

- (two) fabric - mounting channels designed so that the shade cloth does not disengage from the tube itself. Shade rollers shall be reversible for left or right hand position.
 - a. Provide lift-assist mechanism consisting of a spring assembly inside the shade tube and idle-end 'brackets designed to wind the spring in the proper direction; MechoShade "LAM'.
 - 3. Shade Mounting Spline: Extruded vinyl "Snaploc" spline with asymmetrical insertion - locking channels and embossed - shadecloth guide, enabling shadecloth to be removed without having to remove the tube from retainer brackets or without removing brackets from the wall.
 - 4. Tube Support: Delrin cover plate to provide protection from tube's dislocation.
- C. Mounting System: Designed for easy removal and reinstallation of shade, for supporting roller, and operating hardware and for hardware position and shade mounting method indicated.
- 1. Brackets: Minimum 1/8 " sheet steel to which drive assembly, idle-end assembly and center support systems are attached.
 - a. Drive Bracket/Brake Assembly: Mecho/5 SlimLine Bracket.
- D. Manual Operation
- 1. General: Bi-directional clutch and bead -chain mechanism with adjustable brake:
 - a. Sprocket: one-piece, injection-molded, high-density Delrin capable of full engagement with stainless steel bead -chain qualified to match the pitch of the sprocket.
 - b. Chain: Qualified No. 10 stainless steel, 90-lb. test. Nickel-plated brass-bead or steel-bead control-loop chain and plastic-bead chain are not acceptable.

2.3 FABRICATION

- A. Fabricate units to completely fill openings from head to sill and jamb to jamb, unless specifically indicated otherwise. Provide inside and outside mitered comers where necessary for continuous coverage.
- B. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll straight and true without shifting sideways more than 1/8" in either direction per 8 feet of shade height due to warp distortion or weave design. Fabricate with bottom hem weights.
- C. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (w:h) ratios and shall not exceed manufacturer's standards, or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12494

SECTION 13915 - FIRE-SUPPRESSION PIPING

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 fire-suppression piping inside the building:
 - 1. Wet-pipe sprinkler systems.
- B. Related Sections include the following:
 - 1. Division 13 Section "Fire Alarm" for alarm devices not specified in this Section.

1.3 DEFINITIONS

- A. CR: Chlorosulfonated polyethylene synthetic rubber.

1.4 SYSTEM DESCRIPTIONS

- A. Wet-Pipe Sprinkler System: Automatic sprinklers shall provide 100% coverage of all areas throughout the renovation. Existing sprinkler systems shall be modified to accommodate the new ceiling installation. Sprinkler branch lines shall be removed back to active mains and capped. Fire Protection Contractor shall be responsible for relocating existing feed mains located in areas subject to conflicts with other trades, ie. Duct installation. Sprinkler heads shall be quick-response, frangible bulb, concealed style installed flush with ceiling.

1.5 PERFORMANCE REQUIREMENTS

- A. Standard Piping System Component Working Pressure: Listed for at least 175 psig.
- B. Fire-suppression sprinkler system design shall be approved by authorities having jurisdiction.
 - 1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.

- D. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations, if applicable.
- E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13 and NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."
- F. Welding certificates.
- G. Field quality-control test reports.
- H. Operation and Maintenance Data: For standpipe and sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
- B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- C. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13, "Installation of Sprinkler Systems."

1.8 COORDINATION

- A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
 2. Steel Flanges and Flanged Fittings: ASME **B16.5**.
- D. Grooved-End, Standard-Weight Schedule 40 Steel Pipe: ASTM A 53/A 53M, **ASTM A 135**, or **ASTM A 795**, hot-dip galvanized where indicated and with factory- or field-formed, square-cut- or roll-grooved ends.
1. Grooved-Joint Piping Systems:
 - a. Available Manufacturers:
 - 1) Anvil International, Inc.
 - 2) Central Sprinkler Corp.
 - 3) Victaulic Co. of America.
 - 4) Ward Manufacturing.
 - b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
 - c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.

2.3 SPRINKLERS

- A. Sprinklers shall be UL listed or FMG approved, with 175-psig minimum pressure rating.
- B. Available Manufacturers:
 1. Reliable Automatic Sprinkler Co., Inc.
 2. Viking Corp.
 3. Victaulic of America.
- C. Automatic Sprinklers: With heat-responsive element complying with the following:
 1. UL 199, for nonresidential applications.
 2. UL 1767, for early-suppression, fast-response applications.
- D. Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.
 1. Open Sprinklers: UL 199, without heat-responsive element.
 - a. Orifice: 1/2 inch, with discharge coefficient **K** between 5.3 and 5.8.
- E. Sprinkler types, features, and options as follows:

- A. Standard-Pressure, Wet-Pipe Sprinkler System, 175-psig Maximum Working Pressure:
 - 1. Threaded-end, black or galvanized, standard-weight schedule 40 steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
 - 2. Plain-end, black or galvanized, standard-weight steel pipe; locking-lug fittings; and twist-locked joints.
 - 3. Plain-end, black, standard-weight schedule 40 steel pipe; steel welding fittings; and welded joints.

3.5 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe smaller than NPS 8 with wall thickness less than Schedule 40 unless approved by authorities having jurisdiction and threads are checked by a ring gage and comply with ASME B1.20.1.
- C. Grooved Joints: Assemble joints with listed coupling and gasket, lubricant, and bolts.
 - 1. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated.

3.6 PIPING INSTALLATION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.
- B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.
- E. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.
- F. Install sprinkler piping with drains for complete system drainage.

3.11 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Energize circuits to electrical equipment and devices.
 - 4. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 5. Coordinate with fire alarm tests. Operate as required.
 - 6. Verify that equipment hose threads are same as local fire department equipment.
- B. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.12 CLEANING AND PROTECTION

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.
- C. Protect sprinklers from damage until Substantial Completion.

END OF SECTION 13915

SECTION 15140 - DOMESTIC WATER PIPING

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 domestic water piping from locations indicated to fixtures and equipment inside the building.
- B. Related Sections include the following:
 - 1. Division 15 Section "Meters and Gages" for thermometers, pressure gages, and fittings.
 - 2. Division 15 Section "Plumbing Specialties" for water distribution piping specialties.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Domestic Water Service Piping: 160 psig (1100kPa).
 - 2. Domestic Water Distribution Piping: 125 psig (860kPa).

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Water Samples: Specified in "Cleaning" Article in Part 3.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- D. Acceptable Substitute Manufacturers: All bidders desiring to furnish equipment other than that specified must submit a complete verification specification for the substituted equipment along with literature, wiring diagrams, piping diagrams, and a list of similar sized installations where proposed equipment is installed. The complete submittal must be presented to the Architect at least (7) full working days prior to the bid opening for

- a. Jomar. – T-100-SS
- B. Ball Valves Type (BLV-A): MSS SP-110, Class 150, 600-psi (4140-kPa) CWP, ASTM B 584 brass body and bonnet, 2-piece construction; chrome-plated brass ball, 100% port for 3-inch valves and smaller; blowout proof; extruded brass stem; PTFE seats and seals; threaded end connections:
 - 1. Operator: Lever operators with vinyl grip, lockable.
 - 2. Stem Extension: For valves installed in insulated piping.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Grooved joints may be used on aboveground grooved-end piping.
- D. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.
- E. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
 - 1. NPS 1-1/2 (DN40) and Smaller: Hard copper tube, Type **L** (Type **B**) copper pressure fittings; and soldered joints.
 - 2. NPS 2 (DN50): Hard copper tube, [Type **L** (Type **B**)] copper pressure fittings; and soldered joints.
 - 3. NPS 2-1/2 to NPS 3-1/2 (DN65 to DN90): Hard copper tube, Type **L** (Type **B**)] copper pressure fittings; and soldered joints.
 - 4. NPS 2-1/2 to NPS 3-1/2 (DN65 to DN90): Use NPS 2-1/2 to NPS 4 (DN65 to DN100) hard copper tube, Type **L** (Type **B**) with grooved ends; copper grooved-end fittings; copper-tubing, keyed couplings; and grooved joints.

3.3 VALVE APPLICATIONS

Gages" for pressure gages, and to Division 15 Section "Plumbing Specialties" for drain valves and strainers.

- G. Install water-pressure regulators downstream from shutoff valves. Refer to Division 15 Section "Plumbing Specialties" for water-pressure regulators.
- H. Install aboveground domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- I. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.
- J. Perform the following steps before operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
 - 5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 - 6. Remove filter cartridges from housings, and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.
- K. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

3.5 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free **flux**; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.6 ROUGHING-IN FOR WATER METERS

- A. Rough-in domestic water piping for water meter **installation** according to utility company's requirements. Water meters will be furnished by utility.
- B. Rough-in domestic water piping and install water meters according to utility company's requirements. Refer to Division 15 Section "Meters and Gages" for water meters.

3.7 VALVE INSTALLATION

3. NPS 1-1/2 and NPS 2 (DN40 and DN 50): 96 inches (2400mm) with 3/8-inch (10-mm) rod.
4. NPS 2-1/2 (DN **65**): 108 inches (2700mm) with 1/2-inch (13-mm) rod.
5. NPS 3 to NPS **5** (DN 80 to DN 125): 10 feet (3m) with 1/2-inch (13-mm) rod.

G. Install supports for vertical copper tubing every 10 feet (3m).

3.9 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials. Dissimilar metals shall be joined by Victaulic clear-flow waterways.
- D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:
 1. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."

3.10 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
 1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
 2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test domestic water piping as follows:

SECTION 15150 - SANITARY WASTE AND VENT PIPING

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 soil and waste, sanitary drainage and vent piping inside the building and to locations indicated.
- B. Related Sections include the following:
 - 1. Division 15 Section "Chemical-Waste Piping" for chemical-waste and vent piping systems.
 - 2. Division 15 Section "Plumbing Specialties" for soil, waste, and vent piping systems specialties.
 - 3. Division 15 Section "Sewage Pumps" for drainage connections for effluent pumps.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: **10-foot** head of water (**30 kPa**).
 - 2. Sanitary Sewer, Force-Main Piping: 150 **psig** (**1035 kPa**).

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- C. Acceptable Substitute Manufacturers: All bidders desiring to furnish equipment other than that specified must submit a complete verification specification for the substituted equipment along with literature, wiring diagrams, piping diagrams, and a list of similar sized installations where proposed equipment is installed. The complete submittal must be presented to the Architect at least (7) full working days prior to the bid opening for

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- B. Hard Copper Tube: ASTM B **88**, Types L (ASTM B **88M**, Type B), water tube, drawn temper for waste and vent 3-inch & smaller.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end.
 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.
- C. Aboveground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
1. NPS 2 to NPS 4 (DN 50 to DN 100): Hubless, cast-iron soil piping and one of the following:
 - a. Couplings: Heavy-duty, Type **304**, stainless steel.
 2. NPS 5 and NPS 6 (DN 125 and DN 150): Hubless, cast-iron soil piping and one of the following:
 - a. Couplings: Heavy-duty, Type **304**, stainless steel.
- D. Underground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
1. NPS 2 to NPS 4 (DN 50 to DN 100): Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.
 2. NPS 5 and NPS 6 (DN 125 and DN 150): Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.

1. No-hub fittings shall have a pipe stop on the interior of the fitting as well as a stainless steel shield that surrounds the coupling material. Dual pipe clamps shall be installed around the shield.
2. No-hub cast iron fittings shall be supported by clevis hangers. Wire, string, or strapping supports or hanging off other pipes shall not be permitted.

3.4 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for seismic-restraint devices.
- B. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet (**30** m) and Less: MSS Type **1**, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (**30** m): MSS Type **43**, adjustable roller hangers.
 - c. Longer Than 100 Feet (**30** m), if Indicated: MSS Type **49**, spring cushion rolls.
 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30m) or Longer: MSS Type **44**, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install supports according to Division 15 Section "Hangers and Supports."
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, **except** outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 15150

SECTION 15160 - STORM DRAINAGE PIPING

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 storm-drainage piping inside the building and to locations indicated.
- B. Related Sections include the following:
 - 1. Division 15 Section "Plumbing Specialties" for storm drainage piping system specialties.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Storm Drainage Piping: 10-foot **head of water (30kPa)**.

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings: For controlled-flow storm drainage system, include calculations, plans, and details.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- D. Acceptable Substitute Manufacturers: All bidders desiring to furnish equipment other than that specified must submit a complete verification specification for the substituted equipment along with literature, wiring diagrams, piping diagrams, and a list of similar sized installations where proposed equipment is installed. The complete submittal must be presented to the Architect at least (7) full working days prior to the bid opening for approval. Substitutions will not be permitted after the contract has been awarded. Refer to Specification Section 01300, SUBMITTALS AND SUBSTITUTIONS.

- C. Aboveground Storm Drainage Piping: Use the following piping materials for each size range:
 - 1. NPS **2** to NPS **4** (DN **50** to DN **100**): Hubless, cast-iron soil piping and one of the following:
 - a. Couplings: Heavy-duty, Type **304**, stainless steel.
 - 2. NPS **5** and NPS **6** (DN **125** and DN **150**): Hubless, cast-iron soil piping and one of the following:
 - a. Couplings: Heavy-duty, Type **304**, stainless steel.
- D. Underground Storm Drainage Piping: Use the following piping materials for each size range:
 - 1. NPS **3** and NPS **4** (DN **80** and DN **100**): Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.
 - 2. NPS **5** and NPS **6** (DN **125** and DN **150**): Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.
 - 3. NPS **8** and NPS **10** (DN **200** and DN **250**): Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.

3.3 PIPING INSTALLATION

- A. Refer to Division **2** Section "Storm Drainage" for Project site storm sewer and drainage piping.
- B. Refer to Division **15** Section "Basic Mechanical Materials and Methods" for basic piping installation.
- C. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers.
- D. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
- E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division **15** Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.
- F. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division **15** Section "Basic Mechanical Materials and Methods" for wall penetration systems.

- B. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install supports according to Division 15 Section "Hangers and Supports."
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2 (DN40 and DN 50): 60 inches (1500mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 3 (DN 80): 60 inches (1500mm) with 1/2-inch (13-mm) rod.
 - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
 - 4. NPS 6 (DN 150): 60 inches (1500mm) with 3/4-inch (19-mm) rod.
 - 5. Spacing for 10-foot (3-m) lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).
- G. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.7 FIELD QUALITY CONTROL

SECTION 15410 - PLUMBING FIXTURES

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 plumbing fixtures and related components.
- B. Related Sections include the following:
 - 1. Division 15 Section "Plumbing Specialties" for backflow preventers and specialty fixtures not in this Section.

1.3 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, drains and tail-pieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

- A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.
- B. Maintenance Data: For plumbing fixtures to include in maintenance manuals specified in Division 1.
- C. Acceptable Substitute Manufacturers: All bidders desiring to furnish equipment other than that specified must submit a complete verification specification for the substituted equipment along with literature, wiring diagrams, piping diagrams, and a list of similar sized installations where proposed equipment is installed. The complete submittal must be presented to the Architect at least (7) full working days prior to the bid opening for

3. Hose-Connection Vacuum Breakers: ASSE 1011.
 4. Hose-Coupling Threads: ASME B1.20.7.
 5. NSF Materials: NSF 61.
 6. Pipe Threads: ASME B1.20.1.
 7. Supply and Drain Fittings: ASME A112.18.1M.
- J. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1M.
 3. Manual-Operation Flushometers: ASSE 1037.
 4. Tubular Brass Drainage Fittings and Piping: ASME A112.18.1M.
- K. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Floor Drains: ASME A112.21.1M.
 2. Grab Bars: ASTM F 446.
 3. Hose-Coupling Threads: ASME B1.20.7.
 4. Off-Floor Fixture Supports: ASME A112.6.1M.
 5. Pipe Threads: ASME B1.20.1.
 6. Plastic Toilet Seats: ANSI Z124.5.
 7. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 COORDINATION

- A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. For fixture descriptions in other Part 2 articles where the subparagraph titles Products and Manufacturers introduce a list of manufacturers and their products or manufacturers only, the following requirements apply for product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified in other Part 2 articles.
 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified in other Part 2 articles.

2.2 LAVATORY FAUCETS

13. Spout Outlet: Plain end FC retrofit kit Part. No. **50-042** for laminar flow control.
 14. Vacuum Breaker: Not required.
 15. Operation: Electronic w/infrared sensor and hardwire transformer.
 16. Hard-Wire Transformer: Mount transformer under sink within protective lavatory shield.
 17. Drain: Grid.
 18. Tempering Device: Deck mount.
 19. Electrical: **120 VAC, 15 AMP GFI** circuit. Coordinate w/Div. **16**.
- B. Sink Faucet, CSS-1: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Manufacturer:
 - a. Chicago Faucet. **814-NCP-90090-319**
 2. Maximum Flow Rate: **2.5** gpm (**9.5L/min.**), unless otherwise indicated.
 3. Body Material: Cast brass.
 4. Finish: Polished chrome plate.
 5. Type: Service sink faucet with stops in shanks, vacuum breaker, hose-thread outlet, and pail hook.
 6. Mixing Valve: Two-lever handle.
 7. Backflow Protection Device for Hose Outlet: Required.
 8. Centers: 8 inches (203 mm) Single hole.
 9. Mounting: Back/wall, exposed.
 10. Handle[s]: Wrist blade, **6** inches.
 11. Inlet[s]: NPS **1/2** (DN **15**) male shank.
 12. Spout: Rigid, cast With wall brace.
 13. Spout Outlet: Hose thread.
 14. Vacuum Breaker: Required.
 15. Operation: Compression, manual.
 16. Drain: Not required.
 17. Tempering Device: Not required.

2.4 FLUSHOMETERS

- A. Flushometer, WC-1: Manual operated, Cast-brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, and copper or brass tubing, and polished chrome-plated finish on exposed parts.
1. Manufacturers:
 - a. Sloan Royal. **111-1.6**
 2. Internal Design: Diaphragm operation.
 3. Style: Exposed.
 4. Inlet Size: NPS **1** (DN **25**).
 5. Trip Mechanism: Manual.

- A. Water-Closet Support, We-1: Water-closet combination carrier designed for accessible & standard mounting height. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
 - 1. Manufacturers:
 - a. Jay R. Smith. 210
 - 2. Accessible Fixture Support: Include rectangular steel uprights.
- B. Lavatory Support, L-1: Type 11, lavatory carrier with concealed arms and tie rod. Include steel uprights with feet.
 - 1. Manufacturers:
 - a. Jay R. Smith. 700-16-Z-M32.
 - 2. Accessible Fixture Support: Include rectangular steel uprights. Concealed arms shall be 16-inches long for mounting fixture flush to wall.
- C. Clinical Sink Support, CSS-1: Carrier bolted to floor. Include steel uprights with feet.
 - 1. Manufacturers:
 - a. Jay R. Smith. 0914.

2.8 WATER CLOSETS

- A. Water Closets, WC-1: Wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation. Refer to Architectural sections for fixture mounting heights.
 - 1. Products:
 - a. Kohler: **K-4330** “Kingston”.
 - 2. Style: Flushometer valve.
 - a. Bowl Type: Elongated with siphon-jet design.
 - 1) Design Consumption: **1.6 gal./flush (6L/flush)**.
 - b. Color: White.

2.9 LAVATORIES

- A. Lavatories, L-1: Accessible, vitreous-china fixture.

3. Color: White.
4. Rim Guard: Stainless steel on front and sides of rim.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIXTURE INSTALLATION

- A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.
- D. All wall hung water closet carriers shall be installed with an accessible cleanout located above the flood level of the fixture. A minimum of 2-inch tee shall be installed in the vent piping from the carrier with a ¼ bend to the wall and cleanout on either side of the fixture. Tee and bend shall be supported. A stainless steel access plate shall cover cleanout. Refer to detail on drawing P002.
- E. Install wall-hanging fixtures with tubular waste piping attached to supports.
- F. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

- D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
- E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.
- F. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL **486A** and UL **486B**.

3.4 FIELD QUALITY CONTROL

- A. Verify that installed fixtures are categories and types specified for locations where installed.
- B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. Install fresh batteries in sensor-operated mechanisms.

3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets, and flushometer valves to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

SECTION 15412 - EMERGENCY PLUMBING FIXTURES

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 emergency plumbing fixtures:
 - 1. Hand-held drench hoses.
 - 2. Emergency showers.
 - 3. Eye/face washes.
 - 4. Water-tempering equipment.

1.3 DEFINITIONS

- A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.
- C. Self-contained Emergency Plumbing Fixture: Fixture with flushing-fluid-solution supply.
- D. Tepid: Approximately 85 deg F (**29** deg C) temperature.
 - 1. Allowable Variation: Plus or minus 5 deg F (**3** deg C).

1.4 SUBMITTALS

- A. Product Data: Include flow rates and capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Product Certificates: Submit certificates of performance testing specified in "Source Quality Control" Article.

2.1 MANUFACTURERS

- A. For fixture descriptions in other Part 2 articles where the subparagraph titles "Available Products" and "Products" introduce a list of manufacturers and their products, the following requirements apply for product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified in other Part 2 articles.

2.2 EYE WASH/DRENCH HOSE UNIT

- A. Hand-Held Drench Hoses, EW-1: Plumbed counter-mounting type in wall recess. Refer to Architectural documents for additional information.
 - 1. Products:
 - a. Guardian Equipment Co.; G-5036-FSH-VB-HG.
 - 2. Capacity: Deliver potable water at rate not less than 3.0 gpm (**11.4L/min.**) for at least 15 minutes.
 - 3. Supply Fitting: NPS 1/2 (DN 15) brass with flow regulator.
 - 4. Hose: 8-feet, flexible stainless steel.
 - 5. Control-Valve Actuator: Hand-held squeeze valve with locking clip.
 - 6. Spray Heads: Twin gentle spray outlets.
 - 7. Location: Nurse Station.

2.3 WATER-TEMPERING EQUIPMENT

- A. Hot- and Cold-Water-Tempering Equipment (TMV): Factory-fabricated equipment including water thermostatic mixing valve designed to provide **85 deg F (29 deg C)** potable water at emergency plumbing fixtures, to maintain temperature at plus or minus **5 deg F (3 deg C)** throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, corrosion-resistant metal piping, and enclosure.
- B. Combination Shower/Eye Station, TMV-1: Plumbed wall-mounting type within sink protective shielding.
 - 1. Products:
 - a. Lawler Manufacturing Co., Inc.; 911-E/F.
 - b. Leonard Valve Co.; TA-300.
 - c. Guardian Equipment; G3600

2.4 SOURCE QUALITY CONTROL

- I. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.
- J. Fill self-contained fixtures with flushing fluid.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect hot- and cold-water-supply piping to emergency plumbing fixtures with integral, hot- and cold-water-thermostatic mixing valve stations. Emergency fixtures located in Chemistry, Accessions, and Microbiology shall be supplied with tepid water from existing thermostatic mixing valve station located in the basement mechanical room.
- C. Directly connect emergency eye/face wash plumbing fixture receptors with trapped drain outlet to sanitary drainage and vent piping.

3.4 FIELD QUALITY CONTROL

- A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities and temperatures.
- B. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.
- C. Report test results in writing.

3.5 ADJUSTING

- A. Adjust or replace fixture flow regulators for proper flow.
- B. Adjust equipment temperature settings.

END OF SECTION 15412

SECTION 15415 - DRINKING FOUNTAINS AND WATER COOLERS

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. Existing Water-station water coolers.
 - 2. Existing Fixture supports.

1.3 DEFINITIONS

- A. Accessible Water Cooler: Fixture that can be approached and used by people with disabilities.
- B. Fitting: Device that controls flow of water into or out of fixture.
- C. Fixture: Water cooler, unless one is specifically indicated.
- D. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

1.4 SUBMITTALS

- A. Product Data: Include accessories for each type of fixture indicated.
- B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

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

- B. Examine walls and floors for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Use mounting frames for recessed water coolers, unless otherwise indicated.
- B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

3.3 INSTALLATION

- A. Install off-floor supports affixed to building substrate and attach wall-hanging fixtures, unless otherwise indicated.
- B. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.
- C. Install fixtures level and plumb.
- D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Refer to Division 15 Section "Valves" for general-duty valves.
- E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- F. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.
- G. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.4 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect water supplies from water distribution piping to fixtures.
- C. Connect drain piping from fixtures to drainage piping.

SECTION 15430 - PLUMBING SPECIALTIES

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 plumbing specialties:
 - 1. Miscellaneous piping specialties.
 - 2. Sleeve penetration systems.
 - 3. Cleanouts.
- B. Related Sections include the following:
 - 1. Division **15** Section "Meters and Gages" for water meters, thermometers, and pressure gages.

1.3 DEFINITIONS

- A. The following are industry abbreviations for plastic piping materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. PE: Polyethylene plastic.
 - 3. PUR: Polyurethane plastic.
 - 4. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Domestic Water Piping: 125 psig (**860kPa**).
 - 2. Sanitary Waste and Vent Piping: 10-foot head of water (30kPa).
 - 3. Storm Drainage Piping: 10-foot head of water (30kPa).
 - 4. Force-Main Piping: 100 psig (*690kPa*).

1.5 SUBMITTALS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 SLEEVE PENETRATION SYSTEMS

- A. Manufacturers:

- 1. ProSet Systems, Inc.

- B. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.

- 1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
 - 2. Stack Fitting: ASTM A 48 (ASTMA 48M), gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.
 - a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

2.3 CLEANOUTS

- A. Cleanouts: Comply with ASME A112.36.2.

- 1. Application: Floor cleanout, Wall cleanout, For installation in exposed piping.
 - 2. Products:
 - a. Smith, Jay R. Mfg. Co.
 - 3. Body or Ferrule Material: Cast iron.
 - 4. Clamping Device: Required.
 - 5. Outlet Connection: Threaded, Inside calk, Spigot.
 - 6. Closure: Brass plug with straight threads and gasket.
 - 7. Adjustable Housing Material: Cast iron with threads.
 - 8. Frame and Cover Material and Finish: Polished bronze.
 - 9. Frame and Cover Shape: Round.
 - 10. Top Loading Classification: Medium Duty.

PART 3 - EXECUTION

3.1 INSTALLATION

- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL **486A** and UL **486B**.
- F. Connect plumbing specialties and devices that require power according to Division **16** Sections.
- G. Interceptor Connections: Connect piping, flow-control fittings, and accessories.
 - 1. Solids Interceptors: Connect inlet and outlet.

3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each backflow preventer, trap seal primer system.
 - 1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
 - 2. Refer to Division 15 Section "Mechanical Identification" for nameplates and signs.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and their installation, including piping and electrical connections. Report results in writing.
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 15430

HEATING, VENTILATING, AND AIR CONDITIONING

PART ONE - GENERAL

1.01 WORK INCLUDED

- A. Perform WAC work and provide material and equipment as specified in this Section. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
- B. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities having jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda, and Change Orders.

1.02 RELATED WORK

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1.

1.03 APPLICABLE CODES AND STANDARDS

- A. HVAC work shall comply with the following codes and standards:
 - 1. In addition to complying with the specified requirements, comply with pertinent regulations of governmental agencies, authorities having jurisdiction, and all local and state building, plumbing, mechanical, electrical, fire, and health department codes and standards.
 - 2. BOCA MECHANICAL CODE(1993).
 - 3. BOCA Code (1999).
 - 4. City of Portland Code of Ordinances, Section 6- 1.
 - 5. Building and Building Regulations, Chapter 6.

Rev. 12-1-00
Article II. Building Code
Article IV, Mechanical Code.
Article III, Electrical Code.
 - 6. State Energy Efficiency Building Performance Standards.
 - 7. ASHRAE/INESNA Standard 90-1.
 - 8. National Fire Protection Association (NFPA-101-2000Life/Safety Code).
 - 9. Guidelines for Construction and Equipment of Hospitals and Medical Facilities - 2001 Edition.

All areas for inpatient care, treatment
And diagnosis.

30 Percent

90 Percent

1.05 SYSTEM DESCRIPTION – MAINE MEDICAL CENTER

A. General

The proposed heating, ventilating, and air conditioning for the Emergency Room area will utilize the existing supply air from AHU-B.1, which is located in the Bean Building, 4th floor Mechanical Room. The present return air distribution system serving this area only, will be converted to 100% exhaust and connected to a new rooftop exhaust fan. This fan will be located near the AHU-11 penthouse above. Partial rebalance of the AHU-B.1 system will be required as well as integrating the new terminal box zones into the daisy chain network system for the existing energy management system to monitor the new zones. Connections to the existing air distribution system will require some shutdowns of the air handling unit, AHU-B. 1. These shutdowns and subsequent work shall be approved and coordinated **with** the owner.

B. Heating System

The existing building constant temperature and variable temperature hot water hydronic piping systems will continue to serve the new lobby area in this renovation. Piping will be extended to new hot water reheat coils and radiant panels.

D. Controls

The renovation will be integrated into the existing Honeywell Direct Digital Control System [DDC). The DDC System will provide control of all new terminal boxes and monitor status of the new exhaust fan, EF-1, via current sensor or differential pressure sensor and issue an alarm if fan operation is interrupted.

E. Miscellaneous Systems

Provide Seismic Restraints on all mechanical systems and equipment as required by the Codes.

1.06 QUALITY ASSURANCE

- A. Use adequate numbers of skilled, licensed workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

- 5. Duct access doors.
- D. Materials List: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit a proposed list of materials to be provided under this Section.
- E. Record Drawings: Prepare record drawings in accordance with the provisions of Section 01720.
- F. Operation and Maintenance Manuals: Upon completion of the installation work of this section, prepare **and** submit two copies of the Operating and Maintenance Manual for the Owner's use.

1.09 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect materials of this Section before, during and after installation and to protect installed work and materials for all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no change in Contract Sum.

1.10 WARRANTY

- A. Upon completion of the Work, and as a condition of its acceptance, deliver to the Architect two copies of a written Warranty agreeing to replace work of this Section which fails due to defective materials or workmanship within one year after Date of Substantial Completion as that date is determined in accordance with the General Conditions.

PART TWO - PRODUCTS

2.01 ACCEPTABLE PRODUCTS

- A. Acceptable Manufacturers and Substitutions: Comply with Article 1.05 - Quality Assurance in this Section. Provide the specified product or submit the equal product from the list of acceptable manufacturers for approval.
- B. Acceptable Manufacturers:
 - 1. Automatic Temperature Controls: Honeywell.
 - 2. Diffusers and Grilles: Tuttle & Bailey, Titus, Metalaire.
 - 3. Valves: Grinnell, Milwaukee, Nibco, Stockham.
 - 4. Terminal Boxes:, Enviro-tec, Phoenix Controls, Trane, Tuttle & Bailey, Titus.
 - 5. Fans - Roof Exhaust: Loren Cook, Greenheck, Acme.
 - 6. Fire and Smoke Dampers: Prefco, Ruskin.
 - 7. Flexible Ductwork: Flexmaster.
 - 8. Flexible Pipe Connectors: Mason Industries
 - 9. Insulation: Owens-Corning, Certainteed, Knauf, Schuller.
 - 10. Radiant Panels: Airtex, Aerotec. Sun-El.

- C. Notify the Architect immediately when the removal of existing ceilings, walls or obstructions reveal conditions substantially different from the Contract Documents.

3.02 INSTALLATION OF PIPING AND EQUIPMENT

- A. General: Coordinate with the work of other Trades before starting installation. Provide elbows and offsets as required to facilitate the Work of this Section and provide a complete functional system. All materials and equipment provided under this Section shall be installed in accordance with the Manufacturers latest printed installation instructions.
 - 1. Make changes in directions with fittings, make changes in main sizes with eccentric reducing fittings. Install water supply and return piping with straight side of eccentric fittings at top of the pipe.
 - 2. Run piping concealed above ceilings and within furred spaces. Obtain approval from the Architect for piping locations which require furring not indicated on the Contract Drawings.
- B. Equipment Access: Install piping, equipment, and accessories to permit access for maintenance. Relocate items if necessary to provide such access without additional cost to the Owner.

3.03 SYSTEM SHUTDOWNS

- A. Coordinate shutdowns of existing systems with the Owner and submit a written request at least ten working days in advance. Minimize system shutdowns as much as possible.

3.04 PIPE IDENTIFICATION

- A. Provide clip-on color-coded piping identification markers on piping systems installed under this Section. Provide matching flow arrows to indicate direction of flow. Markers shall be equal to Seton Setmark.
- B. Install markers on each side of wall penetrations, at each valve, at tee fittings, and base of risers. Spacing of markers shall not exceed 20 feet and shall include at least one marker in each room.
- C. Leak Test: Install station outlets and perform joint leak test before closing of the walls. Pressurize systems with minimum test pressure of 150 PSIG using Grade D nitrogen. Test each joint for leakage with soapy water. Repair all leaks and retest.
- D. Pressure Test: Finish installing system components and perform final pressure test. Pressurize systems to a minimum test pressure of 70 PSIG. Maintain test pressure for 24 hours.

END OF SECTION

SECTION 16000 - ELECTRICAL

PART ONE - GENERAL

1.01 WORK INCLUDED

- A. Perform electrical work and provide material and equipment as shown on Drawings and as specified in this Section. Completely coordinate work of this Section with work of other trades, and provide a complete and fully functional installation.
- B. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities having jurisdiction as required to perform work in accordance with legal requirements and with Specifications, Drawings, Addenda, and Change Orders.
- C. In general, the work of this Section will include, but not be limited to:
 - 1. Wire.
 - 2. Conduit.
 - 3. Boxes and fittings.
 - 4. Grounding.
 - 5. Wiring devices & device plates.
 - 6. Fire Alarm System modifications.
 - 7. Lighting.
 - 8. Enclosed disconnect switches.
 - 9. Circuit breakers.
 - 10. Enclosed controllers.
 - 11. Connections to Architectural, HVAC, Plumbing, & Owner Furnished Equipment, as required.
 - 12. Empty conduit for low voltage systems (telephone/data, nurse call, etc.).
 - 13. Nameplates.
 - 14. Hangers and supports.
 - 15. Testing.

1.02 RELATED WORK

- A. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions, and Sections of Division 1.
- B. Prepare coordination drawings as specified in Section 01150 - Special Provisions.
- C. Related work specified in other Sections includes, but is not necessarily limited to:
 - 1. Section 01045 - Cutting and Patching: Masonry, concrete, tile, and other parts of structure, except drilling for hangers, providing holes and openings in metal decks, and core drilling.
 - 2. Section 01500 - Temporary Facilities and Controls.
 - 3. Section 02070 - Selective Demolition.

- B. Acceptable manufacturers and substitutions: The manufacturers specified in this Section are used as a basis for the design and are intended to establish the standard of quality upon which the Contract is based. Unless otherwise noted, provide product from one of the specified manufacturers. If substitutes are desired, the submitted product will be equal in all respects to the specified product. Submit list of proposed substitutes for review and approval in compliance with Section 01300.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with NFPA 70.

1.05 SUBMITTALS

- A. Prepare and submit show drawings in accordance with the requirements of the General Conditions - Show Drawings, Product Data and Samples.
- B. Shop Drawings will include, but will not be limited to the following:
 - 1. Wire and cable.
 - 2. Conduit.
 - 3. Boxes & fittings.
 - 4. Wiring devices & device plates.
 - 5. Lighting.
 - 6. Enclosed disconnect switches.
 - 7. Circuit breakers.
 - 8. Enclosed controllers.
 - 9. Grounding systems.
- C. Record Drawings: Prepare Record Drawings in accordance with the provisions of Section 01700 - Contract Closeout and this specification.

1.06 PROJECT CONDITIONS

- A. Contractor will visit the site of the proposed renovation and base his bids from his own site examinations and estimates. Contractor will not hold the Architect, the Owner, or his agents or employees responsible for or bound by any schedule, estimate, or of any plan thereof. Contractor will study the Contract Documents included under this Contract to determine exactly the extent of work provided under this Contract and to ascertain the difficulty to be encountered in performing the work as shown on the Drawings and outlined hereinafter in installing new equipment and systems and coordinating the work with the other Trades.
- B. Contractor will furnish materials and do work in accordance with these specifications and any supplementary documents provided by the Architect. The work will include everything shown on the Drawings and/or required by the specifications as interpreted by the Architect, regardless of where such information is indicated (Architectural, HVAC, Plumbing, Fire Protection, etc., Contract Documents). Work and materials furnished and installed will be new and of the best

electricity or rerouting of existing services as required to accomplish the construction schedule.

- E. The Contractor will maintain electric service to existing electrical circuits passing through the areas being renovated under this Contract and feeding electrical equipment in other areas of the existing building.
- F. Any existing circuits passing through the areas being renovated under this Contract that interfere with new partitions will be relocated by the Contractor.
- G. Contractor will remove electrical equipment, conduit and cabling as indicated on drawings. Electrical equipment, conduit and cabling will not be abandoned above ceilings.

1.10 COORDINATION OF WORK

- A. Electrical Contractor shall compare his drawings and specifications with those for other trades and shall report any discrepancies between them to the Architect and obtain from written instructions any changes necessary in the electrical work. All work shall be installed in cooperation with other trades installing interrelated work. Before installation, Electrical Trade shall make proper provisions to avoid interferences in a manner approved by the Architect. All changes required in the work of the Electrical Trade caused by their neglect shall be made by them at their own expense.
- B. Locations of conduit and equipment shall be adjusted to accommodate the work with interferences anticipated and encountered. Electrical Contractor shall determine the routing and location of his respective systems prior to fabrication or installation.
- C. The Contract Drawings are diagrammatic only intending to show general runs and locations of conduit, equipment, terminals, and specialties and not necessarily showing all required offsets, details, and accessories and equipment to be connected. All work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workmanlike installation which will afford maximum accessibility for operation, maintenance, and headroom. In case of conflict between conduit sizes shown on plans, details, or diagrams, the larger conduit size shall be included under the Contract where such discrepancy occurs.

1.11 CUTTING, PATCHING, AND PIPE SLEEVES

- A. Electrical Contractor shall be responsible for all core drilling required for his work, but shall not cut into any structural elements without the written approval of the Architect.
- B. All cutting, rough patching, and finish patching shall be provided by the General Contractor.
- C. All concrete and masonry equipment, curbs, chases, pockets, and openings except core-drilling required for the proper installation of the work under this Contract will be provided by the General Contractor using dimensions, templates, bolts, and

1.14 DAMAGE TO OTHER WORK

- A. Electrical Contractor shall be held responsible for and shall pay for all damages caused by his work to the building structures, equipment, conduits, systems, etc., and all work and finishes installed under this Contract. Repair of such damage shall be done by the General Contractor at the expense of the Contractor to the Architect's satisfaction.

1.15 CORRECTION OF WORK

- A. Electrical Contractor shall promptly correct all work provided under his Contract and rejected by the Architect as defective or as failing to conform to the Contract Documents whether observed before or after completion of work and whether or not fabricated, installed, or completed.

1.16 EXTRA WORK

- A. No claim for extra work will be allowed unless it is authorized by the Architect before commencement of the said extra work.

1.17 TOUCH-UP PAINTING

- A. All equipment and systems shall be thoroughly cleaned of rust, splatters, and other foreign matter of discoloration leaving every part of all systems in an acceptable prime condition. Electrical Contractor for the work under his Contract shall refinish and restore to the original condition all equipment which has sustained damage to the manufacturer's prime and finish coats of paint and enamel.

1.18 FIRESTOPPING AND SMOKEPROOFING

- A. The Electrical Contractor shall have the space between the conduits provided under his Contract and the sleeves packed as follows:
 - 1. Materials shall be as required under the FIRESTOPS AND SMOKE SEALS specification.
 - 2. Materials shall be delivered in their original, tightly sealed containers or unopened packages, all clearly labeled with the manufacturer's name, product identification, and lot numbers where appropriate.
 - 3. Installation shall comply with the following:
 - a. Penetration seal preparations shall include use of the procedures, techniques, and quality control standards recommended by the product manufacturer as follows:
 - (1) Remove all incidental combustible materials and loose impediment from the penetration openings and involved surfaces.

- D. Using the "Record Drawing Set," Electrical Contractor shall print one complete set of reproducible mylars and two sets of prints for submission to the Owner.
- E. Electrical Contractor shall bear all the costs of reproducing the original drawings, making all the necessary changes and printing the mylar sets for the work in his charge.

1.22 CONTINUITY OF EXISTING ELECTRICAL CIRCUITS

- A. The Electrical Contractor shall maintain electric service to all existing electrical circuits passing through the areas being renovated under this Contract and feeding electrical equipment in other areas of the existing building.
- B. Any existing circuits passing through the areas being renovated under this Contract that interfere with new partitions shall be relocated by the Electrical Contractor.

PART TWO - PRODUCTS

2.01 WIRE

- A. All wiring shall be installed in rigid metal conduit or EMT unless otherwise noted on the drawings. Wiring will be in strict accordance with Rules and Specifications governing insulated wires for low potential systems as contained in the NEC.
- B. Wire will be copper, soft-drawn, and annealed, will be of 95 percent conductivity, will be smooth and true and of a cylindrical form, and will be within 1 percent of the actual size called for, insulated for 600 volts working pressure. Wire will be code type "THWN" of sizes called for on the Drawings.
- C. Minimum size wire will be #12 A.W.G. for lighting and power system and #14 A.W.G. for signal and control systems unless otherwise specified or noted on the Drawings.
- D. Wire will be Code Type "THWN" and will be insulated for 600 volts working pressure with flame retarding, moisture resisting covering unless otherwise noted on the Drawings. Wire will be color coded as follows:

<u>208/ 120 Volts</u>	<u>480/277 Volts</u>
A Phase - Black	A Phase - Brown
B Phase - Red	B Phase - Orange
C Phase - Blue	C Phase - Yellow
Neutral - White	Neutral - Gray
Ground - Green	Ground - Green

- E. Wire for signal and control systems will be U.L. Type "THWN" and will be of sizes called for on Drawings and will be furnished in a sufficient number of colors for coding of the various conductors.
- F. Coils will, in all cases, bear the Underwriters' labels and wire will be new stock delivered at the building in its original wrappings.

and bends and offsets will be avoided as far as possible. Where necessary, conduit fittings will be used. Piping will be run straight and true, satisfactory to the Architect.

- F. Feeder and branch circuit wiring in finished areas will be concealed in the structure and in unfinished areas maybe exposed. Junction and pull boxes of proper sizes will be provided where required.
- G. Feeders will be properly and neatly racked and supported on steel hangers, channels, and clips. Feeder supports will not be attached to the bottom chord of bar joints, air conditioning and heating ducts, or other trade piping.
- H. Empty EMT conduit runs for telephone and data, etc. indicated on the drawings shall have nylon pull cords installed in all runs.

2.03 BOXES AND FITTINGS

- A. At all outlets of whatever kind, for all systems, there will be provided a suitable fitting, which will be either a box or other device especially designed to receive the type of outlet to be mounted thereon.
- B. In the case of fixtures, outlet fittings will be provided with suitable supports of size and kind required by the fixture to be hung. In general, fixture studs will be 3/8".
- C. Outlets on exposed conduit work will be cast alloy conduit fittings of proper type as manufactured by Crouse-Hinds, Appleton, Russell & Stoll, or approved equal.
- D. At all outlets on concealed conduit work, provide galvanized pressed steel outlet boxes of standard make. These boxes will in all cases be specially designed for apparatus required and, where such boxes are not available on the market, special boxes will be made by this Contractor without additional expense. In general, outlet boxes will be 4 inches square.
- E. Plaster rings with ears will be provided to fit outlet boxes installed and will be of the required depth so that the edge of the ring is flush with the finished plaster, masonry, or acoustical materials.
- F. Boxes will be manufactured by Appleton, General Electric, Steel City, or equal.

2.04 PULL AND JUNCTION BOXES

- A. Pull boxes shall be constructed of code gauge galvanized steel and shall be installed at points whether indicated on the drawings or not. Minimum dimensions shall not be less than NEC requirements.
- B. Provide flat plain covers with suitable flat head machine screws or slotted truss head bolts.
- C. Boxes shall be manufactured by one of the following: Lee Products Company, Harry Richmond Company or Commercial Sheet Metal Company.

- A. Description: NEMA ICS-2, general purpose, Class A, with toggle action and overload element.

2.10 MAGNETIC ENCLOSED CONTROLLERS

- A. Description: NEMA ICS 2, Class A, full voltage, non-reversing, across the line, unless otherwise indicated.
- B. Control Circuit: 120 V; obtained from integral control power transformer with a control power transformer of sufficient capacity to operate connected pilot, indicating and control devices, plus 100percent spare capacity.
- C. Combination Controller: Factory-assembled combination controller and disconnect switch.
- D. Circuit-Breaker Disconnecting Means: NEMA AB 1, motor-circuit protector with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
- E. Overload Relay: Ambient-compensated type with inverse-time-current characteristic and NEMA ICS 2, Class 10 tripping characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of specific motor to which they connect and with appropriate adjustment for duty cycle.
- F. Motor running contactor operating automatically when full voltage is applied to motor.

2.11 LIGHTING

- A. Lighting shall be as indicated on contract drawings. Lighting fixtures are scheduled to be re-used as indicated. Refer to architectural RCP drawings for final locations.
- B. Care shall be given during demolition so as not to damage existing lighting fixtures. Fixtures taken down shall be stockpiled by the contractor in a neat and orderly manner, covered to prevent dirt and dust from entering fixtures.
- C. Clean and re-lamp all lighting fixtures labeled as “existing to be relocated” (XR) or “existing to remain” (XM) on the drawings prior to project completion.
- D. Fixtures not re-installed shall be returned to the owner.
- E. Refer to drawings for lighting fixture schedule.

2.12 WIRING DEVICES

- A. Comply with NEMA Standard WD 1, “General Purpose Wiring Devices.”
- B. Receptacles, Straight-Blade, Hospital Grade: Listed and labeled for compliance with UL Standard 498, “Electrical Attachment Plugs and Receptacles,” heavy duty grade unless otherwise indicated.

- C. Supporting rods shall be threaded at ends with allowance for adjustments. Wire and strap hangers **will** not be permitted. All conduit and fittings shall be supported by hangers, straps, etc., using bolts, and/or lead expansion sleeves.

2.15 FIRE ALARM SYSTEM

- A. The existing fire alarm system shall be modified as indicated on the plans. Contractor shall provide all back boxes, devices, wiring, and re-programming required for a complete and operable fire alarm system.
- B. Maintain the fire alarm system in complete operability during construction.
- C. Report any malfunctions or damage encountered during construction to the general contractor immediately.

PART THREE - EXECUTION

3.01 EXAMINATION

- A. Before starting work, inspect site conditions before starting preparatory work, and verify that actual conditions are known and acceptable.
- B. Inspect areas where piping and equipment will be installed, and verify that adequate space is available for access, service, and removal of equipment. Coordinate with the work of other Sections.
- C. Notify the Architect immediately when the removal of existing ceilings, walls, or obstructions reveals conditions substantially different from the Contract Documents.

3.02 INSTALLATION

A. General

1. Unless indicated otherwise, equipment and material specified herein or indicated on the Drawings will be installed under this Contract whether or not specifically itemized herein.
2. The Contractor will obtain detailed information from manufacturers of equipment as to proper methods of installation. Obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.
3. Miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws, and other such items, will be of a galvanized or cadmium plated finish or of another approved rust-inhibiting coating.

3.03 MATERIALS AND WORKMANSHIP

- H. The Electrical Contractor shall erect and maintain, at all times, necessary safeguards for the protection of life and property of the Owner, Workmen, Staff and the **Public**.
- I. Prior to installation, the Electrical Contractor has the responsibility to coordinate the exact mounting arrangement and location of equipment indicated on the drawings to allow proper space requirements as indicated in the National Electric Code. Particular attention shall be given in the field to group installations. If it is questionable that sufficient space, conflict with the work of other Contractors, 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 Engineer and not proceed with this part of the Contract work until definite instructions have been given to him by the Engineer.
- J. The Electrical Contractor shall obtain from Plumbing, HVAC, Fire Protection and all other Contractors copies of all shop drawings prints showing the ductwork, piping and equipment installations as they will be put in place on the project. These drawings shall be thoroughly checked by the Electrical Contractor and the routing of all conduits and installation of all outlets and electrical equipment shall be coordinated with the ductwork and piping so as to prevent any installation conflict. Such coordination shall be done prior to roughing in conduits, outlets and electrical equipment.
- K. Location of all wall outlets shall be verified with the Architect prior to roughing in conduits. Refer to details and wall elevations on the Architectural drawings. Mounting heights indicated on these drawings and/or specific dimensional information given to the Electrical Contractor by the Engineer shall take precedence over such information indicated on the Electrical drawings.
- L. Refer to all other drawings associated with this project. Any and all equipment which require an electrical supply circuit, switch controls or connections, whether indicated on the Electrical drawings or not, shall be furnished and installed as directed by the Engineer shall take precedence over such information indicated on the Electrical drawings.

3.05 INSTALLATION

A. General

1. Unless specifically noted or indicated otherwise, all equipment and material specified in Part 2 of this specification or indicated on the drawings shall be installed under this Contract whether or not specifically itemized herein.
2. The Electrical Contractor shall obtain detailed information from manufacturers of equipment provided under ~~Part~~ 2 of this specification as to proper methods of installation.
3. The Electrical Contractor shall obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.

5. Raceways in ceiling spaces shall be routed in such an approved manner as to eliminate or minimize the number of junction boxes required, but also shall be routed in an orderly and organized manner. Support rods **and** clamps shall be furnished and installed as directed by the Engineer. Support of conduits by use of wire is prohibited. Conduits shall be supported and secured by conduit support devices as approved by the Engineer.
6. Where rigid metal conduit is threaded in the field, a standard conduit cutting die providing $3/4$ inch taper per foot shall be employed. Support coupling shall not be used on rigid metal conduit except where specifically allowed by the Engineer. Running threads ~~shall~~ not be used on rigid metal conduit. Compression fittings shall not be used with rigid steel, intermediate metallic, or aluminum conduit.
7. Conduit work shall be installed in such a manner to keep exposed threads to a minimum and there shall not be more than three (**3**) threads left exposed after the conduit work is made up tight.
8. Provide liquid tight flexible metal conduits for connections to electrical equipment and to equipment furnished under HVAC and Plumbing Sections that are subject to movement, vibration, or misalignment: where available space dictates; and where noise transmission must be eliminated or reduced.
9. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to outlets. Conduit shall enter and be secured to cabinet, junction box, pull box, or outlet box with locknut outside and bushing inside, or with liquid-tight, threaded, self-locking, cold-weld wedge adapter. Locknuts and bushings or self-locking adapters will not be protected from entrance of foreign material before installation of conductors.
10. Size rigid steel conduit, EMT, and flexible conduit as required by NEC, except as otherwise specified or shown on the drawings.
11. Check raceway sizes to determine that green equipment ground conductor fits in same raceway with phase and neutral conductors to meet NEC percentage of fill requirements. Increase duct, conduit, tubing, and raceway sizes shown or specified as required to accommodate conductors.
12. Conduit secured rigidly on opposite sides of building expansion joints and long runs of exposed conduit subject to stress shall have expansion fittings. Fittings shall safely deflect and expand to twice distance **of** structural movement. Provide separate external copper bonding jumper secured with grounding straps on each end of fitting.
13. Threaded sealing fittings for rigid steel conduits shall be zinc or cadmium-coated, cast, or malleable iron. Sealing fittings for aluminum conduit shall be threaded cast aluminum. Fittings that prevent passage of water vapor shall be continuous drain. Install and seal fittings as required by manufacturer's recommendations. In concealed work, install fittings in flush steel box with blank cover plate.

1. Install wire and cable in approved raceways as specified and as approved by Authorities that have jurisdiction. Surface metal raceways shall not be used.
2. Wire from point of service connection to receptacles, lighting fixtures, devices, equipment, outlets for future extension, and other electrical apparatus as shown on the drawings. Provide slack wire for connections where required. Tape ends of wire and provide blank covers for outlet boxes designed for future use.
3. Conductors #10 and smaller in branch circuit panelboards, signal cabinets, signal control boards in switchboards, and motor control centers shall be bundled.
4. Follow homerun circuit numbers shown on the drawings to connect circuits to panelboards. Circuit numbers provided are based on limited field observation and available drawings. Exact circuit numbers may vary in the field. Where homerun circuit numbers are not shown on the drawings, divide similar types of connected loads among phase busses so that currents in each phase are approximately equal in normal usage. Common neutrals are not allowed.
5. 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 neatly and orderly 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 them up. Cable ties shall be Ty-Raps as manufactured by Thomas & Betts, Holub Industries, Inc., Quick-Wrap, Bumdy Unirap, or equal.
6. Branch circuits and auxiliary system wiring shall be peeled out of the wiring gutters at the terminal cabinet and panels at 90 degrees to circuit breakers and terminal lugs for connecting to same. All circuits shall exit panelboards in conduit to a junction box within the area served, then may be transitioned to hospital grade AC cable to feed devices or loads.
7. For large size conductors available only in black, use colored plastic tape at all ends and where connections and splices are made for the specified color code identification. Tape shall be wrapped around the conductor three complete turns.
8. All branch circuits shall be connected to breakers at Electrical Contractor's discretion. The balancing of **all** loads shall be the Electrical Contractor's responsibility.
9. Splices, taps, and lugs shall be electrically and mechanically secure and solderless lugs, and connectors shall be used. Lugs shall be used for conductor sizes #8 AWG and larger. All lugs shall be **of** the proper size, and strands shall not be cut from a conductor in order to fit the conductor into a lug.
10. All wiring shall be installed **and** supported in accordance with the requirements of the NEC.

E. Lighting Fixtures

- B. Despite references in the specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.
- C. Finish of materials, components and equipment shall not be less than industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the Engineer.
- D. Provide proper access to material or equipment that requires inspection, replacement, repair or service. If proper access cannot be provided, confer with the Engineer as to the best method of approach to minimize effects of reduced access.
- E. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all Local and State Codes.
- F. The Owner will not be responsible for material, equipment or the installation of same before testing and acceptance.

3.07 GROUNDING

- A. Provide equipment grounding system as shown on the drawings. Equipment grounding system shall be designed so metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment, and other conductive items in proximity to electrical circuits operate continuously at ground potential and provide low impedance path for possible ground fault currents.
- B. System shall meet NEC requirements, modified as shown on the drawings and as specified. Bonding jumpers shall be installed at all locations required by NEC.
- C. Provide separate green insulated equipment grounding conductor for each single or three-phase feeder and each branch circuit. Install grounding conductor in common conduit with related phase or neutral conductors, or both. Parallel feeders installed in more than one raceway shall have individual full size green insulated equipment ground conductors in each.
- D. Determine numbers and sizes of screw terminals for equipment grounding bars in panelboards and other electrical equipment. Provide screw terminals for active circuits, spares and spaces.
- E. Provide green, insulated equipment ground conductor in same raceway with associated phase conductors, as follows:
 - 1. From green ground terminals of receptacles to green 10-32 washer-in-head outlet box machine screw and to panelboard grounding bus.
 - 2. From panelboard ground bus to green 10-32 washer-in-head machine screw in ceiling outlet box or junction box, through flexible metallic conduit to ground terminal on lighting fixture and from green 10-32 washer-in-head machine screw in ceiling outlet box or junction box through flexible metallic conduit to green 10-32 washer-in-head machine screw in switch outlet box.

equipment is wet or contains moisture, it shall be thoroughly dried before energizing.

C. Raceways and Junction Boxes

1. All raceways and junction boxes shall be blown out and dried prior to installation of feeder conductors and branch circuit conductors.

D. Low Voltage Systems

1. All cabinets and panels for low voltage systems shall be thoroughly cleaned and dried prior to system start-up.

E. Final Cleaning

1. All lighting fixtures, devices, device plates, etc., shall be cleaned and left in "like new" condition to the satisfaction of the Engineer prior to Owner occupancy.
2. All rubbish and discarded materials shall be disposed of and removed from the site on a day-to-day basis or week-to-week basis as required.
3. All equipment, whether part of the Electrical Contractor's Contract or not, which must be cleaned due to the Electrical Contractor's work, shall be cleaned by the Electrical Contractor to the satisfaction of the Engineer.

3.11 START-UP TESTING AND INSPECTION OF ELECTRICAL EQUIPMENT

A. References

1. The testing and inspection shall comply with all applicable sections of the following Codes and Standards:
 - a. **ANSI** American National Standards Institute
 - b. **ATM** American Society for Testing and Materials
 - c. **AC** Association of Edison Illuminating Companies
 - d. **IEEE** Institute of Electrical and Electronics Engineers
 - e. **IPCEA** Insulated Power Cable Engineers Association
 - f. **NEC** National Electrical Code
 - g. **NEMA** National Electrical Manufacturers Association
 - h. **NFPA** National Fire Protection Association
 - i. State and **Local** Codes and Ordinances
2. The inspection and testing shall comply with the project plans and specifications as well as with the manufacturers' drawings, instruction manuals, and other applicable data for the apparatus tested.

B. Responsibilities

1. The Electrical Contractor shall clean the equipment, as specified, torque down all accessible bolts, perform routine insulation resistance tests on all branch and

2. Electrical Tests

- a. Perform insulation resistance test on each cable with respect to ground and adjacent cables.
- b. Be aware that terminated cables in some cases cannot be tested unless disconnected from end devices.

3. Test Values

- a. Insulation resistance tests shall be performed at **1000 VDC** for **1/2** minute.

H. Grounding System Tests

1. Visual and Mechanical Inspection

- a. Inspect ground system for adequate termination at all devices.

2. Electrical Tests

- a. Perform the two-point method test per IEEE Standard 81, Section **0.03** to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

3. Test Values

- a. The main ground electrode system resistance to ground should be no greater than 5 ohms. Provide additional grounding required to meet maximum 5 ohms resistance value.

- 4. Electrical Contractor shall correct or replace any nominal current-carrying circuit which is defective or grounded, and he shall also correct all other troubles encountered by these tests. All defects, whether through faulty workmanship or material furnished, shall be corrected under this Section at the Electrical Contractor's expense.

3.12 FINAL INSPECTION

- A. When all Electrical work on the project has been completed as indicated on the drawings and specified herein and is ready for final inspection, such an inspection shall be made. At this time the Electrical Contractor for the work under this Contract shall demonstrate that the requirements of these specifications have been met to the Architect's satisfaction.

END OF SECTION 16000

Maine Medical Center

Room Finish Schedule

4684.000 ED Pediatric Exam Reno.

6/22/2004

Room#	Room Name	Floor		Base		Walls		Ceiling		Finish Notes	Mlvk.	Toil.	A.
		New	Ex.	New	Ex.	New	Ex.	New	Ex.				
Bldg: -													
Floor: OB - Basement													
B001-ER	T PUB	CT		CT		EPXY/CT		ACT					
B002-ER	T PUB	CT		CT		EPXY/CT		ACT					
B003-ER	HALL	ETR		ETR		ETR/PTD		ETR					
B004-ER	LOBBY	ETR/WOM/PORC T		ETR		ETR		ETR/SP					
B005-ER	CHILD WTG	CPT		WD		ETR/PTD		ETR/SP					
B006-ER	HALL	VCT		RUB		PTD		ACT					
B007-ER	PEDI	VCT		RUB		PTD		ACT					
B008-ER	PEDI	VCT		RUB		PTD		ACT					
B009-ER	PEDI	VCT		RUB		PTD		ACT					
B010-ER	SINK ALC	VCT		RUB		PTD		PTD					
B011-ER	NRS STA	VCT		RUB		PTD		ACT					
B012-ER	WTG	ETR		ETR/ WD		ETR/PM		ETR					