12-inch long samples of exposed suspension system members, including moldings, for each color and system type required.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
 - 1. "Fire Resistance Directory," from ITS/Warnock Hersey's "Directory of Listed Products," or from the listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.
 - 2. Products are identified with appropriate markings of applicable testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Acoustical Ceiling Units: 10 pieces of the installed panels
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products which match the materials of the existing ceiling system

2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics of existing ceiling.
- C. Panel Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3, including those referencing ASTM E 1264 classifications.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.
- B. Metal Suspension System Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3.
- C. Finishes and Colors, General: Match existing grid system
- D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 - 3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch diameter wire.
- F. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- G. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
- H. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's product designations, including splice plates, corner pieces, and attachment and other clips, complying with the following requirements:
 - 1. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
 - 2. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Comply with paint manufacturer's written instructions for applying and baking and for minimum dry film thickness.
 - a. Organic Coating: Manufacturer's standard thermosetting coating system with a minimum dry film thickness of 0.8 to 1.2 mils.
 - b. Color: Match color of finish on flanges of suspension system surfaces.

3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.
 - b. Celotex Corporation (The); Building Products Division; Architectural Ceilings Marketing Dept.
 - c. Chicago Metallic Corporation.
 - d. MM Systems, Inc.
 - e. USG Interiors, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
 1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
 2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
 3. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."

4. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies-- Seismic Zones 3 & 4."
5. U.B.C.'s "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings": U.B.C. Standard 25-2.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
3. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
4. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
5. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches from ends of each member.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:

- a. Install panels in a basket-weave pattern.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.
6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of the following:
 - 1. Exposed interior items and surfaces.
 - 2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts, hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Finished mechanical and electrical equipment.
 - b. Light fixtures.
 - c. Distribution cabinets inside electric or mechanical rooms
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Ceiling plenums.
 - b. Pipe spaces.
 - 3. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.

2. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.

1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

- B. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
 - 1. Quantity: Furnish the Owner with extra paint materials in the quantities indicated below:
 - a. Each color and type of paint used: 2 gal.of each.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
 - 1. Benjamin Moore & Co. (Moore).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Provide color selections to be made by the Architect from manufacturers complete range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.

3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
 4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.

5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 7. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer on metal surfaces that have been shop primed and touchup painted.
 3. If undercoats or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.
- F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- G. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been

prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

- H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
 - 1. The Owner may engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
 - 2. The Owner may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove non-complying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 INTERIOR PAINT SCHEDULE

- A. Concrete and Masonry: Provide the following paint systems over interior masonry:
 - 1) Sherwin Willams High Performance Block Filler

- b. First and Second Coats: Sherwin Williams Pro Industrial High Performance Epoxy.
- B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
- 1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils .
 - 1) Moore: Regal First Coat Interior Latex Primer & Underbody #216.
 - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils .
 - 1) Moore: Moore's Regal AquaVelvet #319.

END OF SECTION 09900

SECTION 15400
PLUMBING

PART 1 - GENERAL REQUIREMENTS

1.01 RELATED DOCUMENTS

- A. General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this specification and the Contractor shall consult them in detail for instructions.
- B. The drawings on which this contract is based are listed in Division 1. Consult all drawings, note all conditions that may affect the work and care for the same in executing the contract.

1.02 SCOPE OF WORK

- A. The work covered in this section of the specifications consists of furnishing all labor, services, materials, equipment, transportation and any other incidentals necessary to furnish and install all Plumbing & Gas work as indicated on the Drawings and/ or as required by the specifications, which without limiting the generality thereof, included the following:
 - 1. Interior soil and drain systems beginning at new melting pit terminating connecting to existing trench drain.
 - 2. Floor drain.
 - 3. Testing of piping systems.

1.03 RELATED WORK IN OTHER SECTIONS

- A. The following work is not included in this section and is to be performed under other Sections:
 - 1. Coring, drilling, sleeving & fire-stopping for all new pipe systems.

1.04 STANDARDS

- A. Unless otherwise indicated or specified, materials & workmanship shall conform to the latest edition of the following codes, specifications, requirements and regulations:
 - 1. Plumbing work shall be done in strict accordance with the latest edition of the Massachusetts State Plumbing & Fuel Code.
 - 2. Any and all other State and / or local authorities having jurisdiction.

1.05 PERMITS AND FEES

- A. This subcontractor shall secure and pay for all required permits, certificates, tests, inspections, licenses, incidental for the installation of his work and the use of said work once complete.

1.06 SHOP DRAWINGS

- A. Shop Drawings shall be submitted to the Architect for approval in accordance with provisions of Division 1.
- B. Submit shop drawings and/or manufacture's literature for all materials and equipment under this section of work for approval. No work shall commence until, shop drawings have been stamped with an approval by the engineer and architect.
- C. This subcontractor shall assume the cost and entire responsibility for any changes in the work which has arisen by the approval of materials or equipment other than those specified. The cost and responsibility also encompass any work performed prior the approval of shop drawings.

1.07 INTENT

- A. This Subcontractor shall refer to the Plumbing Drawings and Architectural Floor Plans and details for full comprehension of the extent and detail of the work to be performed. These Drawings are intended to be supplementary to Specifications, and any work indicated, mentioned or implied in either is to be considered as specified in both.
- B. It is not intended that the drawings show all details of construction but this subcontractor shall be required to furnish and install all materials necessary to complete the plumbing systems in accordance with the best practice and to the full intent of the drawings and specifications.
- C. If the subcontractor bidding this project believes that any necessary item of work has been omitted from the plans or specifications, he shall notify the Architect in writing. In the absence of such written notice and upon bidding the work in this section, the bidder has included the cost of all required items in his bid and that he will be responsible for the satisfactory operation of the entire plumbing work at no extra cost to the Owner or General Contractor.
- D. Prior to the installation of any new work, verify the locations and elevations of all new sanitary, & gas systems to which connections are scheduled.

1.08 EXCHANGE OF INFORMATION & CORDINATION

- A. This Subcontractor shall obtain detailed information from the Manufacturer's of apparatus which he is to provide, for the proper methods of installation. He shall also obtain all information from the General Contractor and other Subcontractors to insure full comprehension of the work to be done and to assure coordination between work under this Section and of all other work under this Contract.
- B. This subcontractor, before installing any of his work, shall see that it does not interfere with the clearances required for finished columns, pilasters, partitions, walls and ceilings as shown on the Contract Drawings, Architectural Drawings and details.
- C. This Subcontractor shall keep himself fully informed as to the shape, size and position of all openings and foundations required for his apparatus and shall give full information to General

Ned O'Brien Ice Rink
55 Locust Circle
Woburn, MA

Contractor sufficiently in advance of the work, so that all openings and foundations may be built in advance.

- D. In any case of failure on the part of the this subcontractor to give the proper information as noted above, he shall be required to pay the cost of having the work done.
- E. In areas in which conflicts may occur between trades, if so directed by the Architect or General Contractor, this subcontractor shall prepare coordination drawings clearly showing how his work is to be installed in relation to the other trades work. If this subcontractor installs his work prior to coordinating with other trades, he shall make the necessary changes in his work without additional charge.

1.09 GUARANTEES

- A. All parts of the installation are to be guaranteed in writing by this Subcontractor to be free from defects and/or manufacture and installation for a period of one year from the date of written acceptance of the entire building by the Architect. This Subcontractor shall replace, without charge to the Owner, any part or parts of piping and equipment, and all labor and materials required, which fails due to such cause or causes during the guarantee period.
- B. The manufacturer's written guarantee, where such guarantees extend beyond the one year limit stated herein, shall be delivered to the Architect for transmittal to the Owner.
- D. All fixtures, equipment, etc., which are purchased by the Owner in order to expedite delivery, shall be the full responsibility of this Subcontractor. Subcontractor shall also be responsible for all guarantees and warranties of said items. Guarantees and warranties shall be such as though purchased by this Subcontractor.

1.10 RECORD DRAWINGS

- A. The Plumbing Subcontractor shall note the requirements of Division 1 general requirements, which shall be strictly enforced.
- B. Furnish and keep on the job at all times, one complete and separate set of blackline prints of the Plumbing & Gas work on which shall be clearly, neatly, and accurately noted, promptly as the work progresses, all Architectural and Plumbing changes, revisions and additions to the work. Wherever work is installed than as otherwise shown on the Contract Drawings, such changes shall be noted on the prints and also the specifications.
- C. At the completion of the work, the Contractor shall obtain and pay for a set of reproducible copies of the original contract drawings on disk and a disk of original specification. The Contractor shall have a cad operator or draftsman and secretary make all changes to the disks and specification. The as-built disks and specifications and a reproducible of each shall be submitted to the Owner, for record, after review by the Engineer. This work shall be performed in accordance with the requirements of the supplementary general conditions.

1.11 DAMAGE TO OTHER WORK

- A. This subcontractor shall be responsible for any and all damages to other work caused by his work or workmen. Repairing of said damage shall be done by the General Contractor as directed by the Architect. This subcontractor will pay for any losses occurred.

1.12 TESTS

- A. The contractor shall notify the proper authority having jurisdiction over the work to be inspected. No work shall be concealed until the required tests have been conducted. This contractor shall be responsible for all labor, materials to correct all work deemed as defected. All equipment for the tests to be provided by this contractor.
- B. All tests for the Plumbing & Gas systems shall be conducted in accordance with the Massachusetts State Plumbing & Fuel Code.

1.13 CLEANING AND ADJUSTING

- A. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe & fittings shall be cleaned of grease, dirt, metal filings or sludge which have accumulated by operation of the system for testing.
- B. Any stoppage or discoloration or other damages to the property due to properly clean the piping systems shall be repaired with no cost to the owner.

PART 2 - PRODUCTS

2.01 MATERIALS

- B. Soil, Waste and Vent Below Ground:
 - 1. Service weight, bell & spigot cast iron with resilient rubber gaskets or lead & oakum joints.

2.02 FIXTURES

FD-1 Floor Drain: Floor drain shall be equal to Watts drainage model FD-100-DD or equivalent by Zurn or J.R. Smith with epoxy coated cast iron floor drain with anchor flange, reversible clamping collar with primary and secondary weep holes, adjustable cast iron hub funnel and inside caulk outlet.

PART 3 - EXECUTION

3.01 GENERAL

- A. This Subcontractor, under this Section of specifications, shall be responsible for the supervision of his personnel and the inspection of equipment and appliances provided by him to assure a safe working environment in compliance with OSHA regulations. In addition, this Subcontractor shall

immediately report to the General Contractor, in writing, any possible violations of OSHA regulations observed in areas occupied by his personnel. Failure to notify the General Contractor shall constitute this Subcontractor's acceptance of the working conditions and the responsibility, therefore.

3.02 PROTECTION OF WORK AND PROPERTY

- A. This Subcontractor shall take particular care to protect any finished work from injury or defacement and must remedy, at his own expense, any injury caused thereto by his operation or the operations of any other Subcontractors.
- B. This Subcontractor shall provide suitable protection of all equipment furnished under this Contract while stored at the job site and after installation. This protection shall be suitable to guard equipment items against damage from the weather or from construction activities. Such protection shall not be removed until systems are put into service. Piping and equipment shall be kept in a clean condition, free from dirt and debris.
- C. Materials, fixtures, and fittings shall be properly protected and all pipe openings shall be closed to prevent construction debris from damaging or causing obstructions.

3.03 WORKMANSHIP

- A. All work shall be executed in a workmanlike manner, and shall present a neat and mechanical appearance.
- B. All pipes shall be run parallel or perpendicular to building lines and shall be properly graded.
- C. All pipe connections shall be made in a manner which will allow for freedom of movement during expansion and contraction.
- D. All installation methods and materials shall comply with all State and local standards.
- E. All Plumbing work shall be in accordance with the latest approved Massachusetts Plumbing Code, as used by the Board of State Examiners of Plumbing.

3.04 SLEEVES AND ESCUTCHEONS

- A. Pipes passing through wood and concrete floors and interior walls shall run through pipe sleeves, two pipe sizes greater than the pipe passing through and caulked as below. This Subcontractor shall be responsible for furnishing and setting in place the sleeves. Provide escutcheons for exposed vertical and horizontal piping at floors, walls and ceilings. Cored holes for vertical piping do not require sleeves.
- B. Annular space between sleeves and pipe shall be filled with an approved UL listed Fire proofing compound.

END OF SECTION

SECTION 26 00 00
ELECTRICAL

PART 1 – GENERAL

1.01 FILING SUB-BIDS

- A. Electrical is stipulated as a filed Sub-Bid under Part D, Item 2 of the GENERAL BID FORM.
- B. All sub-bids shall be submitted on the SUB-BID FORM furnished by the Awarding Authority, as required by Section 44F of Chapter 149 of the General Laws, as amended.
- C. Sub-Bids must be filed with the Awarding Authority in a sealed envelope, before twelve o'clock noon, local time, on the date stipulated in the Advertisement.
- D. Specific information relating to sub-bidders is set forth in the Contract Documents, under the heading "NOTICE TO ALL BIDDERS, Including Sub-bidders" and the attention of sub-bidders is directed thereto.
- E. The work to be done under this SECTION 26 00 00 is shown on drawings numbered:

Drawings as listed on "LIST OF DRAWINGS", Sheet E-1 and E-2

See SECTION 00 01 15, LIST OF CONTRACT DRAWINGS

1.02 DESCRIPTION OF WORK

- A. The scope of work consists of the installation of all materials to be furnished under this Section, and without limiting the generality thereof, includes all equipment, labor, and services required for the furnishing, delivering, and installing the principal items of work hereinafter and all items incidental thereto as specified herein and as shown on the drawings.
- B. The itemization of work hereinafter specified does not in any way limit the responsibility to perform all work and furnish all the equipment, labor, and materials necessary for completion and satisfaction of operation of the installations described in the Specifications and shown on the Contract Drawings. In addition to the principal and miscellaneous items of work specifically mentioned and/or indicated, to be responsible for furnishing and installing all incidental and collateral materials such as supporting hardware for panelboards, conduit hangers, fastening devices, insulating tape and the like, which constitute essential components of the grade of Electrical Trade Practices and Workmanship acceptable to the Architect.

1.03 RELATED DOCUMENTS

- A. All of the Contract Documents, including General Conditions, Modifications, and Division 1 General Requirements, apply to the work of this section.

1.04 SCOPE OF WORK

- A. The scope of work consists of the installation of all materials to be furnished under this Section, and without limiting the generality thereof, includes all equipment, labor, and services required for the furnishing, delivering, and installing the principal items of work hereinafter and all items incidental thereto as specified herein and as shown on the drawings.

- B. The itemization of work hereinafter specified does not in any way limit the responsibility to perform all work and furnish all the equipment, labor, and materials necessary for completion and satisfaction of operation of the installations described in the Specifications and shown on the Contract Drawings. In addition to the principal and miscellaneous items of work specifically mentioned and/or indicated, to be responsible for furnishing and installing all incidental and collateral materials such as supporting hardware for panelboards, conduit hangers, fastening devices, insulating tape and the like, which constitute essential components of the grade of Electrical Trade Practices and Workmanship acceptable to the Department.

1. Grounding.
2. Panelboards.
3. Distribution feeders and distribution panelboard.
4. Raceways.
5. Branch circuit wiring.
6. Motor wiring.
7. Electrical distribution equipment.
8. Wiring and connection of electrical equipment supplied by Owner and other Subcontractors.
9. Fireproof seals.
10. Core drilling and cutting.
11. Cutting and patching.
12. Junction boxes and pull boxes.
13. Temporary lighting during construction.
14. Nameplates and labels.
15. Disconnect switches.
16. Electrical connections refrigeration equipment, cooling tower and associated pumps.
17. Removal of existing electrical equipment and associated feeders.
18. Disconnect and remove existing disconnect switches, starters, and branch circuit wiring serving all existing refrigeration equipment, cooling tower, and associated pumps.

1.05 RELATED WORK

- A. The following work is not included in this Section and is to be performed under the designated Sections:
1. All control wiring shall be furnished and installed by the Refrigeration Contractor.
 2. Charges for current consumed by the temporary light and power system for construction will be paid by the Ice Rink Management Corporation.
 3. Painting (except for factory finished items) specified under Section "Painting".
 4. Refrigeration system starters and pump starters furnished by others, installed, and wired by the Electrical Contractor. All starters or VFD required for the refrigeration system and associated pumps shall be furnished by the Refrigeration Contractor and installed and wired by the Electrical Contractor.

1.06 BREAKDOWN

- A. This Subcontractor must submit a breakdown of his contract price per building to aid the Department in determining the value of work installed as the job progresses.
- B. No requisition will be paid to this Subcontractor until the breakdown is delivered to the Department.

1.07 PRODUCT DATA SHEETS

- A. Prepare and submit five (5) copies of product data sheets of all equipment, labels, tags, and nameplates supplied under this Section of the Specifications to the General Contractor for approval, as specified under General Conditions and Supplementary Conditions. No work shall be done until product data sheets have been approved.
- B. Shop drawings shall show plans, details, layouts and job conditions and relationship to other work.

1.08 RECORD DRAWINGS

- A. This Contractor shall furnish and keep on the job at all times, two, (2) complete and separate sets of blackline prints of the electrical work on which shall be clearly, neatly and accurately noted, promptly as the work progresses, all changes, revisions and additions to the work. Wherever work is installed otherwise than as shown on the Contract Drawings, such changes shall be noted.
- B. Indicate daily progress on these prints by coloring in the various conduits, fixtures, apparatus, and associated appurtenances as they are erected.
- C. No approval of requisition for payment for work installed will be given unless supported by record prints as required above.
- D. At the conclusion of work, prepare Record Drawings in accordance with the requirements of the GENERAL CONDITIONS.

1.09 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

- A. This Subcontractor shall instruct to the Owner's satisfaction, such persons as the Owner designates in the proper operation and maintenance of the systems and their parts.
- B. Furnish in accordance with provisions under "Special Conditions" operating and maintenance manuals and forward same to the Department. The Subcontractor shall provide three (3) sets of Maintenance Manuals.
- C. The operating instructions shall be specific for each system and shall include copies of posted specific instructions.
- D. For maintenance purposes, provide shop drawings, parts lists, specifications, and manufacturer's maintenance bulletins for each piece of equipment. Provide name, address, and telephone number of the manufacturer's representative and service company, for each piece of equipment so that service or spare parts can be readily obtained.

1.10 SAMPLES

- A. Submit samples as requested by the Department of all materials specified herein in accordance with General Condition and Supplementary Conditions, and before ordering materials obtain approval from the Department.

1.11 LAWS, ORDINANCES, CODES, AND PERMITS

- A. The Electrical Subcontractor shall give all necessary notices, obtain all permits, and pay all taxes, fees, and other costs in connection with his work; file all necessary plans, prepare all necessary documents and obtain all necessary approvals of state authorities, all local, town, city, or county departments having jurisdiction; obtain all required certificates of inspection for

his work.

- B. The Electrical Subcontractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings in addition to Contract Drawings and Documents, in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on the drawings and/or specified.
- C. All materials furnished and all work installed shall comply with the rules and recommendations of the National Electrical Code, the National Board of Fire Underwriters', all requirements of the local utility company, recommendations from the fire insurance rating organizations having jurisdiction, and with the requirements of all state, local, town, city, or county departments having jurisdiction.

1.12 DEFINITIONS

- A. "This Contractor" or "This Subcontractor" means specifically the Electrical Subcontractor working under this Section of the Specifications.
- B. "Furnish and Install or "Provide" means to supply, erect, install and connect up, complete for regular operation, the particular work referred to unless otherwise specified. "Piping" includes in addition to pipe, all fittings, boxes, hangers and other accessories relating to such piping. "Concealed" means hidden from sight as in trenches, chases, furred spaces, shafts, hung ceilings, embedded into construction, ground or concealed as defined above.

1.13 INSPECTION AND TEST

- A. All work will be subject to the inspection of the Department and such other inspections are may have jurisdiction.
- B. As the various part of the works are installed and/or revised, insulation resistance test shall be made to insure that the new systems are free from short circuits and grounds and that all connections, switches, controls and equipment are in proper operating condition.
- C. The installation resistance between conductors and between conductors and grounds, for the distribution systems shall be not less than the requirements of the National Electrical Code.
- D. All testing equipment necessary shall be provided. The tests shall incur no additional expense to the Owner.
- E. Failure or defects in workmanship or materials revealed by tests shall be corrected promptly and retested. Defective materials furnished under this contract shall be replaced at no additional expense to the Owner.

1.14 REFERENCES

- A. Installation shall comply in all details with the National Electrical Code with its latest revisions and all prevailing local, Federal, and State regulations.
- B. Material and equipment shall be Underwriters' laboratories, Inc., listed, where a standard has been established.
- C. Manufacturers' names and nomenclature facilitates descriptions of certain materials and equipment and are used to establish type, quality, and function.
- D. Unless otherwise specified, all work shall be manufactured, tested and installed in accordance with the latest editions of applicable publications and standards of the following organizations:

1. American Society for Testing and Material (ASTM).
 2. Underwriters' Laboratories, Inc. (U.L.)
 3. Insulated Power Cable Engineers Association (IPCEA).
 4. National Electrical Manufacturers Association (NEMA).
 5. Institute of Electrical and Electronic Engineers (IEEE).
 6. American National Standards Institute (ANSI).
 7. National Fire Protection Association (NFPA).
 8. National Electrical Code (NEC) as amended by the Massachusetts Electrical Code (MEC).
- E. Should specifications, Departments' instructions, laws, ordinances, or public authority require any special tests or approvals, arrange for these and give the Department timely notice. If the inspection is by another authority other than the Department, notify the Department of the dates fixed for such inspection.
- F. Make all reasonable tests required by the Department to provide the integrity of the electrical installation and leave the entire installation properly adjusted and in operating condition. After connections are made test the insulation resistance of all parts of the electrical work except that which is not furnished under this Specification. All wiring shall be so installed that when completed the system will be free from short circuits and from unintentional grounds.
- G. Where reference is made to Codes and Standards these shall be interpreted as minimum requirements. Requirements in excess of these codes and Standards may be indicated on the Drawings or in the Specifications and shall be so included in the contract work. Compliance with such code requirements only shall not be construed as fulfillment of the contract work, where the plans and/or Specifications indicate additional work which may exceed such code standards.
- H. Copies of NEMA, NFPA, and NEC shall be made available by the Electrical Subcontractor at the job site.

1.15 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

- A. Before submitting prices or beginning work, thoroughly make an examination of the site and the Contract Documents.
- B. No claim for extra compensation will be recognized if difficulties are encountered which an examination of site conditions and Contract Documents prior to executing contract would have revealed.
- C. The drawings showing layout of the electrical systems indicate the approximate location of outlets, apparatus, and equipment. The runs of feeders and branch circuits as shown on the drawings are schematic only, and are not intended to show the exact routing of the wire; the final determination as to the routing of the wire shall be governed by structural conditions and other obstructions. This shall not be construed to mean that the design of the system may change; it merely refers to the exact run of a raceway between given points.
- D. The right to make any reasonable change in the location of outlets, apparatus, and equipment up to the time of roughing-in is reserved by the Owner without involving any additional expense to the Owner.
- E. The Drawings and these specifications are complementary with one another, any labor, or materials called for by either, whether or not by both, or necessary for the successful operation of any of the particular types of equipment furnished under this contract, shall be furnished and

installed.

- F. Before installing any work, see that it does not interfere with the clearance required for finished columns, pilasters, partitions or walls, as shown on the contract Architectural drawings and details.
- G. Be responsible for all materials delivered to the site in connection with the work and pay all charges for cartage, scaffolds, planking, rigging, and erecting. Take every precaution necessary to protect equipment and installation in addition to plugging and protecting open ends of all pipes, outlet boxes, panelboxes, and junction boxes. All equipment must be stored in a clean dry place to preserve the quality of materials being used. Equipment and/or materials damaged during the construction period shall be replaced at no additional cost to the Owner.
- H. All materials and equipment required by this Electrical Specification shall be new, clean, and free of defects at the time of installation. The manufacturer's and Underwriter's label shall be on all materials and equipment unless otherwise approved, in writing, by the Department.

1.16 SUBSTITUTION OF MATERIALS OR EQUIPMENT

- A. If the Electrical Subcontractor wishes to use materials or equipment other than those specifically designated herein, as being equal to those so specifically designated; BEFORE PURCHASING AND/OR FABRICATION, he shall submit the proposed substitution in accordance with the requirements of the GENERAL CONDITIONS, supported by sufficient proof of equality, the successful subcontractor will be required to furnish the specifically named items designated under the base bid.
- B. If the apparatus or materials substituted for those specified necessitate changes or additional connections, piping supports, or construction: same shall be provided and the Electrical Subcontractor shall assume the cost and the entire responsibility thereto.
- C. The Department's permission to make such substitutions shall not relieve the Electrical Subcontractor from full responsibility for the work.

1.17 DAMAGE TO OTHER WORK

- A. This Contractor shall be held responsible for and shall pay for all damage to other work caused by his work or workmen.
- B. Repairing of such damage shall be done by the General Contractor or Subcontractor who installed the work, and so directed by the Department.

1.18 COORDINATION OF TRADES

- A. This Contractor shall give cooperation to other trades and shall furnish (in writing, with copies to the Department) any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay. Where the work of this Subcontractor will be installed in close proximity to work of other trade, or where there is evidence that the work of this Subcontractor will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Department, this Subcontractor shall prepare composite working drawings and sections, in conjunction with other trades at a suitable scale not less than 1/4" - 1"-0", clearly showing the installation of his work in relation to the work of other trades. If this Subcontractor installs his work before coordinating with other trades, or so as to cause interference with work of other trades, he shall make necessary changes in his work to correct the conditions without extra charge. All cutting, patching, excavation, and backfilling, except for primary electrical service,

shall be done by the General Contractor. This Subcontractor shall inform the General Contractor well in advance as to his requirements, and if, in the Department's judgment, he is negligent in this respect, this Subcontractor shall bear all expenses flowing from his negligence with respect thereof.

1.19 PROCEDURE

- A. This Subcontractor shall provide all labor and materials necessary for the complete and substantial execution of the work, including all transportation, scaffolding, apparatus, utensils, tools, etc., requisite for the faithful performance of the work to the true intent and meaning of the Specifications, Drawings, and Instructions. All workmanship and materials shall be of the best of their respective kinds.
- B. This Subcontractor shall store his material and equipment prior to installation only where designated by the Owner. He shall be responsible for all his property stored on the premises and shall hold the Owner free from liability for loss by theft or carelessness of employees of the Owner, or of other Contractors. This Subcontractor must take particular care to protect any finished work from injury caused thereto by his operations. After completion of the work, this Subcontractor shall remove all waste, rubbish and other materials left as a result of his operations and leave the premises in clean condition.

1.20 FIELD MEASUREMENTS

- A. This Subcontractor shall verify in the field all measurements necessary for his work and shall assume responsibility for their accuracy.

1.21 CLEANING AND PROTECTION

- A. All materials and equipment shall be carefully protected during shipment and protected during installation and properly handled and stored at the job site so as to prevent damage. This Subcontractor shall assume full responsibility for protection of work until its completion and final acceptance.
- B. Upon completion of this work, this Subcontractor shall clean all fixtures and equipment and replace damaged parts. Upon failure of this Subcontractor to fulfill his obligation, this work will be taken care of at his expense.

1.22 GUARANTEE

- A. All materials, items of equipment and workmanship furnished under this Section shall carry the standard warranty against all defects in materials and workmanship for a period of not less than one (1) year from the date of final acceptance of the work.

1.23 CLEANING UP

- A. The Electrical Contractor shall, at the completion of the work, clean, polish and/or wash all exposed items of material, equipment, and fixtures in his contract so as to leave such items bright and clean. Special attention being given to interiors and exteriors of all panels, electrical equipment, and enclosures.
- B. All painted metal surfaces which have been scratched, dented or marred shall be re-painted by the Electrical Contractor.
- C. At the end of each work day, the Electrical Contractor shall remove all waste, rubbish and other

materials left as a result of his operation and leave the premises in clean condition.

1.24 CONFLICT BETWEEN PLANS AND SPECIFICATIONS

- A. In case of a conflict between contract plans and the specification the Department will decide which takes precedence.

1.25 SUPERINTENDENCE OF WORK

- A. This Subcontractor shall give his personal superintendence to the work and shall retain at the job site during the period of construction, a competent foreman, satisfactory to the Department, who shall be in full charge of the work under this Section.

1.26 SITE VISITATION

- A. The Electrical Contractor shall be required to visit the site and to have examined the existing conditions which may affect his work under this Contract. Failure to do so shall be his responsibility and no claims for extra compensation or extension of time shall be allowed because of lack of compliance herewith.

1.27 COOPERATION AND WORK PROGRESS

- A. The electrical wiring shall be carried on under the usual construction conditions, in conjunction with all other work at the site. The Electrical Contractor shall cooperate with the Department and all contractors and equipment suppliers working on the site, coordinate the work, and proceed in a manner so as not to delay the progress the project.
- B. The Electrical Contractor shall coordinate his work with the progress of the building and other trades so that he shall complete his work as soon as conditions permit. Any overtime hours worked or additional costs incurred due to lack of or improper coordination with other trades of the Owner by the Electrical Contractor shall be assumed by the Electrical Contractor without any additional cost to the Owner.
- C. The Electrical Contractor has a responsibility to coordinate the exact mounting arrangement and location of equipment indicated on the Drawings to allow for proper space requirements for equipment access, operation and maintenance. Particular attention shall be given in the field to such group installations. If it is questionable that insufficient space or conflict with the work of other contractors, or Architectural or structural obstructions will result in an arrangement which will prevent proper access, operation or maintenance of the indicated equipment, the Electrical Contractor shall immediately notify the Department and not proceed with this part of the contract work until definite instructions have been given to him by the Department.
- D. It shall be the responsibility of the Electrical Contractor to coordinate the delivery of electrical equipment to the project prior to the time installation of equipment will be required; but he also shall make sure such equipment is not delivered too far in advance of such required installation, to assure that possible damage and deterioration of such equipment will not occur. Such equipment stored for an excessively long period of time (as determined in the opinion of the Department) on the project site prior to installation may be subject to rejection by the Department.

PART 2 - PRODUCTS

2.01 RIGID STEEL CONDUIT

- A. All rigid steel conduits shall be standard IPS, galvanized or sheradized, threaded conduit equal to Pittsburgh Standard, J & L, Youngstown, or equal. Conduit installed in slabs on grade shall be wrought iron.
- B. Changes in direction of conduit, where concealed, shall be made by means of standard radius bends, and where exposed, or by means of galvanized, or sheradized threaded condulets as manufactured by Crouse-Hinds or equal.
- C. Conduits shall be continuous from junction or pull boxes and shall enter and be secured to all boxes in such a manner that each system shall be electrically continuous from service to all outlets. Terminals of all conduits shall be furnished with double lock nuts and grounding bushings.

2.02 ELECTRICAL METALLIC TUBING

- A. Electrical metallic tubing may be used for main feeders to light and power panels.
- B. Tubing shall be continuous between outlets, making a continuous electrical system for bonding.
- C. Connector and couplings shall be set screw type.

2.03 FLEXIBLE METALLIC CONDUIT

- A. Flexible metallic conduit may be used for short connections to recessed fixtures and motors, except in wet areas. Liquid tight flexible metallic conduit shall be used to all pump motors and in all wet areas.

2.04 WIRES AND CABLES

- A. All conductor wire and cable shall consist of thoroughly tinned 98% conductivity copper, with 600 volt insulation, manufactured in strict accordance with the requirements of the Board of Underwriters' and AIEE.
- B. No wires smaller than No. 12 shall be used for any branch circuit unless noted on plans for special system circuits. Larger sizes shall be used where so indicated on the Drawings.
- C. All 600 volt wire and cables shall be single conductor suitable for use in wet areas and dry locations; shall have an insulation that is moisture and heat resistant cross linked thermosetting polyethylene without an outer jacket, shall be type "THHN" as manufactured by General Electric, Okonite, Rome Cable, or equal. Wire sized No. 12 and No. 10 AWG shall be solid. Sizes 8 and larger shall be stranded.

2.05 OUTLET BOXES

- A. Furnish and install all required outlet boxes as manufactured by Appleton, National, or Steel City or equal.
- B. All outlet boxes for concealed work shall be galvanized, stamped steel; those for fixtures, furnished with a fixture stud.
- C. Outlet boxes shall be of size and type to accommodate (1) structural conditions, (2) size and number of raceways, conductors, or cables entering, and (3) devices or fixtures for which required.
- D. Wall outlets shall be 4" sq. x 1-1/2" deep with plaster covers to suit, or Standard "new work" wall case boxes. Wall boxes shall be designed for rigid metallic conduit and shall be the best

type for the wall construction involved.

- E. Install blank plates on all outlet boxes, in which no apparatus is installed, which do not integrally provide a cover for the box.
- F. Special care shall be taken to set all boxes correctly square and true with the building finish. As far as possible, all wall and switch outlets shall be erected in advance of furring and fireproofing, and shall be secured to the building structure or steel by adjustable strap iron supports, which shall be buried in.
- G. The exact location of all outlets and switches in finished rooms shall be obtained from the Department and from the Scale Drawings of interior details and finish. Final correct readjustment shall be made to the outlets if necessary to give proper centering.
- H. In centering of outlets and location of outlet boxes, allow for overhead pipes, and thickness of fireproofing and plastering; also for window trim, paneling, hung ceilings, and the like. Any inaccuracy resulting from failure to do so must be corrected under this Section of the Specifications without expense to the Owner. Confer with the Department and other Subcontractors and find out where hung ceilings occur and piping and ductwork run before signing the Contract and include in proposal whatever costs of the electrical work these conditions necessitate.
- I. The locations given or designated on the Drawings for the outlets are subject to modification. In the case of local wall switches established by the swing of the door. In all cases, the switch shall be on the side of the door opposite the hinges.

2.06 JUNCTION AND PULL BOXES

- A. Junction or pull boxes shall be furnished and installed under this Section of the Specifications where indicated on the Drawings and wherever else such a box may be deemed necessary to facilitate the pulling or splicing of wires or cables.
- B. All such boxes must be made accessible and shall be built only from approved detail Working Drawings. Conduits shall enter these boxes through tight fitting clearance holes.
- C. The covers of the boxes shall be designed for quick removal. Where junction boxes are required for a splicing box for special recessed fixtures, consult the Architect before installing boxes for these fixtures and determine the exact location of the boxes.
- D. Each feeder passing through a pull box shall be tagged or designated in some other approved manner. If tags are used, they shall be of fireproof material.
- E. Locations of junction boxes and pull boxes shall meet the approval of the Architect. Generally, junction boxes and pull boxes shall not be exposed in finished spaces; where necessary re-route conduits or make other arrangements to meet the approval of the Architect.

2.07 PANELBOARDS (120/208 Volt)

- A. Panels shall be type ANQOD@ bolted as manufactured by Siemens, Square AD@, Cutler Hammer, or equal.
- B. The panelboard schedule indicates the details as to size, voltage, capacity, and number of circuits necessary, including spares.
- C. The panelboard shall conform to the requirements of the Underwriters= label.
- D. The panelboard shall be designed for operation at 120/208 volts 3 phase 5 wire.

- E. Circuit breakers 1, 2, and 3-pole for 120/208 volts application shall be type AQOB@ switch rated with interrupting capacity as indicated on drawings. Circuit breakers shall be bolt-on type.
- F. Furnish 10 circuit breaker locks for branch circuit locking control.
- G. All locks of all panels shall be operated by a common master key.
- H. Furnish and install on the inside cover of all light and power panels, a neatly typed index, giving the circuit number; and opposite each number the area of equipment which that particular circuit serves or controls.
- I. In connecting branch circuits to panels, care shall be taken to insure balance; and circuit numbering shown on plans shall be changed to prevent same circuits on same phase being connected to a common neutral.
- J. Panelboards shall be furnished with hinged trim with door and door covers to provide easy access to the panelboard interior, without removing the panelboard cover.
- K. Panelboard bussing shall be copper and shall meet the requirements of the Owner.

2.08 NAMEPLATES

- A. Nameplates consisting of black mica with white center, lettering to be 1/4" high engraved through to white layer and properly fastened with brass screws shall be provided for the following equipment:
 - 1. Switchgear.
 - 2. Disconnect switches.
 - 3. VFD's.
 - 4. Panelboards.
- B. Junction boxes.
- C. Electrical Contractor shall note branch circuit number terminated at each disconnect switch servicing mechanical system terminal box.

2.09 DISCONNECT SWITCH

- A. Furnish and install safety switches as required by plans and specifications. All safety switches shall be NEMA Heavy Duty Type HD and Underwriters' Laboratories listed. Square D Class 3110 or approved equal as manufactured by Siemens or General Electric.
- B. All switches shall have switch blades which are fully visible in the OFF position with the door open. All current-carrying parts shall be plated through electrolytic processes to resist corrosion and promote cool operation.
- C. Switches shall be quick-make and quick-break such that, during normal operation of the switch, the operation of the contacts shall be not capable of being restrained by the operating handle after the closing or opening action of the contacts has started. The handle and mechanism shall be an integral part of the box, not the cover, with positive padlocking provisions in the OFF position.
- D. Switches shall be furnished in NEMA 1 general purpose enclosures unless NEMA 3R (raintight) is indicated on the plans. Enclosures shall be of code gauge (UL 98) sheet steel (NEMA 1) or code gauge (UL 98) galvanized steel (NEMA 3R) with a rust-inhibiting

phosphate treatment and gray baked enamel finish.

- E. Switches shall be horsepower rated for 600 volts ac.

2.10 SLEEVES, INSERTS, AND SUPPORTS

- A. The Electrical Subcontractor shall lay-out and install his work in advance of the pouring of concrete floors.
- B. Furnish and install all inserts, conduit hangers, anchors, and steel supports necessary for the support and installation of all electrical equipment.
- C. Where openings are required in walls and floors for the passing of raceways the Electrical Subcontractor shall furnish the General Contractor with the necessary information regarding dimensions and locations so that he may install suitable concrete stops to provide these openings. Such openings shall be by the General Contractor in such a manner so as not to interfere with the fireproof integrity of the building.
- D. This Subcontractor will be held responsible for the location of and maintaining in proper position, sleeves, inserts, and anchor bolts supplied and/or set in place by him. In the event that failure to do such required cutting and patching of finished work, such work shall be done at this Subcontractor's expense by the General Contractor.

2.11 RECEPTACLES

- A. All convenience outlets shall be of the single or duplex type, back or side-wired. T-slot or polarized slot type, grounded as required, as manufactured by Hubbell, Eaton or Legrand.
- B. In general, convenience outlet circuits shall be independent of light circuits and shall not be controlled by light circuit breaker switches or light switches.
- C. Duplex receptacles shall be equal to Hubbell 5252-WH.
- D. Single receptacles rated at 20A-250V shall be Hubbell 5451-WH.
- E. Single receptacles rated at 30A-250V 1 phase shall be Hubbell 2620A.
- F. Single receptacles rated at 50A-250V 1 phase shall be Hubbell CS8269.
- G. Single receptacles rated at 20A-250V 3 phase shall be Hubbell 2420A.
- H. Single receptacles rated at 30A-250V 3 phase shall be Hubbell 2721.
- I. Single receptacles rated at 50A-250V 3 phase shall be Hubbell 3769.
- J. Single receptacles rated at 20A-125/250V 1 phase shall be Hubbell 7310B.
- K. Single receptacles rated at 30A-125/250V 1 phase shall be Arrow Hart 5744.
- L. Single receptacles rated at 50A-125/250V 1 phase shall be Arrow Hart 5754.
- M. Ground fault receptacles shall be Leviton 8899.

2.12 WIRING DEVICE PLATES

- A. All device plates shall be stainless steel. Plates shall be of appropriate type and size for all wiring and control devices, signal and telephone outlets.
- B. Plates shall be set so that all edges are in contact with the mounting surface. Plaster fillings will not be allowed. Multi-device locations shall have one common device plate.
- C. Device plates shall be by the same manufacturer as devices.

- D. Plates for surface type boxes shall not overlap boxes and shall be designed for use with surface boxes.

2.13 FIRE PROOF SEAL MATERIAL:

A. Fire Stop Foam:

1. The fire stopping sealant shall be a one-part, neutral curing silicone sealant. The sealant shall be completely water resistant and shall contain no solvents nor inorganic fibers of any kind. The through-penetration firestop sealant shall allow movement of +25% and shall be UL Classified and/or FM Systems Approved and tested to the requirements of ASTM E814 (UL1479). The firestop joint sealant shall allow movement up to + 50% and shall be UL Classified and tested to the requirements of UL2079.

B. Firestop Mortar:

1. The fire stopping material shall be a light-weight, fast drying Portland cement based material. The density of the wet mortar shall be < 45 lb./cu.ft. The specified mortar shall be approved for a wide range of applications including combustible and non-combustible penetrants when used by itself or in combination with other products from the same manufacturer. The firestop mortar shall be UL Classified and/or FM Systems Approved and tested to the requirements of ASTM E814 (UL1479).

PART 3 - EXECUTION

3.01 DRAWINGS

- A. The drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangements of equipment, ducts, conduits and fixtures. The locations of all items shown on the drawings or called for in the Specifications that are not definitely fixed by dimensions are approximate only. The exact location necessary to secure the best conditions and results must be determined at the project and shall have the approval of the Architect before being installed. This Subcontractor shall follow drawings in laying out work and checking drawings of other trades to verify spaces in laying out work to be installed.
- B. Maintain maximum headroom and space conditions are all points. Where headroom or space conditions appear inadequate, Architect shall be notified before proceeding with the installation. If directed by the Architect, this Subcontractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work. The Architect shall be the sole judge of what a "reasonable modification" in the layout is.

3.02 WORKMANSHIP

- A. The entire work provided in this Specification shall be constructed and finished in every respect in a workmanlike and substantial manner. It is not intended that the drawings shall show every pipe, fitting and appliance, but Subcontractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best trade practice and satisfaction of the Architect.

3.03 INSTALLATION OF WIRING AND CONDUIT

- A. In general, all conduits shall be run concealed unless otherwise indicated to be run exposed.
- B. Exposed conduits shall be run parallel to, or at right angles to, the walls of the building, and all bends shall be made with standard conduit ells or conduits bent to, not less than, the same radius. Horizontal runs of exposed conduits shall be close to ceiling beams, passing over water or other piping where possible and shall be supported by pipe straps or by other approved means, not more than 5' apart. Installation of exposed conduits in finished areas of the building shall be checked with the Architect for layout before installation to conform to the pattern of the structural members, and when completed, is to present the most unobtrusive appearance possible. No exposed conduits will be permitted on walls or partitions in public areas.
- C. In no place shall a conduit be run within 3" of hot water pipes, or appliances, except where crossing is unavoidable and, in that case, the conduit shall be kept at least 1" from covering or pipe crossed.
- D. Conduits shall be supported on approved type if galvanized wall brackets, ceiling trapeze, strap hangers or pipe straps, secured by means of toggle bolts on hollow masonry units or expansion bolts in concrete or brick, matching screws on metal surfaces and wood screws on wood construction. No nails shall be used as a means of fastening boxes or conduits.
- E. In general, no splices or joints will be permitted in either feeder or branches except at outlets or accessible junction boxes.
- F. All splices in wire #8 AWG and smaller shall be standard pigtail, made mechanically tight, soldered and insulated with proper thickness of insulating tape. Wire splicing nuts as manufactured by Minnesota Mining Company (Scotch Lock) or Ideal wire nuts may be used, subject to the local wire inspector.
- G. Wire #6 and larger shall be connected to panels and apparatus by means of approved lugs or connectors. Connectors shall be solderless type, sufficiently large to enclosure all strands of the conductors and securely fastened.

3.04 CUTTING, PATCHING AND DRILLING

- A. It shall be the duty of the General Contractor to provide all cutting, patching, and drilling necessary for the electrical installation.

3.05 GROUNDING

- A. This Subcontractor shall furnish all fittings, clamps, conduits and wire of proper size to make ground connections between all apparatus and conduit and the water piping as required by the latest edition of the National Electrical Code and as indicated on the Drawings. Any ground wires shall be run in conduit of size required by the National Electrical Code.

3.06 QUIET OPERATION

- A. All equipment and material furnished by this Subcontractor shall operate under all conditions of load without objectionable noises or vibrations, which, in the opinion of the Architect, is objectionable. Where sound or vibrations conditions arise which are considered objectionable by the Architect, this Subcontractor shall eliminate same in a manner approved by the Architect.

3.07 TESTS

- A. Furnish all labor, material, instruments, supplies, and services and bear all costs for the accomplishment of tests herein specified. Correct all defects appearing under test, and repeat the tests until no defects are disclosed. Leave the equipment clean and ready for use.

3.08 FINAL INSPECTION AND TEST

- A. Prior to test, feeders and branches shall be continuous from service contact point to each outlet; all panels, feeders and devices connected and fuse in place. Test system free from short circuits and grounds with insulation resistances not less than outlined in the National Electrical Code. Provide testing equipment necessary and conduct test in presence of the Owner's authorized representative.

3.09 GUARANTEE

- A. All materials, items of equipment and workmanship furnished under this Section shall carry the standard warranty against all defects in materials and workmanship for a period of not less than one (1) year from the date of final acceptance of the work.

3.10 SLEEVES AND OPENINGS

- A. Sleeves and openings for piping through walls, floors and other parts of the structure shall be provided at all points shown on the Contract Drawings and where indicated by the Department. The conduit shall go through the sleeve consisting of the next size conduit that will provide clearance. Sleeve ends shall be flush with surfaces.

3.11 WIRING METHODS

- A. Rigid steel conduit shall be used for all refrigeration equipment and pump wiring.
- B. Fire alarm system wiring shall be installed in electrical metallic tubing.
- C. Branch circuit wiring shall be installed in electrical metallic tubing.

3.12 SUPERINTENDENCE OF WORK

- A. The Electrical Subcontractor shall give his personnel superintendence to the work and shall retain at the job site during the period of construction, a competent foreman, satisfactory to the Department, who shall be in full charge of the work under this Section.

3.13 PROTECTION

- A. The Electrical Subcontractor shall be responsible for his work and equipment until finally inspected, tested and accepted; careful storage of materials and equipment which are not immediately installed after delivery to site; and closure of open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.

3.14 SPECIAL COORDINATION INSTRUCTIONS:

- A. Coordination with the work of other trades is referred to within various parts of this Section of the Specifications. The following special instructions shall also be carefully noted:
 1. This Subcontractor shall obtain from the Refrigeration Contractor copies of all shop drawing prints showing the piping installation as it will be put in place on the project. These drawings shall be thoroughly checked by this Subcontractor, and the routing of all conduits and installation of all outlets and electrical equipment shall be coordinated with

- the piping so as to prevent any installation conflict. Such coordination shall be done prior to roughing-in conduits, outlets and electrical equipment.
2. If any discrepancy is found to exist between the electrical plans and any other drawings associated with the project, notify the Department at once and have location verified before work is installed. Any reasonable change in location of equipment prior to installation shall not involve additional expense to the Owner. The term "reasonable" shall be interpreted at moving outlets or equipment locations a maximum of ten (10) feet in any direction from the location indicated on the Drawings.
 3. All feeder, branch circuit or auxiliary system wiring passing through pull boxes and/or being made up in panelboards shall be properly grouped, bound and tied together in a neat and orderly manner, in keeping with the highest standards of the trade, with plastic cable ties. Loose ends of the cable ties shall be properly trimmed after making up same. Cable ties shall be TY-Raps as manufactured by Thomas & Betts, or Holub Industries, Inc., Quick-Wrap, or Burndy Unirap, or equal.
 4. Branch circuits and auxiliary system wiring shall be peeled out of the wiring gutters of the terminal cabinets and panels at 90 degrees to circuit breakers and terminal lugs for connecting to same.
 5. At all points where steel support channels are cut and the unprotected steel is epoxed, two (2) coats of any approved rust preventative paint shall be applied to the bare surfaces, after proper cleaning. This requirement shall also apply to exposed job-cut threads of rigid steel conduit.
 6. Color and type of rust preventative paint shall be as directed by the Department. In general, the paint for metals which are galvanized shall be aluminum paint and others will be of a zinc chromate type, or as otherwise approved.
 7. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws, and other such items, shall be of a galvanized or cadmium plated finish, or of other approved rust-inhibiting coatings. Care should be taken that fixtures shall not be installed on both sides of existing or new building expansion joints.
 8. The Electrical Contractor shall provide all materials, equipment and workmanship to provide for adequate protection of all electrical equipment during the course of construction of the project. This shall also include protection from moisture and all foreign matter. The Subcontractor shall also be responsible for damage which he causes to be done to the work of other trades and shall remedy any such injury at his own expense.
 9. Specific reference is made to Article 380-8 of the National Electrical Code, relating to accessibility and mounting heights of circuit breakers. It shall be herein understood that this article shall also apply to the mounting heights of circuit breakers in panelboards. Circuit breakers in panelboards shall be located so that they may be operated from a readily accessible place and shall be so installed that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, will not be more than 6-1/2 (six and one-half) feet above the finished floor or working platform. It shall also be herein understood that this requirement shall take precedence over any contradictory notes, dimensions or details which may be indicated on the Contract Drawings. All panelboards shall be mounted at a height to conform to this requirement.

3.15 SECONDARY ELECTRICAL SERVICE:

- A. The existing building utilization voltage is 277/480 volts, 3-phase, 4-wire, originating at building pad mounted transformer.

3.16 AS BUILT DRAWINGS

- A. Operating and instruction manuals shall be submitted prior to testing of the system, four (4) complete sets of operating and instruction manuals shall be delivered to the Owner upon completion.
- B. A complete set of reproducible Mylar as-builts, showing installed wiring and color coding and wire tag notations, exact locations of all installed equipment, specific interconnections between all equipment and internal wiring of the equipment shall be delivered to the Owner upon completion of the system.
- C. Complete, simple comprehensive, step-by-step, testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete trouble shooting manual explaining what might be wrong if a certain malfunction occurs and explaining how to tests the primary internal part of each piece of equipment, shall be delivered to the Owner upon completion of the system.
- D. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:
 - 1. Instruction on replacing any components of the system, including internal parts.
 - 2. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions.
 - 3. A complete list of all equipment and components with information as to the address and phone number of both the manufacturer and local supplier of each item.

END OF SECTION