

PROJECT

FOR

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXX COUNTY, PENNSYLVANIA

PROJECT NO. D.G.S. A XXXXXXXXXX

COMMONWEALTH OF PENNSYLVANIA
TOM CORBETT, GOVERNOR
HARRISBURG, PENNSYLVANIA

DEPARTMENT OF GENERAL SERVICES
SHERI L. PHILLIPS, SECRETARY
HARRISBURG, PENNSYLVANIA

BUREAU OF ENGINEERING AND ARCHITECTURE
18TH AND HERR STREETS
HARRISBURG, PENNSYLVANIA

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE NO.</u>	
<u>BIDDING AND CONTRACT DOCUMENTS FOR ALL CONTRACTS</u>			
	Notice to Bidders	1 -	
	Table of Contents	A-1 – A-2	
	Instructions to Bidders	1 - 26	
	Form of Agreement	1 - 5	
	Contract Bond	1 - 4	
	General Conditions of the Contract	1 - 101	
	Federal Wage Scale	1 -	
	List of Drawings	B-1	
	Federal Clauses	G-1 -	
<u>DIVISION 1</u>	<u>GENERAL REQUIREMENTS</u>		
Section 01010	Summary of Work	01010-1	01010-3
Section 01030	Base Bid Descriptions	01030-1	01030-2
Section 01040	Coordination and Control	01040-1	01040-6
Section 01115	DPW-Supplemental Provisions	01115-1	01115-4
Section 01300	Submittals	01300-1	01300-4
Section 01310	Sequence of Construction & Milestones	01310-1	01310-2
Section 01400	Quality Control Testing	01400-1	01400-4
Section 01401	Quality Assurance Testing	01401-1	01401-3
Section 01500	Temporary Utilities	01500-1	01500-2
<u>GENERAL CONSTRUCTION</u>			
<u>DIVISION 2</u>	<u>SITE WORK</u>		
Section 02050	Demolition	02050-1	02050-4
<u>DIVISION 5</u>	<u>METALS</u>		
Section 05400	Light Gauge Steel Framing	05400-1	05400-3
Section 05500	Metal Fabrications	05500-1	05500-6
<u>DIVISION 7</u>	<u>THERMAL AND MOISTURE PROTECTION</u>		
Section 07841	Penetration Firestopping	07841-1	07841-4
	Attachments: Drawing No. 146553a		
	Drawing No. 151526a		
	Drawing No. 151527a		
<u>DIVISION 9</u>	<u>FINISHES</u>		
Section 09260	Gypsum Board Assemblies	09260-1	09260-7
Section 09310	Ceramic Tile Walls	09310-1	09310-5
Section 09671	Epoxy Flooring	09671-1	09671-3
Section 09775	Wall Panels and Accessories	09775-1	09775-4
Section 09900	Painting	09900-1	09900-6

DIVISION 10

Section 10155

Section 10800

SPECIALTIES

Toilet Partitions (Solid Plastic)

Toilet Accessories

10155-1

10800-1

10155-4

10800-3

PLUMBING CONSTRUCTION**DIVISION 15**

Section 15040

Section 15100

Section 15410

Section 15430

Section 15700

Section 15838

Section 15890

Section 15936

PLUMBING

Basic Materials and Methods

Piping Material, Equipment and Methods

Plumbing Fixtures

Plumbing Specialties

HVAC Terminal Equipment

Power Ventilators

Ductwork, Accessories and Sheetmetal Specialties

Air Inlets and Outlets

15040-1

15100-1

15410-1

15430-1

15700-1

15838-1

15890-1

15936-1

15040-17

15100-7

15410-8

15430-6

15700-2

15838-6

15890-5

15936-3

ELECTRICAL CONSTRUCTION**DIVISION 26**

Section 260500

Section 260510

Section 260519

Section 260526

Section 260529

Section 260533

Section 260553

Section 260923

Section 262726

Section 262813

Section 262816

Section 265100

ELECTRICAL

Common Work Results for Electrical

Electrical Equipment Wiring

Low Voltage Electrical Power Conductors and Cables

Grounding and Bonding

Hangers and Supports for Electrical Systems

Raceway and Boxes for Electrical Systems

Identification for Electrical Systems

Lighting Control Devices

Wiring Devices

Fuses

Enclosed Switches and Circuit Breakers

Interior Lighting

260500-1

260510-1

260519-1

260526-1

260529-1

260533-1

260553-1

260923-1

262726-1

262813-1

262816-1

265100-1

260500-15

260510-4

260519-4

260526-8

260529-7

260533-9

260553-9

260923-3

262726-7

262813-3

262816-8

265100-9

DRAWINGS

NUMBER AND TITLE OF DRAWINGS

The drawings which form a part of this project are indicated in the following list:

SHEET NO. CS-1 – COVER SHEET

SHEET NO. A-1 OF 3 – XXXXXXXXXXXXXXXX

SHEET NO. A-2 OF 3 – XXXXXXXXXXXXXXXX

SHEET NO. A-3 OF 3 – XXXXXXXXXXXXXXXX

SHEET NO. H-1 OF 1 – XXXXXXXXXXXXXXXX

SHEET NO. P-1 OF 2 – XXXXXXXXXXXXXXXX

SHEET NO. P-2 OF 2 – XXXXXXXXXXXXXXXX

SHEET NO. E-1 OF 2 – XXXXXXXXXXXXXXXX

SHEET NO. E-2 OF 2 – XXXXXXXXXXXXXXXX

The above is an exact list of the drawings included under Project No. D.G.S. A XXXXXX and shall be considered a part thereof.

The Professional will furnish from time to time as the work progresses, such supplemental drawings as may be required for further illustrating the details of the work, but these supplemental drawings will not include the shop drawings, all of which are to be prepared by the Contractor and submitted as hereinafter specified for approval before the work is started.

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01010

SUMMARY OF WORK

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 LOCATION

- A. XXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXX County, Pennsylvania

1.3 PROJECT DESCRIPTION

- A. Renovate existing toilet in Ward #7. Remove and replace existing water closets, toilet partitions and accessories, floor, ceiling tile and suspension system. Remove and replace toilet fixtures and associated sanitary and domestic water piping. Provide new fixture controls to operate using infrared controls. Renovate existing HVAC system to provide adequate ventilation compatible with adjacent zones. Remove and replace electrical receptacles and light fixtures and relocate existing nurse call stations.

1.4 WORK INCLUDED

- A. The work of this project consists of but is not necessarily limited to the following. Detailed requirements of the work are described on the pertinent specification sections and/or shown on the drawings.

B. GENERAL CONSTRUCTION (.1)

1. Demolition:

- a. Remove existing panel system (covering existing urinals).
- b. Remove existing ceramic floor tile. Patch and repair existing mortar bed to receive new epoxy floor system.
- c. Remove existing toilet partitions and toilet room accessories; remove grab bars and toilet paper dispensers.
- d. Remove existing acoustical ceiling tile and suspension system.

2. New Construction:

- a. Retain existing ceramic wall tile. Repair wall. Install new ceramic tile (wall) including installation of new backer board.
- b. Install new wall bumpers and railings in corridors.
- c. Provide and install new solid plastic toilet partitions at existing locations.
- d. Provide and install new toilet accessories; grab bars and toilet paper dispensers.
- e. Provide and install new water resistant gypsum board ceiling with access panels at new ceiling height.
- f. Apply new seamless quartz epoxy floor coating to match existing floor elevation.
- g. Install new plastic panel wainscoting in corridors, etc.
- h. Provide new fire rated steel door in Toilet Room. Provide new door hardware including kickplate. Provide new fire rated louver with fusible link.

C. HVAC CONSTRUCTION (.2)

1. Remove existing and provide new exhaust fan, ductwork, grilles, hangers, supports and related accessories shown and written on the contract documents.
2. Remove existing and provide new finned tube radiation, enclosures, piping, hangers, supports and related accessories shown and written on the contract documents.
3. Cut and patch existing construction to perform demolition and new construction.
4. Provide operational testing, adjusting and balancing.
5. Provide notification to, submit reports to, obtain all permits and pay all fees required by regulatory authorities and agencies.

D. PLUMBING CONSTRUCTION (.3)

1. Remove existing plumbing fixtures as shown and written on the contract documents, piping and related accessories no longer required.
2. Provide and install new plumbing fixtures, specialties, piping, hangers, supports, insulation and related accessories as per contract documents.

E. ELECTRICAL CONSTRUCTION (.4)

1. Remove existing and provide new lighting fixtures, receptacles, and related accessories.

2. Remove existing and relocate or provide new fire alarm devices, and related accessories.
3. Remove existing and provide new power connections to exhaust fan, and related accessories.
4. Provide power connections to new plumbing fixture sensors, and related accessories.
5. Cut and patch existing construction to perform demolition and new construction.
6. Provide operational testing and adjusting.
7. Provide notification to, submit reports to, obtain all permits and pay all fees required by regulatory authorities and agencies.

1.5 WORK BY OTHERS

- A. Work of others shall be coordinated by the Lead Contractor.

1.6 QUESTIONS DURING BIDDING PERIOD

- A. Direct all questions pertaining to the project as shown and described in the contract documents to the project designer listed below.
1. DGS Project Coordinator – XXXXXXXXXXXXXXXX
Telephone – XXXXXXXXXXXXXXXX
FAX – XXXXXXXXXXXXXXXX
Email: XXXXXXXXXXXXXXXXXX
 2. DGS Project Designer (.1) – XXXXXXXXXX
Telephone – XXXXXXXXXXXXXXXX
Email: XXXXXXXXXXXXXXXXXX
 3. DGS Project Designer (.2) – XXXXXXXXXX
Telephone – XXXXXXXXXXXXXXXX
Email: XXXXXXXXXXXXXXXXXX
 4. DGS Project Designer (.3) – XXXXXXXXXX
Telephone – XXXXXXXXXXXXXXXX
Email: XXXXXXXXXXXXXXXXXX
 5. DGS Project Designer (.4) – XXXXXXXXXX
Telephone – XXXXXXXXXXXXXXXX
Email: XXXXXXXXXXXXXXXXXX

END OF SECTION

SECTION 01030

BASE BID DESCRIPTIONS

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections “General Conditions of Contract” and “General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.
- B. **THE PRICE WRITTEN ON EACH SEPARATE BASE BID LINE ON THE BASE BIDS SHEET IN THE BID PACKAGE SHALL BE THE TOTAL BID PRICE FOR THAT PARTICULAR BASE BID.**

1.2 SECTION INCLUDES

- A. Identification of each Base Bid and description of the basic changes to be incorporated in the work.

1.3 DESCRIPTION OF SEPARATE BASE BIDS

A. GENERAL CONSTRUCTION (.1)

- 1. Base Bid No. 1:
 - a. All work as shown on the contract drawings and as described in contract specifications for Toilet Room and Lobby Areas.
- 2. Base Bid No. 2:
 - a. All work as shown on the contract drawings and as described in contract specifications for Toilet Room and Lobby Areas with addition of Corridor No. 1.
- 3. Base Bid No. 3:
 - a. All work as shown on the contract drawings and as described in contract specifications for Toilet Room and Lobby Areas with addition of Corridor No. 2 and Dayroom No. 2.

B. HVAC CONSTRUCTION (.2)

- 1. Base Bid No. 1:
 - a. All work as shown on the contract drawings and as described in contract specifications.

2. Base Bid No. 2:
 - a. Same as Base Bid No. 1.
3. Base Bid No. 3:
 - a. Same as Base Bid No. 1.

C. PLUMBING CONSTRUCTION (.3)

1. Base Bid No. 1:
 - a. All work as shown on the contract drawings and as described in contract specifications.
2. Base Bid No. 2:
 - a. Same as Base Bid No. 1.
3. Base Bid No. 3:
 - a. Same as Base Bid No. 1.

D. ELECTRICAL CONSTRUCTION (.4)

1. Base Bid No. 1:
 - a. All work as shown on the contract drawings and as described in contract specifications.
2. Base Bid No. 2:
 - a. Same as Base Bid No. 1.
3. Base Bid No. 3:
 - a. Same as Base Bid No. 1.

END OF SECTION

SECTION 01040

COORDINATION AND CONTROL

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SECTION INCLUDES

- A. This section includes the on-site provisions that govern the performance of the work to complete this project.

1.3 PRIME CONTRACTS - FOR THIS PROJECT CONSTRUCTION

- A. DGS A XXXXXXXX.1 - General (**LEAD**)
- B. DGS A XXXXXXXX.2 - HVAC
- C. DGS A XXXXXXXX.3 - Plumbing
- D. DGS A XXXXXXXX.4 - Electrical

1.4 VISIT TO SITE

- A. For access to the site during the bidding period contact the Using Agency site personnel with phone number listed below:
 - 1. Using Agency Site Representative: XXXXXXXXXX
 - 2. Telephone Number: XXXXXXXXXXXXXXXX

1.5 UNIDENTIFIED HAZARDOUS MATERIALS (ASBESTOS, LEAD, ETC.)

- A. There is a possibility that hazardous materials not identified in the contract documents may be discovered on this project. Should it be determined that some or all of the hazardous materials must be removed, the Contractor shall obtain an estimate for said removal from a Subcontractor who is experienced in the field, has insurance and is knowledgeable of the regulations as they apply. The Contractor may provide the estimate itself if it is qualified in the applicable hazardous materials field. The Department shall consider authorizing a Change Order for the removal of the hazardous material to the extent necessary.
- B. The Contractor or Subcontractor must comply with all requirements of the General Conditions, including the maintenance of insurance up to the limit required under the General Conditions.

- C. Should a hazardous material be encountered on the job, the Contractor shall comply with all statutes and regulations of the Commonwealth of Pennsylvania and all rules and regulations of the United States Environmental Protection Agency as they apply during construction and demolition work and the disposal of hazardous material. Particular attention is drawn to Code of Federal Regulations, Title 40, Part 61, Section 112 of Clean Air Act and PA Department of Labor and Industry, Act 194 for asbestos.
- D. The Contractor shall comply fully with the regulations of OSHA as they pertain to the protection of workers exposed to the emission of asbestos fibers, or lead particulate and shall take all steps necessary to protect its employees, as well as all other people engaged in the building.
- E. Whenever a hazardous material is to be removed or disposed of, the Contractor is required to make proper notification to the Bureau of Air Quality Control in the Department of Environmental Protections' Regional Office, PA Department of Labor and Industry and EPA as applicable, and is required to obtain and pay for any permits required.

1.6 LEAD PAINT

- A. All work is to be performed with the assumption that all painted surfaces are lead containing. Each Prime Contractor is responsible for following all required OSHA 1926.62 'Lead In Construction' standard when disturbing or impacting these painted surfaces during the course of the renovation including but not limited to activities such as; cutting and patching, core drilling, penetration, anchoring, fastening, etc. The area(s) shall be visually clean upon completion of any of these activities:
 - 1. Action Plan: Contractor(s) shall submit an Action Plan to the Department for approval at the Initial Job Conference which specifically outlines details of means and methods to be used for each dust generating activity involving lead painted surfaces, erection of critical barriers and plastic sheeting for dust control, subsequent exposure assessment, personal protective equipment, hygiene and clean-up.
 - 2. Contractor(s) shall utilize means and methods that preclude dust generation to complete work that disturbs/impacts lead containing paint (i.e., paint stripper, HEPA assisted drills, etc.).
 - 3. Contractor(s) shall ensure areas beyond work area are not contaminated and shall immediately stop work and erect plastic sheeting to prevent the spread of dust anytime means and methods inadvertently create dust.

1.7 TESTING OF EQUIPMENT

- A. After any equipment furnished under the contract and any permanent heating, ventilating, plumbing, drainage or electrical systems and equipment have been installed or modified, it shall be the responsibility of the Contractor to operate its equipment for a satisfactory period of time, as required by the Department for proper testing and instructing the operating personnel. Fuel, electricity and water required for proper testing of permanent equipment and for the period of instructing personnel, shall be paid for by the Contractor testing its equipment.

1.8 PROJECT PHOTOGRAPHS

- A. Contractor shall refer to the General Conditions of the Contract.

1.9 INSTRUCTIONS AND TRAINING

- A. Refer to General Conditions as specified in the applicable technical portion of each specification for "Operations and Maintenance Manual Requirements".
- B. Provide full on-site training and instruction to designated Commonwealth personnel given by competent manufacturer's authorized personnel thoroughly familiar with all technical and operational aspects of the installed items. Instructions are to cover operation and maintenance of all systems, equipment components and other items as specified and furnished under this contract. Instructional video tapes may be used to augment required instructions and training but may not be substituted for the in person on-site training. All on-site training shall be video taped by the Contractor. The video tape(s) are to be given to the Department.
- C. Conduct instruction and training during regular working hours. For training on complicated systems, allow at least one-half of the training time to be at and/or with the system equipment.
- D. Provide additional training and instructions for all significant modifications and/or changes made under the terms and/or conditions of the manufacturer's and/or Contractor's warranty.

1.10 PROJECT SIGN

- A. See General Conditions, Project Sign. No sign shall be furnished and erected.

1.11 FURNISHINGS AND EQUIPMENT

- A. No item of removed material shall be reinstalled in the work unless so noted on the drawing or in these specifications.

1.12 GENERAL

- A. All construction trailers, offices, equipment and materials required to be on-site shall be located at the direction of the Department.

1.13 WORK IN OCCUPIED BUILDINGS

- A. The General Contractor shall install dust-tight temporary partitions isolating the work area(s) from the other portions of the building before any work of any Contractor begins on-site. These portions must allow access to means of egress in compliance with fire codes.
- B. Protect all existing equipment and finishes remaining in the work area.

- C. Where isolated work must be performed outside the partitioned work area, the Contractor performing shall provide temporary dust/dirt protection for its work. Those areas shall be cleaned by the Contractor before its employees leave the area each shift.

1.14 WORKING HOURS

- A. The Contractor's available working hours shall be from 6:00 A.M. to 6:00 P.M., Monday through Friday. The approved working hours will be established at the Initial Job Conference.
- B. Work during different hours, or work on Saturdays, Sundays, State and National Holidays or overtime work, must have the Regional Director's or his designee's prior written approval.
- C. This shall not apply in those unforeseen isolated and/or emergency instances when a particular operation must be performed in a continuous sequence that extends the working day beyond the approved working hours. Coordinate with the Department in these instances.
- D. The Department's failure to approve different working hours, weekend or holiday working hours, or overtime hours is not cause for a claim against the Department for delay.

1.15 DELIVERY, STORAGE AND HANDLING

- A. Prefinished materials shall arrive at job site in their original unopened cartons or other protective packaging necessary to protect finishes. Materials should be stored in such packages until time of application. Flat materials such as panels shall arrive and remain on adequate support to ensure flatness and prevent damage.
- B. Store all materials, equipment and bulk items prior to installation in clean, dry, well ventilated locations away from uncured concrete, masonry or damage of any kind. Waterproof tarpaulin or polyethylene sheeting must allow for air circulation under covering.
- C. Coordinate storage location with Department.
- D. Refer to each section for specific delivery, handling and storage instructions of items specified.

1.16 PARKING

- A. Limited parking space is available on the Commonwealth property. Any parking is subject to prior approval of the Department.

1.17 TRAFFIC

- A. The Lead Contractor shall establish at the Initial Job Conference a construction staging and traffic plan for the project which minimizes the construction interferences with the Institution's operation. This plan is subject to the Department's approval.

1.18 SUBSURFACE INFORMATION

- A. Any available data concerning subsurface materials or conditions based on soundings, test pits or test borings, has been obtained by the Department for its own use in designing this Project. Its accuracy or completeness is not guaranteed by the Department or the Professional and in no event is it to be considered as part of the contract plans or specifications. Contractors must assume all risks in excavating for this project and shall not be entitled to rely on any subsurface information obtained from the Department or Professional. Bidders shall make their own investigation of existing subsurface conditions and if they do not do so, The Department will not be responsible. Said subsurface information is available at the office of the Professionals, and prospective bidders may obtain this information by applying to the Professional. Bidders will be required to sign a standard form of receipt for this subsurface information; and they will accept such subsurface information in accord with the provisions of this section.

1.19 SITE FENCE

- A. The Lead Contractor shall erect and maintain a temporary fence on the perimeter of the work area. A plastic net type fence is sufficient.

1.20 ENVIRONMENTAL QUALITY CONTROL

- A. The Prime Contractor and its Subcontractors shall perform their work in a manner which shall minimize the possibility of air, water, land and noise pollution, in accordance with General Conditions.
- B. The name, address and telephone number of the Department of Environmental Protection Regional Office is furnished below. This office shall be contacted for waste disposal permits and for information concerning sites already approved for conducting waste disposal.

Northeast Regional Office
2 Public Square
Wilkes-Barre, PA 18701-3296
(717) 826-2511

Counties: Carbon, Lackawanna,
Lehigh, Luzerne, Monroe,
Northampton, Pike, Schuylkill,
Susquehanna, Wayne and Wyoming

1.21 OFFICE FOR CONTRACTOR

- A. Each Contractor shall provide and maintain, at its cost, a suitable office on the premises, at a location directed by the Department. The Contractor shall provide and maintain heating facilities and supply fuel for same in cold weather, and shall remove the office from the premises at completion of all work.

1.22 INSPECTOR'S OFFICE

- A. The Contractor will not be required to supply an office and equipment for the Inspector's on this project. The Using Agency will provide an existing space for this project.

1.23 SANITARY FACILITIES

- A. General Conditions is hereby deleted. The following conditions shall be followed.
- B. Sanitary facilities will, within the limitations of the existing facilities, be provided by the Using Agency at no cost.
- C. The existing facilities available for the Contractor's use will be assigned by the Department at the Initial Job Conference.

1.24 SMOKING POLICY

- A. Smoking is prohibited in all buildings.

END OF SECTION

SECTION 01115

DPW – SUPPLEMENTAL PROVISIONS CONTRACTOR BEHAVIOR AND ACTIVITIES AT DEPARTMENT OF PUBLIC WELFARE YOUTH DEVELOPMENT CENTERS, MENTAL HEALTH AND MENTAL RETARDATION FACILITIES

Part 1 – GENERAL

1.1 STIPULATIONS

- A. The Specifications Sections, "General Conditions of Contract" and "General Requirements", form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

- 1. Any additional regulations will be discussed at the Initial Job Conference.

1.2 PERSONAL BEHAVIOR

- A. Contractors are responsible for disseminating to their employees the special restrictions on personal behavior and the procedures/potential penalties for violations.
- B. Identification tags or badges to be furnished by the facility must be worn at all times while on facility property.
- C. Smoking is not permitted in any facility building.

1.3 VEHICLES

- A. Construction vehicles and employee's vehicles will be parked in an area designated by the Department and locked at all times. The license numbers of vehicles to be left overnight will be reported to the security office at the facility on a daily basis by the Contractors.
- B. Vehicles may not be operated or parked on any lawn areas, unless otherwise permitted.

1.4 TOOLS

- A. Tools shall be kept in a secure (locked) area when not in use and inventoried to insure complete and total accountability at the end of each shift. While being used, tools shall be kept in view or on person. Broken or non-usable tools are to be disposed of away from the facility property. Any missing tools are to be reported promptly to the Facility Maintenance Manager. Particular attention should be paid to tools, which may be used as weapons or instruments of escape. Special procedures will be developed with the facility's Maintenance/Engineering Department concerning cutting pliers, bolt cutters, hacksaws and welding or cutting equipment. UNDER NO CIRCUMSTANCES WILL CUTTING TORCHES OR WELDING EQUIPMENT BE LEFT INSIDE THE PERIMETER SECURITY ENCLOSURE (at facilities with enclosures) OVERNIGHT, ON WEEKENDS OR ON HOLIDAYS.

- B. No ladders may be left upright and accessible to residents. If not in use, ladders must be taken down and secured. Scaffolding must be secured to guard against unauthorized use.

1.5 WORK AREAS

- A. All work areas are to be kept safe and orderly at all times.
- B. All doors are to be kept locked to ensure resident safety. Doors normally unlocked are excluded, unless safety becomes an issue.
- C. Passenger elevators are not to be used to transport materials, unless written authorization is given specifying dates and times when it is permissible.
- D. Flammable liquids are not to be stored inside occupied buildings.
- E. Do not compromise Life Safety Code requirements without prior written consent of the facility's Safety Manager, who will develop and implement alternate plans.
- F. Facility supplies are not to be utilized by Contractors, unless called for in the project specifications.
- G. Contractors are to be aware of the locations of fire alarms, fire extinguishers and related equipment. The facility Fire Marshal is available to instruct the Contractors in the proper operation of fire safety equipment.

1.6 FRATERNIZATION

- A. There shall be no fraternization or private relationships of Contractors' employees with residents. This includes, but is not limited to trading, bartering or receiving gifts, money, or favors from the residents or the residents' friends, relatives or representatives.

1.7 ALCOHOL AND CONTROLLED SUBSTANCES

- A. Alcoholic beverages and controlled substances shall not be carried, stored or consumed on facility property nor left in any vehicle.

1.8 GAMBLING

- A. Gambling or wagering of any type is not permitted on facility property.

1.9 WEAPONS OR IMPLEMENTS FOR ESCAPE

- A. Weapons or implements of escape (other than tools applicable in Paragraph 9.04) shall not be permitted on facility property. Non-compliance with this policy may result in criminal charges.
- B. Offense Defined - A person commits a 2nd degree felony if that person unlawfully introduces within a Youth Development Center or MH/MR facility or unlawfully provides a resident thereof with any weapon, tool, implement or other item which may be used for escape.

C. Definitions:

1. As used in this section, the word "unlawfully" means surreptitiously or contrary to law, regulation, or order of the detaining authority.
2. As used in this section, the word "weapon" means any implement readily capable of lethal use and shall include any firearm, knife, dagger, razor, other cutting or stabbing implement or club, including any item which has been modified or adapted so that it can be used as a firearm, knife, dagger, razor, other cutting or stabbing implement or club. The word "firearm" includes any unloaded firearm and the unassembled components of a firearm.

1.10 CONTRABAND

- A. Contraband shall not be permitted on facility property. Non-compliance with this policy may result in criminal charges.
- B. Contraband to confined persons is prohibited. A person commits a misdemeanor of the first degree if that person sells, gives or furnishes to any resident in a Youth Development Center or MH/MR Facility, or gives away or brings into any Youth Development Center or MH/MR facility or any building appurtenant thereto, or on the land granted to or owned or leased by the Commonwealth for the use and benefit of the residents, or puts in a place where it may be secured by a resident or employee thereof, any kind of spirituous or fermented liquor, drug, medicine, poison, opium, morphine, or other kind of narcotics (except the ordinary hospital supply) without a written permit signed by a physician of such facility, specifying the quantity and quality of the liquor or narcotic which may be furnished to any resident or employee; the name of the resident or employee for whom it is prescribed; and the time when the same may be furnished, which permit shall be delivered to and kept by the superintendent of the facility.
- C. Money to residents is prohibited. A person commits a misdemeanor of the third degree if that person gives or furnishes money to any resident of a Youth Development Center or MH/MR facility, PROVIDED NOTICE OF THIS PROHIBITION IS ADEQUATELY POSTED AT THE FACILITY. A person may, however, deposit money with the superintendent, or other authorized individual of the facility, for the benefit and use of a resident confined therein, which shall be credited to the resident's account and expended in accordance with the rules and regulations of the facility. The person making the deposit shall be provided with a written receipt for the amount deposited.

1.11 SEARCH

- A. Any person entering this facility is subject to a search of his or her person at any time. While the person may refuse, such refusal may be cause for denial of further entrance.

1.12 ORIENTATION PROGRAM

- A. The facility agrees to provide an orientation program for covering security rules and regulations for the Contractors' personnel, if so requested.

1.13 EMPLOYEE CRIMINAL RECORD CHECK

- A. The Prime Contractor must obtain a criminal record check for all of its employees as well as the employees of Subcontractors or suppliers who will be required to enter the building as part of this project.
- B. The criminal record check must be requested from the Pennsylvania State Police by completing a 'REQUEST FOR CRIMINAL RECORD CHECK' FORM and submitting it to the Pennsylvania State Police.
- C. All Prime Contractors are responsible for the costs incurred with the record check including the \$10.00 processing fee for all of their employees as well as the employees of Subcontractors or suppliers who will be required to enter the building as part of this project.
- D. The forms must be obtained directly from the Pennsylvania State Police.
- E. If the Criminal Record Check discloses a criminal record for a Contractor, Subcontractor or supplier employee, the Contractor shall not allow the employee access to the building unless authorized by the Department.
- F. Contractors must submit the request for criminal record check to the Pennsylvania State Police with a copy to the Department not less than twenty-four (24) hours prior to individual starting work on the project.
- G. The Contractor shall provide each individual with a photo identification card or badge issued by the Contractor or Subcontractors. The identification card shall include the individual's name, address, telephone number, date of birth, driver's license number and date of issuance of the card.
- H. **CLARKS SUMMIT STATE HOSPITAL ONLY:** All Contractors are required a \$10.00 deposit for ID badges. Upon completion, and return of badges (during normal working hours), deposit will be returned.

END OF SECTION

SECTION 01300

SUBMITTALS

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SECTION INCLUDES/CONTENT

- A. Included in this section of the specifications is a list of approvals required for all materials incorporated into the project. The Department reserves the right to require additional approvals if necessary. No material, equipment or supplies listed herein shall be incorporated into the work until the Contractor has obtained prior approval from the Department.
- B. Submittals required by each prime contract are indicated in the description of items to be submitted, Paragraph 1.9.

1.3 SUBMITTAL PROCEDURES

- A. Refer to 'Submittals' of the General Conditions.
- B. Comply with the following or resubmission will be required:
 - 1. Indicate contract number and specification section on each item submitted.
 - 2. Signify approval by stamp, initialing and dating each item prior to submission to the Professional.
- C. Items requiring testing shall be forwarded directly to the approved laboratory. The Contractor shall pay all costs associated with testing.
- D. Expedite critical materials, equipment and shop drawings, and other required submissions.
- E. Incomplete submissions will be returned for resubmission.
- F. Use of substitutions for materials or details shown on the contract drawings or called for in these specifications require written approval from the Department. See General Conditions.

1.4 PRODUCT DATA

- A. Manufacturer's printed directions and manufacturer's standard specifications showing all dimensions, cuts, finishes, etc., as well as catalog cuts and ratings of all material will be required and shall be submitted in advance prior to application and/or installation.

1.5 TESTS

- A. Refer to 'Tests' of the General Conditions.
- B. Submit required reports listing items tested, tests conducted and results obtained as specified.

1.6 CERTIFICATIONS

- A. Submit required certifications in written form identifying authorized representative, manufacturer, systems designer and other required data as specified.

1.7 WARRANTIES

- A. Refer to Specifications for required warranties. Copies of proposed warranties specified for products shall accompany the designated submittal of that product.

1.8 OPERATION AND MAINTENANCE MANUALS

- A. Manual Format (Use 3-ring binder):
 - 1. Title page with the following information for each system covered:
 - a. Project Title and DGS Contract Number (in capital letters)
 - b. Name of Company
 - c. Name of the individual to be called
 - d. Normal telephone numbers
 - e. Contractor's account number for project
 - 2. Index listing all sections of the Manual.
 - 3. Warranties for equipment furnished in contract. (Index tabbed)
 - 4. Complete system circuit diagrams, block diagrams, copies of all approved shop drawings, which shall clearly illustrate how all the components relate and how they are interconnected and a point wiring diagram.
 - 5. Reports, testing analysis.
 - 6. Operating instructions and maintenance instructions for all equipment and finish materials furnished.

1.9 SUBMITTALS LIST

A. Abbreviations

1. Mfr - for Manufacturer
2. Prod - for Producer or Supplier
3. SHDR - for Shop Drawings
4. DeDa - for Descriptive Data or Catalog Cuts
5. Samp - for Samples
6. Cert - for Certification
7. Tests - required Test Reports
8. Warr – for Warranties

DESCRIPTION OF ITEMS TO BE SUBMITTED	MFR	PROD	SHDR	DeDa	SAMP	CERT	TESTS	WARR
GENERAL CONSTRUCTION (.1)								
CONCRETE FLOOR REPAIR MATERIAL	X			X				
FIBERGLASS REINFORCED WALL PANELS	X		X	X				
STEEL STUDS	X		X	X		X		
SEALANTS	X			X				
CERAMIC WALL TILE	X		X	X	X			
PAINT	X			X				
TOILET ACCESSORIES	X		X	X				
GRAB BARS	X		X	X				
GYPSUM BOARD AND CEILING SUSPENSION	X		X					
CEILING ACCESS PANEL	X		X					
QUARTZ EPOXY COATING	X			X	X			
FASTENERS	X			X		X		
TOILET PARTITIONS AND BRACKETS	X		X	X				
HVAC CONSTRUCTION (.2)								
EXHAUST FANS AND ACCESSORIES	X			X			X	X
DUCTWORK AND ACCESSORIES	X		X	X				
GRILLES AND REGISTERS	X			X				
IDENTIFICATION	X			X				
INSULATION	X			X				
PIPE, TUBE AND FITTINGS	X			X				
VALVES	X			X				
STRAINERS	X			X				
STRUCTURAL STEEL	X		X					

DESCRIPTION OF ITEMS TO BE SUBMITTED	MFR	PROD	SHDR	DeDa	SAMP	CERT	TESTS	WARR
PIPE HANGERS	X							
ACCESS PANELS	X			X				
AS-BUILT DRAWINGS			X					
OPERATION AND MAINTENANCE MANUALS				X		X	X	X
PLUMBING CONSTRUCTION (.3)								
IDENTIFICATION	X			X				
INSULATION	X			X				
PLUMBING FIXTURES AND TRIM	X			X				
PIPE, TUBE AND FITTINGS	X			X				
VALVES	X			X				
STRAINERS	X			X				
PIPE HANGERS	X							
STRUCTURAL STEEL	X		X					
ACCESS PANELS	X			X				
AS-BUILT DRAWINGS			X					
OPERATION AND MAINTENANCE MANUALS				X		X	X	X
ELECTRICAL CONSTRUCTION (.4)								
LIGHTING FIXTURES	X			X				
CONDUIT AND FITTINGS	X			X				
WIRE AND CABLE	X			X				
WIRING DEVICES & DEVICE PLATES	X			X				
SUPPORTS	X			X				
FIRE ALARM DEVICES	X		X	X			X	X
EQUIPMENT IDENTIFICATION	X		X					
AS-BUILT DRAWINGS			X					
OPERATION & MAINTENANCE MANUALS				X				

END OF SECTION

SECTION 01310

SEQUENCE OF CONSTRUCTION AND MILESTONES

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 GENERAL REQUIREMENTS

- A. Before beginning work, the Contractor will be required to prepare a schedule in consultation with the Department. The work must be carried out in full accordance with the schedule. The Contractor shall arrange without any unnecessary interference with the Institution's operation.

1.3 CRITICAL MATERIALS AND EQUIPMENT

- A. The Contractor is cautioned that all necessary and required critical materials and equipment shall be ordered as quickly as possible, in order that the shipping will not delay the progress of the work or completion of the project.

1.4 CRITICAL ITEMS TO BE NOTED AS MILESTONES

- A. Refer to the General Conditions, regarding construction progress Milestones to be established by the Lead Contractor.
- B. The Contractor shall include the following critical items as Milestones:

1. GENERAL CONSTRUCTION (.1)

- a. Submittals
- b. Mobilization
- c. Demolition
- d. New construction/patch repair
- e. Install toilet accessories
- f. Finishes

2. HVAC CONSTRUCTION (.2)

- a. Start-up paper work (GS-23's & Submittals, schedule,...)
- b. Remove existing and provide new exhaust fan, ductwork, grilles, hangers, supports and related accessories shown and written on the contract documents.
- c. Remove existing and provide new finned tube radiation, enclosures, piping, hangers, supports and related accessories shown and written on the contract documents.
- d. Provide operational testing, adjusting and balancing.
- e. Submit final paperwork

3. PLUMBING CONSTRUCTION (.3)

- a. Start-up paper work (GS-23's & Submittals, schedule,...)
- b. Remove existing plumbing fixtures as shown and written on the contract documents, piping and related accessories no longer required.
- c. Provide and install new plumbing fixtures, specialties, piping, hangers, supports, insulation and related accessories as per contract documents.
- d. Submit final paperwork

4. ELECTRICAL CONSTRUCTION (.4)

- a. Paperwork
- b. Mobilization
- c. Demolition of wiring, lighting fixtures, receptacles, fire alarm devices, power connections to equipment, etc.
- d. Demolition/Rework of existing conduit and install new conduit.
- e. Install new wiring, lighting fixtures, receptacles, fire alarm devices, power connections to equipment, etc.
- f. Patch and repair surfaces, and perform final cleanup.
- g. Final paperwork.

END OF SECTION

SECTION 01400

QUALITY CONTROL TESTING

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections, "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 GENERAL

- A. The Contractor is responsible for verifying and enforcing compliance with all requirements of the contract documents. Contractor's responsibility includes but is not limited to the following:
 - 1. Supervision of field work to enforce contract compliance of all construction activity.
 - 2. Performance of all necessary field testing to verify compliance with requirements of the plans or specifications requiring adherence to measurable standards of field performance.
 - 3. Engaging an independent testing laboratory to perform tests as required by each specification section.
 - 4. Providing support services for all Quality Control Testing, including cutting and patching and repair or replacement as required.
 - 5. Verification of compliance with plans and specifications of all manufactured materials or equipment. Provide certificates of compliance, or other approved proof of compliance, by the manufacturers of same and submit to the professional whenever requested.
 - 6. All activities noted heretofore and amplified hereafter shall be considered Quality Control Services.
- B. Work not included: Quality Assurance Testing by the Department is specified in Section 01401. The Department reserves the right to perform tests under the Quality Assurance Testing program and to use those as the basis for approval or rejection at its sole discretion.

1.3 DESCRIPTION OF QUALITY CONTROL TESTING

- A. Quality Control Testing services include inspections, tests and reports, whether by the Contractor, independent testing laboratory or other agency allowed by the applicable specification section. All testing and related activities shall be at the Contractor's cost, which shall be included proportionally in all items of payment or contained in any Base Bid or Unit Price on the Proposal.

- B. Quality Control Testing by Contractor or a Quality Control Agency or Agencies is intended to assist in the determination of probable compliance of the work with requirements specified or indicated and does not relieve the Contractor of the responsibility for compliance with Contract Document requirements.
- C. Specific testing required to be performed by independent Quality Control Agencies for individual construction activities are specified in the Sections that specify those activities.
- D. Inspections, tests and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Documents requirements.
- E. Quality Control Testing services required by the local municipality or other governing authorities are the responsibility of the Contractor, regardless of whether or not specified in the applicable specification section.
- F. Unless specifically stated otherwise, all tests listed in the specifications shall be the responsibility of the Contractor. Statements such as "test as requested by" or "as directed by" the Department or the Professional shall not be construed to indicate the test is the responsibility of the Department.
- G. Each prime Contractor will pay for all costs in connection with its Quality Control Services. Whenever the word "Contractor" is used it shall be interpreted to mean Prime Contractor or Contractors as applicable.

Part 2 PRODUCTS

- A. Not Applicable

Part 3 EXECUTION

3.1 RESPONSIBILITIES AND DUTIES OF CONTRACTOR

- A. The Contractor shall provide all Quality Control Services, including those of independent agencies, required to comply with the Contract Documents. These services shall be at no cost to the Department.
- B. The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and indicate non-compliance with Contract Document requirements. Likewise, the Contractor is responsible for retesting when the Department's Quality Assurance Test results prove unsatisfactory.
- C. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility.
- D. Provide the Quality Control Agency with preliminary representative samples of materials to be tested in quantities requested. If the source, quality or characteristics of an approved material changes or indicates lack of compliance with Contract requirements, submit additional samples of materials to the Quality Control Agency.

- E. When requested by the Professional, the Department, or the Quality Control Agency, the Contractor shall immediately provide reports, cutting lists, material bills, shipping bills, time and place of shipment of materials to shop and field and any relevant data on previous testing and investigations of materials.
- F. Provide casual labor and facilities:
 - 1. To provide access to the work inspected or tested.
 - 2. To obtain and handle samples at the site.
 - 3. To facilitate inspections and tests.
 - 4. For security and protection of samples and test equipment at the project site.
- G. To facilitate the timely sequence of inspection and testing, the Contractor shall give advanced notification to the Quality Control Agency and the Department that work has progressed to a point where inspection and testing may proceed.
- H. Contractor shall pay for additional cost of Quality Control Agency services which, in the opinion of the Professional and the Department, are required because of the following:
 - 1. Failure of materials or workmanship to meet Contract requirements.
 - 2. Materials or practices not complying with the technical specifications which could possibly result in defective and unacceptable work.
 - 3. Changes in source, quality or characteristics of materials.
 - 4. Site cured cylinders requested by the Contractor.
- I. Wasted time of the Department or the Professional because of untimely cancellations or delays of concrete placement, or other work, shall be paid by the Contractor when the cancellation or delay is caused by the Contractor.
- J. The Quality Control Agency shall submit a certified written report of each inspection, test or similar service in duplicate, with additional copies directly to any governing authority when that authority so directs.
- K. Report Data: Written reports of each inspection, test or similar service shall include but not be limited to:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address and telephone number of testing agency.
 - 4. Dates and location of samples and tests or inspections.

5. Names of individuals making the inspection or test.
 6. Designation of the Work and test method.
 7. Identification of product and specification section.
 8. Complete inspection or test data.
 9. Test results and an interpretation of test results.
 10. Ambient conditions at the time of sample taking and testing.
 11. Comments or professional opinion as to whether inspected or tested work complies with Contract Document requirements.
 12. Name and signature of Quality Control Agency inspector.
- L. Engage independent testing laboratories, which are pre qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.
- M. Upon completion of inspection, testing, sample taking and similar activities, repair the damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the Contract Document requirements for "Cutting and Patching". Protect work exposed by or for Quality Control Testing activities, and protect repaired work.

3.2 RESPONSIBILITIES AND DUTIES OF QUALITY CONTROL AGENCIES

- A. Quality Control Agencies engaged to perform inspections, sampling and testing of materials and construction specified in individual specification sections shall cooperate with the Professional, the Department and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.
- B. Quality Control Agencies shall notify the Department, Professional and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

END OF SECTION

SECTION 01401

QUALITY ASSURANCE TESTING

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 GENERAL

- A. All testing and inspecting specifically called for and/or described in this section of the specifications will be the responsibility of the "Quality Assurance Agency" and except as hereinafter specified, will be performed without expense to the Contractor. The Quality Assurance Agency is an independent testing and inspecting agency engaged by the Department through the Professional. Testing required because of changes in materials or proportions at the request of the Contractor shall be at the Contractor's expense. The Professional may engage more than one Quality Assurance Agency to perform services. Whenever the word "Contractor" is used it shall be interpreted to mean Prime Contractor or Contractors as applicable.

- 1. Fireproofing: Corridor top of partition.

- B. Work Not Included: Quality Control Testing to be performed by the Contractor is specified in Section 01400.

Part 2 PRODUCTS

- A. Not Applicable

Part 3 EXECUTION

3.1 RESPONSIBILITIES AND DUTIES OF THE CONTRACTOR

- A. The use of Quality Assurance testing services shall in no way relieve the Contractor of its responsibility to furnish materials and construction in full compliance with the plans and specifications or to perform Quality Control Testing where specified.
- B. To facilitate Quality Assurance Inspection or Testing, the Contractor shall:
 - 1. Secure and deliver to the project site, without cost, representative samples of materials it proposes to use and which are required to be tested.

2. Furnish such casual labor as is necessary to obtain and handle samples at the project or at other sources of material.
3. Provide Quality Assurance Testing support services specifically required under the individual specification sections.
4. Provide access to work areas and furnish such incidental labor and assistance as is deemed necessary by the inspectors of the Quality Assurance Agency.

3.2 AUTHORITY AND LIMITATIONS OF QUALITY ASSURANCE AGENCY

- A. Personnel representing the Quality Assurance Agency will not act as foremen nor perform other duties for the Contractor.
- B. Work will be checked as it progresses, but failure to detect any defective work or materials shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Department or the Professional for final acceptance.
- C. The Quality Assurance Agency is not authorized to revoke, alter, relax, enlarge, or release any requirements of the specifications, nor to approve or accept any portion of the work.
- D. The Quality Assurance Agency shall report all test and inspection results to the Professional, the Department and the Contractor immediately after they are performed. Selection and frequency of tests shall be at the sole discretion of the Professional.
- E. Written reports of each inspection, test or similar service shall include but not be limited to:
 1. Date of issue.
 2. Project title and number.
 3. Name, address and telephone number of testing agency.
 4. Dates and location of samples and tests or inspections.
 5. Names of individuals making the inspection or test.
 6. Designation of the Work and test method.
 7. Identification of product and specification section.
 8. Complete inspection or test data.
 9. Test results and an interpretation of test results.
 10. Ambient conditions at the time of sample taking and testing.

11. Comments or professional opinion as to whether inspected or tested work complies with Contract Document requirements.
 12. Name and signature of Quality Control Agency inspector.
- F. When it appears that any material furnished or work performed by the Contractor fails to fulfill contract requirements, the Quality Assurance Agency shall report such deficiency to the Professional, the Department and the Contractor.

3.3 CONTRACTOR'S FAILURE TO MEET CONTRACT REQUIREMENTS

- A. The Department and the Professional reserve the right to reject any items which do not meet the requirements of the plans and specifications and will require the contractor to replace these items and bear all expenses in connection with such replacements.
- B. The Contractor shall pay all costs incurred in providing additional testing and/or analysis (including engineering fees) required because of deficient test results or construction not in compliance with requirements of the Contract Documents.

END OF SECTION

SECTION 01500

TEMPORARY UTILITIES

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections “General Conditions of Contract” and “General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 TEMPORARY SERVICES DURING CONSTRUCTION

- A. The designated Contractor shall install, operate, protect and maintain the respective temporary services as hereinafter specified during the construction of the entire project.
- B. Temporary connections to new and/or existing permanent service lines shall be made at locations as directed by the Department, and when the temporary service lines are no longer required, they shall be removed by the Contractor. Any part or parts of the permanent service lines, grounds and building, disturbed and damaged by the installation and/or removal of the temporary service lines, shall be restored to their original condition by the Contractor responsible for the temporary installation.
- C. If the Contractor fails to carry out its responsibility in supplying temporary services as set forth in this contract it is responsible for such failure and the Department may take such action as it deems proper for the protection and conduct of the work and shall deduct the cost involved from the amount due the Contractor. Only those temporary utilities required for construction need to be extended to the work area(s).

1.3 TEMPORARY WATER SUPPLY

- A. The Using Agency will, within the limitations of its existing facilities, furnish water for construction purposes, free of charge to the Contractors.

1.4 TEMPORARY HEAT

- A. None required.

1.5 CONSTRUCTION LIGHT AND POWER

- A. Electric service will, within the limitations of the existing facilities, be provided by the Using Agency at no cost to the Contractor. Each Contractor must extend existing power/lighting to meet its own requirements. All work must comply with NEC and OSHA. Connection to existing source shall be as determined by the Department.

1.6 WELDING

- A. Any Contractor using electrical power for welding on the site shall use self-contained engine generating units.

1.7 FIRE EXTINGUISHERS

- A. Each Contractor shall provide UL listed, NFPA approved fire extinguishers (ten (10) lb. minimum) at the construction site during operations, suitable for all types of fires in accordance with OSHA.

1.8 INTERRUPTION OF SERVICES

- A. Each Prime Contractor shall have all needed equipment and material to complete planned work at the site prior to shutting down any system.
- B. No additional compensation or time will be given to the Contractor if work must be performed on State or National Holidays or on weekends or on overtime. See paragraph on 'Working Hours' under Section 01040.
- C. No allowance will be made to shutdown the use of the facility's sanitary sewer system. The Contractor shall install the facility's new sanitary sewer while maintaining service to all buildings. Temporary sewage disposal service shall be maintained during construction through the use of holding tanks, by-pass pumping or by-pass piping.

END OF SECTION

CONTRACT

FOR

GENERAL CONSTRUCTION

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXX COUNTY, PENNSYLVANIA

CONTRACT NO. D.G.S. A XXXXXXXXXX.1

DIVISION 2 – SITE WORK

SECTION 02050

DEMOLITION

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE OF WORK

- A. Extent of demolition is shown on drawings.
 - 1. The work includes, but is not necessarily limited to the following:
 - a. Protection of new and/or existing equipment or finishes to remain in place.
 - b. Remove existing construction; cabinet type (covering existing urinals).
 - c. Remove existing ceramic floor tile in work area.
 - d. Removal of existing handicapped grab bars, soap dispensers, paper towel dispenser and toilet paper dispensers in the work area.
 - e. Removal of existing toilet partitions.
 - f. Removal of acoustic ceiling tile, plaster ceiling and suspension system.
 - g. Remove corridor hand railings, corner guards, etc.
 - h. Remove vinyl wall base.
 - i. Remove doors and door hardware.
 - j. Remove drywall as noted.

1.3 SALVAGE

- A. The Institution retains the right of salvage of any removed materials. Contractor shall contact Institution Site Administrator prior to demolition. All removed materials not retained by the Institution shall become the property of the Contractor, shall not be used in the work and shall be promptly removed from the building.

- B. Neatly store and protect, in a protected, dry, on-site location or move to an on-site location assigned by the Department's Representative any materials salvaged to be turned over to the Institution.
- C. Contractor shall verify extent of remaining items for salvage or reuse at the time of bidding. Salvage value of these items shall be reflected in the Contractor's bid price.
- D. On-site sale of materials is not permitted.

1.4 JOB CONDITIONS

- A. Refer to the General Conditions and General Requirements (Division 1) for stipulations regarding provisions for protection of the site, equipment and tools, shoring and bracing and other provisions regarding the protection of property and life.
- B. Drawings are diagrammatic in nature and require field verification for actual conditions, quantities, and details. Failure to inspect actual field conditions and dimensions prior to preparation of bid shall not be justification to a claim for additional costs.
- C. Cutting and removals indicated on the drawings are a general indication only and do not necessarily show the full extend of cutting and removals which may be required by job conditions.

1.5 SCHEDULING DEMOLITION

- A. All demolition removal work must be done at times agreed upon by the representative of the Department and the Institution.
- B. Once commenced, work shall proceed as scheduled, in an efficient, quiet operation without delays or interruptions.
- C. For interior work do not start removal until areas in which the removal is to proceed, are thoroughly closed off from adjacent spaces.
- D. Coordinate all work between all Contractor's working on this project.

Part 2 **PRODUCTS**

2.1 MATERIALS

- A. Not Used.

Part 3 **EXECUTION**

3.1 PRECAUTIONS

- A. Perform the work in a manner to prevent damage or injury to property or the public. Provide barriers, warning lights and other protection as required. Protection devices shall be maintained until completion of work, or until removal may be directed by the Department. Restore any damage to grounds and building to original conditions or repair as directed at no additional cost.

- B. Use caution and wear appropriate protective clothing, including gloves and safety goggles while removing materials.
- C. Adopt a method for control and scheduling of loud noises.
- D. Carefully remove all materials scheduled for removal so that adjacent surfaces and finishes are not damaged.
- E. Leave all surrounding areas in a safe, clean condition.
- F. Provide a fire extinguisher at construction site during operations.
- G. Repair all damage to existing materials scheduled to remain, including damage to adjacent fixtures, finishes and materials damaged by work performed under this section.

3.2 DISPOSITION OF UTILITIES

- A. Make all necessary arrangements and pay all charges for relocating active utilities in the way of new work that must be moved and for shutting off and disconnecting utilities that are to be abandoned.
- B. Existing services and equipment, including any piping and/or conduits encountered that are not required to be removed shall be temporarily supported and maintained until permanent support has been restored.
- C. Existing soil lines, drain lines, water service, and gas pipes, electrical conduits and wires, telephone conduits and wires, and/or other similar obstructions in the way of demolition or new construction and which have been scheduled to be removed, shall be removed after they have been satisfactorily closed off and/or capped.

3.3 DUST CONTROL

- A. Control the amount of dust and dirt resulting from demolition to prevent the spread of dust and other airborne particles.
 - 1. Erect plastic dust barricades as and where required to control airborne particles.

3.4 PROHIBITIONS (SEE SECTION 01115 – DPW SUPPLEMENTAL PROVISIONS)

- A. The use of burning at the project site for disposal of refuse and debris is not permitted.

3.5 CLEAN-UP

- A. Debris and Rubbish: Remove debris and rubbish from the site daily. Do not allow to accumulate on site. Provide chutes from the upper floors to dumpster at ground level in locations satisfactory to the Professional and Department.
- B. Debris Control: Remove and transport debris in a manner as to prevent spillage on streets or adjacent areas.

1. Any area either temporary or permanent over which hauling operations or other moving operations are conducted shall be kept clean and any debris shall be removed promptly by the Contractor.
 2. Streets, walks and drives, adjacent to the areas of construction, shall be kept clean and clear of obstructions at all times; they shall be kept clear of materials and debris to their full width and shall be maintained in such a manner as to permit safe and normal use.
- C. Regulations: Local regulations regarding hauling and disposal apply.

END OF SECTION

DIVISION 5 - METALS

SECTION 05400

LIGHT GAUGE STEEL FRAMING

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 DESCRIPTION OF WORK

- A. Extent of steel stud framing is shown on drawings and schedules; repair and/or replace.
 - 1. Included are steel studs, miscellaneous track, channels, clips, bracing, bridging and fasteners necessary for complete installation.
 - 2. Coordinate with all trades required to install work on or into work of this section.

1.3 RELATED WORK

- A. Gypsum Drywall – Section 09260

1.4 QUALITY ASSURANCE

- A. ASTM A 446 Standard Specification for Steel Sheet, Zinc-coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- B. ASTM A 525 Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- C. ASTM A 568 Standard Specification for Steel, Sheet, Carbon, and High Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions for systems used.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Handling: Handle materials to avoid damage.

- B. Delivery: Deliver materials to the job site in original packages, containers, or bundles bearing the brand name and manufacturer's identification.
- C. Storage: Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling. Damaged materials shall be removed from the job site.

1.7 PROJECT CONDITIONS

- A. Protect adjacent work of other trades from damage, physical distress, etc.

Part 2 PRODUCTS

2.1 MANUFACTURER

- A. Subject to compliance with requirements, provide light gauge steel framing, and all related components, as manufactured by Unimast, Inc., and supplied by United States Gypsum Co., or approved equal.

2.2 MATERIALS

- A. CSJ Style Steel Studs: 20 guage, 3-1/2" depth
Spaced 16" O.C. or as indicated on drawing
Runner: (Select CR20 Runner to match)
- B. Furring Channel: 20 guage hat-shaped section
- C. 80 CSJ, 16 gauge steel joists
- D. Finish: Provide galvanized finish to metal framing components complying with ASTM A 525 for a minimum G60 coating.
- E. Fasteners: Provide nuts, bolts, washers, screws, and other fasteners with corrosion resistant finish.

Part 3 EXECUTION

3.1 RUNNER TRACK INSTALLATION

- A. Install continuous runner tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks with suitable fasteners for the type of construction involved spaced as required by design to resist lateral forces. Provide fasteners at corners and ends of tracks.

3.2 STUD ERECTION

- A. Complete, uniform and level bearing support shall be provided for the bottom runner. Studs shall be plumbed, aligned, fully seated in the bottom runner, and securely attached to flanges of both top and bottom runners by screw fastening. All studs should be aligned vertically from floor and securely anchored to substructure above. Resistance to bending and rotation shall be provided by gypsum board and/or horizontal straps or cold-rolled channels securely fastened to the studs. Jack studs or cripples shall be installed below window sills and above window and door heads, and elsewhere to furnish support. Splicing of studs is not permitted.

3.3 CLEAN-UP

- A. At the completion of light gauge steel framing work remove all rubbish, excess material, scaffolding, tools and equipment from site.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This section includes the following:

1. Support angles.
2. Fasteners.
3. Structural steel tube system for new drywall ceiling support system. (See drawings).
4. Provide new fire rated (1 Hr.) 16 gauge steel door to be installed in existing door frame. Prepare door frame for door swing change. Provide new door hardware to match existing. New door hardware to be anti-ligature. Provide fire rated door louver with fusible link. Provide kickplate. Door louver to be 18" x 24. Kickplate to be 34" x 36".

1.3 SUBMITTALS

- A. Product Data: For the following:

1. Select product data under provisions of Section 01300, Submittals.

1.4 PRODUCT HANDLING

- A. Store materials in horizontal position on supports above ground.
- B. Protect from elements, and keep free of dirt and debris.
- C. Handle material carefully so as not to bend or mar.
- D. Repair or replace damaged materials as determined by the Department, at no additional cost to the Department.

1.5 QUALITY ASSURANCE

A. Comply with:

1. American Institute of Steel Construction (AISC) Publications:
 - a. 'Manual of Steel Construction' (Includes 'Specifications for Structural Steel Buildings', 'Code of Standard Practice for Steel Buildings and Bridges', 'Specification for Structural Joints Using ASTM A 325 or A 490 Bolts, Volume II – Connections').
2. American Welding Society, Inc. (AWS):
 - a. AWS D 1.1 – 'Structural Welding Code – Steel'.
 - b. AWS C 5.4 – 'Recommended Practices for Stud Welding'.
3. Committee of Stainless Steel Producers, American Iron and Steel Institute (AISI):
 - a. 'Selection and Use of Stainless Steel'.
4. Steel Structures Painting Council (SSPC):
 - a. 'Surface Preparation Specifications'.

1.6 PRODUCT CONDITIONS

- A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.
1. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.7 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

Part 2 PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

- A. Steel Plates, Shapes and Bars: ASTM A 36/ASTM A 36M.
- B. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Stainless Steel Bars and Shapes: ASTM A 276, Type 304.

2.3 PAINT

- A. Shop Primers: Provide primers that comply with Section 09900, Painting.
- B. Shop Primer for Ferrous Metal: Organic zinc rich primer, complying with SSPC-Paint 20 and compatible with topcoat.

2.4 FASTENERS

- A. General: Provide Type 304 or 316 stainless steel fasteners for wet area use and zinc plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5.
- B. Machine Screws: ASME B 18.6.3 (ASME B 18.6.7M).
- C. Plain Washers: Round, carbon steel, ASME B 18.22.1 (ASME B 18.22M).
- D. Lock Washers: Helical, spring type, carbon steel, ASME B 18.21.1 (ASME B 18.21.2M).
- E. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six (6) times the load imposed when installed in unit masonry and equal to four (4) times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material: Alloy Group 1 or 2 stainless steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

2.5 GROUT

- A. Non-Shrink, Metallic Grout: Factory packaged, ferrous aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy duty loading applications.

- B. Non-Shrink Non-Metallic Grout: Factory packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Where applicable pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Shear and punch metals cleanly and accurately. Remove burrs.
- C. Ease exposed edges to a radius of approximately 1/32", unless otherwise indicated. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- F. Cut, reinforce, drill and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- G. Fabricate joints that will be exposed to wet and humid conditions in a manner to exclude water, or provide weep holes where water may accumulate.
- H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and night time sky heat loss.
 - 1. Temperature Change (Range): 120°F (67°C), ambient; 180°F (100°C), material surfaces.

- I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- J. Remove sharp or rough areas on exposed traffic surfaces.
- K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.7 WALL SUPPORT ANGLES

- A. Provide stainless steel 1/4" expansion anchors and sleeves. Two (2) per angle to fasten into block wall.

Part 3 EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- B. Cutting, Fitting and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturer's written instructions and requirements indicated on shop drawings, if any.
- B. Anchor supports securely to and rigidly.

3.3 ADJUSTING AND CLEANING

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0 mil dry film thickness.
- B. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09900, Painting.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07841

PENETRATION FIRESTOPPING

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. Section Includes:
 - 1. Penetration in horizontal assemblies.

1.3 SUBMITTALS

- A. Provide material submissions for all items as specified in Section 01300, Submittals.

1.4 QUALITY ASSURANCE

- A. Fire Test Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency, such as UL, acceptable to authorities having jurisdiction.

Part 2 PRODUCTS

2.1 MANUFACTURERS

- A. The manufacturer and its products specified herein are used to establish a standard of quality and performance expected for the work of this section. Other manufacturers providing the products of equal quality and performance, as determined by the Department, shall be acceptable as herein specified.
- B. Provide products as manufactured by Hilti, Inc., or a product approved by the Department as equal.
 - 1. Hilti, Inc. – FS One Sealant
 - 2. 3M

3. W. H.

- C. The submission of any product as an equal to the manufacturer and product listed here must include the submission of an equivalent firestopping design with the same hourly rating or better. The design must be approved either by a recognized testing agency or a firestop engineer through an engineering judgement. If approved, any additional products or accessories needed for the comparable design shall be provided at no additional cost to the Department.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Horizontal Assemblies: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01" wg.
1. F Rating: At least 1 hour, but not less than the fire resistance rating of constructions penetrated.
 2. T Rating: At least 1 hour, but not less than the fire resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- C. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Sealants: 250 g/L
 2. Sealant Primers for Non-Porous Substrates: 250 g/L
 3. Sealant Primers for Porous Substrates: 775 g/L
- D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
- E. Appearance: The firestopping product shall be red in color in order to be consistent with the appearance with other firestopping throughout the facility.

Part 3 EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the work.

- B. Install penetration firestopping to comply with manufacturer's written installation instructions, the firestopping design, and published drawings for products and applications indicated.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- D. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6" of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self adhering type labels with adhesives capable of permanently bonding to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words 'Warning – Penetration Firestopping – Do Not Disturb. Notify Building Management of Any Damage'.
 - 2. Designation of applicable testing and inspecting agency.
 - 3. Date of installation.
 - 4. Manufacturer's name.

3.3 FIELD QUALITY CONTROL

- A. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- B. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.4 PENETRATION FIRESTOPPING SCHEDULE

- A. Hilti Engineering Judgment Firestop Detail Drawing No. 146553a.
- B. Hilti Engineering Judgement Firestop Detail Drawing No. 151526a.
- C. Hilti Engineering Judgement Firestop Detail Drawing No. 151527a.

END OF SECTION

DIVISION 09 – FINISHES

SECTION 09260

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections 'General Conditions of Contract' and 'General Requirements' form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board for ceilings.
 - 2. Non-load-bearing steel framing for ceiling suspension system.
 - 3. Gypsum board for repair at walls, etc.

1.3 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Fire Assembly Design Data.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire Test Response Characteristics: Provide fire resistive systems that comply with the following requirements:
 - 1. Fire resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock-Hersey, Factory Mutual, Omega Point Laboratories or another agency performing testing and follow-up inspection services for fire resistive assemblies systems acceptable to authorities having jurisdiction.
 - 2. Test fire resistive assemblies that do not directly correspond to tested fire resistive assemblies.
 - 3. Fire resistive assemblies are similar to those tested by UL and are qualified for type use indicated.

4. Provide rated systems complying with the following requirements:
 - a. Fire resistive assembly products bear classification marking of qualified testing and inspecting agency.
 - b. Fire resistive assemblies correspond to those indicated by referencing system designations listed.
 - c. Fire resistive assemblies that have been tested by an approved testing and inspection agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Steel Framing and Furring:
 - a. Clark Steel Framing Systems
 - b. Consolidated Systems, Inc.
 - c. Dale Industries, Inc. – Dale/Incor.
 - d. Dietrich Industries, Inc.
 - e. MarinoWare; Division of Ware Ind.
 - f. National Gypsum Company
 - g. Scafco Corporation
 - h. Unimast, Inc.
 - i. Western Metal Lath & Steel Framing Systems
 2. Gypsum Board and Related Products:
 - a. American Gypsum Co.
 - b. G-P Gypsum Corp.
 - c. National Gypsum Company
 - d. United States Gypsum Co.

2.2 STEEL FRAMING

- A. Steel Framing, General: Comply with ASTM C 754 for conditions indicated.
 1. Steel Sheet Components: Metal complying with ASTM C 645 requirements.
 - a. Protective Coating:
 - 1) Interior Applications: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized.

B. Suspended Ceiling Framing:

1. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
2. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.
3. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch (1.37 mm), a minimum 9/16 inch wide flange, and 1-1/2 inch in depth indicated.
4. Furring Channels (Furring Members):
 - a. Cold Rolled Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange, 3/4 inch (19.1 mm) deep.
 - b. Steel Studs: ASTM C 645, in depth indicated.
 - 1) Minimum Base Metal Thickness: 0.0312 inch.
 - c. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep x 2-5/8 inch width.
 - 1) Minimum Base Metal Thickness: 25 gauge.

C. Partition and Soffit Framing:

1. Steel Studs and Runners: ASTM C 645, in depth indicated.
 - a. Minimum Base Metal Thickness: 0.027 inch.
2. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges.
3. Proprietary Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Available Products:
 - 1) Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
 - 2) Metal-Lite, Inc.; The System.
4. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - a. Minimum Base Metal Thickness: 0.027 inch.
5. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange, and in depth indicated.
 - a. Clip Angle: 1-1/2 by 1-1/2 inch thick, galvanized steel, minimum.

6. Hat-Shaped, Rigid Furring Channels: ASTM C 645, in depth indicated.
 - a. Minimum Base Metal Thickness: 0.0312 inch.
7. Cold-Rolled Furring Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange, and in depth indicated.
 - a. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
 - b. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
8. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.
9. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.3 PANEL PRODUCTS

- A. Interior gypsum board complying with ASTM C 36/C 36M or ASTM C 1396 C/1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 1. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
 2. Ceiling Type: ASTM C 1395 High Strength Brand Ceiling Board – Sag Resistant.
 3. Thickness: 1/2”.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape:
 1. Interior Gypsum Wallboard: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, flanges of trim accessories, and fasteners, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Fire Resistive Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, intrumescent latex based caulk. Also see Division 7 Section "Through Penetration Firestop Systems".
 1. Available Products:
 - a. Pecora Corp.; AC-20 FTR.
 - b. United States Gypsum Co.; Firecode™ brand acrylic firestop sealant.
 - c. 3M Specified Construction Products Division; (800) 328-1687; 3M Fire Barrier CP 25WB-; 3M Fire Damage 150+.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

PART 3 - EXECUTION

3.1 NON-LOAD-BEARING STEEL FRAMING INSTALLATION

- A. General: Comply with ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Suspended Ceiling and Soffit Framing:

1. Suspend ceiling hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Attach hangers to structural members. Do not support ceilings from or attach hangers to permanent metal forms, steel deck tabs, steel roof decks, ducts, pipes, or conduit.
4. Screw furring to wood framing.
5. Wire-tie or clip furring channels to supports.
6. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

C. Partition and Soffit Framing:

1. Where studs are installed directly against exterior walls, install isolation strip between studs and wall.
2. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
3. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
4. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

D. Z-Furring Members: Erect insulation vertically and hold in place with Z-furring members.

1. Until gypsum board is installed, hold insulation in place with 10-inch (250-mm) staples fabricated from 0.0625-inch- (1.59-mm-) diameter, tie wire and inserted through slot in web of member.

E. Polyethylene Vapor Retarder: Install to comply with requirements of assembly.

3.2 FINISHING

- A. Installing Trim Accessories: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Finishing Gypsum Board Panels: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
 - 1. Prefill open joints or beveled edges, and damaged surface areas.
 - 2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

END OF SECTION

SECTION 09310

CERAMIC TILE WALLS

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 WORK INCLUDED

- A. The work of this section includes all materials and labor for new work where shown on drawings and schedule, but not necessarily limited to the following.
 - 1. Ceramic Tile
 - 2. Backer Board
 - 3. Fasteners and Adhesives

1.3 APPLICABLE STANDARDS

- A. Tile shall comply with requirements of ANSI 108, and U.S. Department of Commerce and National Bureau of Standards "Simplified Practice" Recommendation R61, (Federal Specification SS-T-308) and with modifications as specified herein. Tile shall be of grade specified and all containers grade-sealed in accordance with minimum grade specifications described in SPR-R61. In addition to grade seal, furnish the Department with Master Grade Certificate stating grade, kind of tile, identification marks for tile packages and the names and location issued before shipment of tile is made. Deliver containers to site with seals unbroken.

1.4 SAMPLES

- A. Submit full size samples of tile and threshold showing texture and colors, grout and any accessories. Color selections by Using Agency.

1.5 PROTECTION

- A. The Contractor shall provide all other items of protection necessary to prevent damage to all work under this section at all times during the progress of the work until its final acceptance.
- B. Protect adjacent surfaces during progress of the work of this section.
- C. Close rooms and spaces to traffic of all types until mortar and grout have set for 72 hours.

Part 2 PRODUCTS

2.1 MATERIALS

- A. Glazed 4 ¼" x 4 ¼" wall tile shall be standard grade, as manufactured by American-Olean, U.S. Ceramic Tile Company, Summitville Tiles, Inc., or equal approved by the Department; not less than 5/16" thick with cushioned and a colored glazed finish. Provide spacer lugs on edges of tile, and all trim and shapes required.
- B. Tiles shall meet ADA Guidelines and be approved by the Department.

2.2 COLOR SELECTIONS

- A. Provide three (3) color selections:
 - 1. Color 1: 45%; Color 2: 45%; Color 3: 10% (Chair Rail Accent).
 - 2. Using Agency will choose colors and layout of tiles.

Part 3 EXECUTION

3.1 INSTALLATION

- A. EXAMINATION: Examine surfaces to receive tile work and conditions under which tile is to be installed. Proceed with tile work only when surfaces and conditions comply with requirements specified in referenced installation standards.
- B. PREPARATION: Prior to tile installation, remove dust, curing compounds, oil and other foreign substances from surfaces.
- C. Maintain minimum temperature limits and installation practices recommended by materials manufacturers.
- D. Mix and use proprietary materials in strict accordance with the manufacturer's printed instructions.
- E. Prepare the surfaces, set, fit, grout and clean the work of this section in strict accordance with the reference standards and the manufacturer's recommendations.
- F. Provide new cement backer board as recommended by tile manufacturer. Backer board shall be **adhered and screwed/bolted** to existing wall tile.
 - 1. All fasteners shall be extra heavy duty.
 - 2. Adhesives shall be continuous and as recommended by tile manufacturer, etc. Scarify existing tile if required.
- G. Where tile units will be thin-set directly to the substrate, do not commence installation of the tile units until substrates are within the following tolerances:

1. Horizontal surfaces: Level within 1/8" in 10' in all directions.
 2. Vertical surfaces: Plumb within 1/8" in 8' in all directions.
- H. Condition of surfaces to receive tile:
1. Verify that surfaces to receive mortar setting bed and tile are firm, dry, clean and free from oily or waxy films and curing compounds.
- I. Limits of tile:
1. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruptions.
 2. Terminate tile neatly at obstructions, edges, corners without disruption of pattern or joint alignment.
- J. Joining pattern:
1. Lay tile in grid pattern unless otherwise indicated on the drawings or directed by the Department.
 2. Align joints where adjoining tiles on floor, base, trim, and walls are the same size.
 3. Provide uniform joint widths.
- K. Allowable variations in finished work; do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignments shown.
1. Horizontal surfaces: 1/8" in 10' in all directions.
 2. Vertical surfaces: 1/8" in 8' in all directions.
- L. Curing: Damp cure all tile installations, including Portland cement grouts, for 72 hours minimum.
1. Cover with 40 lb. kraft paper.
 2. Do not use polyethylene sheets directly over tile on horizontal surfaces.

3.2 CUTTING OF TILE

- A. Do all cutting and fitting of tile to permit installation of built-in accessories and other equipment and piping. All cutting of tile shall be done with carborundum power saw.

3.3 SETTING OF TILE

- A. Prior to installing any tile, this Contractor shall inspect subfloors and wall surfaces which are to receive tile covering. He shall notify the Department in writing of any serious defects or condition that will prevent a satisfactory tile installation and he shall not proceed with installation until such defects or conditions have been corrected. The starting of installation work in a room or space shall imply acceptance of the surfaces to receive the tile.
- B. Except as otherwise indicated on drawings or specified herein, the installation of all tile shall be in accordance with the applicable general requirements for inspection, preparation, protection, workmanship and application as described in the following adopted and proposed current ANSI Standards and Tile Council of America 'Handbook for Ceramic Tile Installation' installation methods.
- C. Where possible, lay out work so that no tile less than half size occurs. Align joints in wall tile vertically and horizontally except where other patterns are shown or specified. Align all joints in floor tile at right angles to each other and straight with walls to conform to patterns selected. Align joints when adjoining tiles on floor, base, walls and trim are same size.

3.4 BACKER BOARD

- A. Provide new cement backer board as recommended by tile manufacturer. Backer board shall be **adhered and screwed/bolted** to existing wall tile.
 - 1. All fasteners shall be extra heavy duty.
 - 2. Adhesives shall be continuous and as recommended by tile manufacturer, etc. Scarify existing tile if required.

3.5 THIN-SET INSTALLATIONS

- A. Latex-Portland Cement Mortar: As per ANSI A 108.1 – TCA F112-92.
- B. Walls: ANSI Standard for new tile walls: Comply with standard Grade requirement of ANSI W243-92. ANSI standard for new tile walls to be placed over existing tile walls – Comply with standard grade requirements of ANSI TR 713-92. Interior or Exterior Masonry – Method W202 – Glass mesh Mortar Units Method W244.

3.6 GROUT INSTALLATION

- A. Install and cure grout in accordance with reference standards and grout manufacturer's written instructions.
- B. Latex-Portland Cement (Latex commercial Portland cement grout) (Latex-sand Portland cement grout). Install in accordance with ANSI A 108.6.

3.7 CLEANING

- A. After the point has sufficiently set or hardened all tile, new and existing, shall be thoroughly cleaned in an approved manner. All traces of cement or dust accumulations shall be completely removed. Acid solution shall not be used for cleaning tile.
- B. Give all work a thorough cleaning upon completion of the work. Cleaning shall meet with the approval of the Department. If surfaces show marks, scratches or cracks or other imperfections which cannot be removed by cleaning, the defective material shall be removed and replaced with new material, at no additional cost.

END OF SECTION

SECTION 09671

EPOXY FLOORING

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE

- A. Provide all labor and materials for a seamless, epoxy flooring installation.

1.3 DELIVERY AND STORAGE

- A. Material must be delivered to job site in clean, clearly labeled containers and inspected by installer prior to start of job.
- B. Material must be stored in a dry, enclosed area protected from the elements. Temperature of storage area must be kept between 60°F and 90°F.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. New concrete must be cured no less than 28-days under good conditions. Concrete subfloors on or below grade must be properly equipped with vapor barriers.
- B. Water, heat and lighting shall be supplied by Contractor/Using Agency. Only 110V/single phase electricity shall be made available to installer.
- C. Work area shall be made free of other trades and traffic during and for a period of 48-hours after completion of floor. Trucks can be moved back in and regular traffic can resume at this time.

1.5 WARRANTY

- A. Manufacturer/Installer to submit a single source, one (1) year warranty against defects in material and workmanship upon completion of installation.

Part 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER/INSTALLER

- A. For the purpose of designating type and quality of work, epoxy flooring shall be by C.A. Reed Associates, Inc., (800) 462-6149.

- B. Single source manufacturer/installer who has technical qualifications and facilities to manufacture and install specified system. Installation crew shall be direct employees of the single source manufacturer/installer. No Subcontractors shall be permitted.
- C. Manufacturer/Installer must have written safety program, \$5,000,000 liability and required workman's compensation insurance. Insurance certificates must be submitted prior to job start-up.
- D. Manufacturer/Installer must have at least ten (10) similar installations with this flooring system. Submit reference list with contact name, numbers, addresses, and size of project.

2.2 MATERIALS

- A. 1/8" decorative quartz floor multiple component, heavy duty epoxy flooring system as manufactured by C.A. Reed Associates, Inc. (800) 462-6149.
- B. Color and texture shall be selected from submitted samples.
- C. Physical Properties:

Compressive Strength	ASTM C 579	11,500 psi
Hardness (Shore D)	ASTM D 2240	80 – 84
Weight @ 1/8"		1.0 – 1.2 # per sq. ft.
Tensile Strength	ASTM C 307	2,400 psi
Flexural Strength	ASTM C 580	4,300 psi
Bond Strength (Concrete)	ACI 403	250 psi (concrete fails)
Adhesive Strength	MIL D 24613	420 psi
Impact Resistance	MIL D 3134 F	16 ft/lb (no cracking)
Abrasion Resistance	ASTM C 501	32 mg
Thermal Shock Resistance	ASTM C 884	passes
Water Absorption	MIL D 24613	Nil
Flammability	ASTM D 635	self-extinguishing
Coefficient of Friction	ASTM D 2047	0.80
Coefficient of Expansion	ASTM C 531	26 x 10 to the -6
Curing Time (@ 70°F)		Light traffic 24-hours Heavy traffic 48-hours

2.3 PRODUCT PACKAGING

- A. All materials used must be precision mixed on site with approved mix and measure apparatus to ensure a timely, accurate mix ratio.

Part 3 EXECUTION

3.1 PREPARATION

- A. Concrete preparation to be performed through the use of a Blastrac (vacuum shotblaster) running off of installer's 60K generator (power required for Blastrac machine will not be supplied by General Contractor/Using Agency) in order to yield a clean, profiled substrate. Sawtec 'dust-free' diamond grinding shall be performed along all edges and areas where shotblasting machine is unable to reach.

- B. All termination points, including doorways and trench drains, shall be 'keyed in' in order to provide smooth transitions.
- C. All cracks, sawcuts, gouges and holes shall be filled with a C.A. Reed #5100/fumed silica mixture prior to flooring installation.

3.2 PRODUCT INSTALLATION

- A. Floor installation must be strictly adhere to manufacturer/installer's current written instructions.
- B. Apply 20 mil base coat of C.A. Reed #5100 with a notched squeegee and backroll with a high quality, non-shed roller.
- C. Broadcast colored quartz granules to excess, and allow to cure.
- D. Sweep up excess quartz.
- E. Repeat steps B and C.
- F. Apply topcoat of C.A. Reed #5100 at 100 sq. ft. per gallon, allow to cure.
- G. Moving joints shall be recut and filled with a flexible sealant approved by C.A. Reed Associates, Inc.

END OF SECTION

SECTION 09775

WALL PANELS AND ACCESSORIES

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE OF WORK

- A. Provide labor, material, equipment and incidentals as required to furnish and install:
 - 1. Wall covering panels and accessories as shown on the drawings.
 - 2. Provide bumper guards, corner guards, etc.
- B. Related Work Includes:
 - 1. Section 07925 – Joint Sealant/Caulking

1.3 QUALITY ASSURANCE

- A. Contractor shall use adequate numbers of skilled workmen with ten (10) years minimum experience, and who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the method needed for proper performance of the work of this section.
- B. Contractor shall follow all applicable ASTM references for the test methods, standards and specifications for panelboards, fasteners and steel framing members. Also all references for material installation shall be followed.

1.4 SYSTEM DESCRIPTION

- A. Wall coverings and accessories shall be installed as per manufacturer's specified recommendations.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's specifications and installation instructions for each product specified.

1. Materials list of items proposed to be provided under this section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements. Provide two (2) extra sheets of wall material and 20 lineal ft. of each accessory material to the facility for future repairs.
3. Samples of each item, color, and pattern available in the specified grades from the proposed manufacturer's. Colors will be coordinated with Using Agency.
4. Manufacturer's recommended installation procedures which, when approved by the Contractor, will become the basis for accepting or rejecting actual installation procedures used on the work.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Packaging and Shipping: Have materials shipped in manufacturer's original packages showing manufacturer's name and product brand name.
- B. Storage and Protection: Store materials inside and protected from damage by the elements. Protect ends, edges, and faces of panelboards from damage. Protect steel studs and accessories from bending.

Part 2 PRODUCTS

2.1 MATERIALS, GENERAL

- A. Provide colors and patterns to be selected by the Using Agency from standard colors and patterns of the approved manufacturer in the specified type.
- B. Adhesives:
 1. Provide waterproof and stabilized type adhesive as recommended by manufacturer of the material being installed.
 2. Provide all necessary screws, shields, adhesives, and materials as required by the manufacturer for a secure and complete installation. Installation shall comply with all **Antiligature** requirements (ADA, etc.).

2.2 WALL MATERIALS/ACCESSORIES

- A. Wall Panel: Shall be Acrovyn .060 Wall Protection System, as manufactured by Construction Specialties, Muncy, Pennsylvania 217756 (800-541-6253) FAX (800-233-8493), www.c-sgroup.com (C.S.) or approved equal. Colors by Using Agency.
- B. Wall Corner Guards: Shall be 3" wide with aluminum retainer and top caps only. Color by Using Agency.
- C. Bumper Guards: Shall be PVC retainer, end caps, and high impact rail cover. Color by Using Agency.

- D. Hand Railings: Match existing at project site.
- E. Provide corner pieces and edge termination strips where provided and required by the manufacturer for a complete and secure installation of wall panels and bumper guards.
- F. Provide other materials, not specifically described but required, for a complete and proper installation, including all anchorage and wall plugs to receive anchors, as selected by the Contractor subject to the approval of the Designer.

Part 3 EXECUTION

3.1 PREPARATION

A. Substrate:

1. Substrate shall be clean, dry, smooth and level at required finish elevation, and without more than 1/8" in 10'-0" variation from level or perpendicular.
2. Prior to laying materials, clean or patch the surfaces to be covered with the wall panels.

3.2 INSTALLATION

A. General:

1. Remove existing vinyl wall fabric/paper from entire wall. Remove existing vinyl base from walls. Remove glue residue or wall materials that will interfere with panel application. Prepare wall as required by wall panel manufacturer.

B. Installation of Materials:

1. Install corner guard wall panels and bumper guards in all corridor wall areas receiving new wall finishes as detailed. Use mastics trowelled continuous; in addition to approved fasteners, etc.
2. Use factory preformed interior corners, and factory preformed divider bars where required.
3. Repair severely damaged plaster wall finishes that interfere with panel application. Apply adhesive to entire backside wall panels with rollers.
4. Install concealed plastic expansion shields into wall material at all attachment locations for corner guards and bumper guards.

3.3 CLEANING AND PROTECTING

- ##### **A. Remove excess adhesive and other blemishes from exposed surfaces, using neutral cleaner recommended by the manufacturer of the resilient materials.**

- B. Realign wavy or crooked materials, joints and accessories to close gaps and provide straight and true lines on all new materials throughout the entire project.
- C. Replace damaged materials and accessories not accepted by the Designer.

END OF SECTION

SECTION 09900

PAINTING

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE OF WORK

- A. The Painting Contractor shall furnish all material, labor and equipment required to complete all painting and finishing as shown on drawings, plans and specifications.
 - 1. Clean, prime and paint all ceilings in Toilet Room.
 - 2. Clean, prime and paint all walls as noted on drawings. NOTE: **All** existing painted surfaces shall be repainted.
 - 3. See Base Bids, Section 01030.
- B. The Painting Contractor shall examine the specifications for the various trades and shall thoroughly familiarize himself with all their provisions regarding their painting. All surfaces that are left unfinished by the requirements of other specifications shall be painted or finished as a part of this contract.
- C. The Painting Contractor shall be responsible for inspecting the work of others prior to the application of any paint or finishing material. If any surface to be finished cannot be put to proper condition for finishing by customary cleaning, sanding, and puttying operations, the Painting Contractor shall immediately notify the General Contractor or the Architect in writing or assume responsibility for and rectify any unsatisfactory finish resulting.

1.3 SUBMITTALS

- A. Colors and Samples
 - 1. All colors shall be selected and approved by the Department from manufacturers colors available for coating type.
 - 2. Upon request, the Painting Contractor shall prepare and submit finished samples of specified materials for approval. Successive coats on these sample panels shall be applied in such a way that portions of all preceding coats remain exposed. Samples shall be retained to compare with the finishes as they are applied.

1.4 STORAGE AND PROTECTION

- A. All materials used on the job shall be stored in a single place designated by the Owner. Such storage place shall be kept neat and clean and all damage thereto or to its surrounding shall be made good by the Painting Contractor.
- B. All soiled or used rags, waste, and trash must be removed from the building each night, and every precaution taken to avoid the danger of fire.
- C. The Painting Contractor shall protect surfaces and objects inside the building, as well as the grounds, lawns, shrubbery, and adjacent properties against damage. The Painting Contractor shall hold himself responsible for damage to adjacent furnishings.
- D. At completion of work, the Painting Contractor shall remove from the premises all surplus painting materials and all debris created by him; he shall remove all spatters and leave his part of the work in a clean and finished condition.

1.5 WARRANTY

- A. General: See General Conditions of Contract.
- B. Special Warranty: The manufacturer shall warrant the work of this section to be in accordance with the contract documents and free from faults and defects in materials for a period of five (5) years from date of Substantial Completion. This special warranty shall extend the one (1) year period of limitations contained in the General Conditions.
- C. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the contract documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the contract documents.

Part 2 **PRODUCTS**

2.1 MATERIALS

- A. All materials used on the work shall be of the brand and quality specified and shall be delivered at the site of work in original containers with seals unbroken and labels intact.
 - 1. Material used to fill holes in walls shall determine the type of finish to be used. A grout material is preferred.
 - a. Contractor shall submit material to be used for filling holes and finishing, for approval prior to installing material.
 - 2. Paint shall contain anti-microbial to inhibit the growth of mold, mildew, and bacterial from setting up on the dried paint film. The product shall meet or exceed the LEED standards and shall meet or exceed 4,200 scrub cycles on the ASTM D 2486 test.

- B. All materials shall be used strictly in accordance with manufacturer's label directions.
- C. All materials such as linseed oil, shellac, and turpentine shall be pure and of highest quality and approved by the Department. They shall bear identifying labels on the containers.
- D. Any necessary materials not specifically covered and specified in this contract shall be subject to approval before any materials are delivered. Contractor shall submit the name and brand of the materials which it proposes to use and shall receive an approval in writing from the Department prior to purchase and delivery to the site.
- E. ASTM (ASTM):
 - 1. ASTM D 2486 – Standard Test Method for Scrub Resistance of Interior Latex Flat Wall Paints.
 - 2. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. Gypsum Association (GA):
 - 1. GA 214 – Recommended Specification; Levels of Gypsum Board Finish.
- G. Painting and Decorating Contractors of America (PDCA):
 - 1. PDCA P5 – Benchmark Sample Procedures for Paint and Other Decorative Coating Systems.
- H. South Coast Air Quality Management District (SCAQMD):
 - 1. SCAQMD Rule # 1168 – Adhesive and Sealant Applications, including most recent amendments.
- I. Performance:
 - 1. VOC: Coatings shall have less than 98 g/L of VOC's.
 - 2. Fire Rating: Coatings shall be Type I or Class A fire rated, ASTM E 84.

2.2 MANUFACTURERS

- A. Basis of Design: Products specified are those as manufactured by Master Coating Technologies. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by listed manufacturers are acceptable.
- B. Primers:
 - 1. Interior Gypsum Board Ceilings and Walls – Laytex - Flat
 - a. 1 coat – Primemaster Primer/Sealer

C. Finish System Components:

1. Base Coat: Water based polyurethane/acrylic base coat and cross linker.
 - a. Basis of Design: Scuffmaster MC 100, Master Coating Technologies.
2. Effect Coat: Water based polyurethane/acrylic effect coat and cross linker.
 - a. Basis of Design: Scuffmaster Clear Pearl Coat, Master Coating Technologies.
3. Clear Coat: water based polyurethane protective clear coat with cross linker.
 - a. Basis of Design: Scuffmaster Ultra-Clear Flat, Scuffmaster Ultra-Clear Satin, or Scuffmaster Ultra-Clear Gloss, Master Coating Technologies.
4. Miscellaneous Materials: Surface patching compounds and other materials necessary for application of finish system shall be of high quality and compatible with coating system.

Part 3 **EXECUTION**

3.1 SURFACE PREPARATION

- A. All surfaces should be sound, clear, and free of oil, grease, dirt, loose or peeling paint and other foreign substances.
- B. Remove all rust and scale from all existing metal surfaces down to sound, clean metal. Regalvanize as required and repair metal as required prior to painting.
 1. Repairing shall be grinding out deteriorated areas and welding new galvanized plates into voids.
- C. Remove all expansion fastener plugs from walls prior to filling holes.
 1. Finish material shall match the surrounding areas.
- D. Follow approved manufacturers surface preparation guidelines for each substrate.

3.2 WORKMANSHIP

- A. All work shall be done by skilled mechanics in accordance with the best standard practice and the manufacturer's printed instructions in a manner acceptable to the Department. Any work not conforming to these specifications shall be corrected to the satisfaction of the Department. Such corrections shall be made at the expense of the Painting Contractor.
- B. All finishes shall be evenly applied and free from sags, runs, crawls, brush marks, skips or other defects.
- C. Products shall be applied at the proper consistency and shall be thinned, tinted, or otherwise altered only in accordance with the manufacturer's printed directions.

- D. If the finish coat is to be colored, the prime coat and the intermediate coat shall be tinted to have a slight variation in color from each other.
- E. All materials shall be applied to surfaces that are dry and properly prepared and when conditions are favorable for paint.
- F. Each coat of materials shall be thoroughly dry before application of the succeeding coat.
- G. The Painting Contractor shall notify the Department of any surface which he considers not his responsibility, of any defects in surfaces to be painted, or any errors or omissions in the drawings or in the specifications. The Painting Contractor shall not proceed with the finishing of the surfaces in question until an agreement has been reached with the Department concerning the alleged discrepancies. The starting of work on any surface shall imply that the surface has been inspected and approved by the Painting Contractor.

3.3 APPLICATION

- A. Applicator shall apply smooth pearl finishes in accordance with manufacturer's written instructions and using conventional or HVLP spray equipment.
 - 1. Finish HVAC registers and grilles and other items located in surfaces to receive coatings.
- B. Apply as many primer coats as necessary to produce a uniform substrate appearance. Do not exceed manufacturer's recommended coverage rate. Allow to dry prior to application of subsequent coats.
- C. Re-prime suction and hot spots on substrate prior to applying base coatings.
- D. Over wood and gypsum board, sand primer with 100 grit or finer sandpaper. Thoroughly remove dust from sanding with a clean, wet rag.
- E. Apply each coat to a natural break point such as an edge or corner without stopping.
- F. Finishes shall match approved benchmark samples and shall be free of runs, sags, holidays, and excessive irregularity/unevenness of pattern coat. Transitions between colors and/or other materials shall be sharp, clean and without overlaps.

3.4 CLEANING AND TOUCH UP

- A. At the end of each day, the Contractor shall place in covered, metal containers, or destroy all cloths, waste and refuse, which have been used in the application of inflammable paint materials.
- B. At completion of work, all staging, scaffolding, containers, and debris shall be removed from the premises, leaving all painting in perfect and clean condition.
- C. Touch up and finish any part of the work requiring same, after all other trades have finished repairing any damage to the work.

- D. Upon completion, leave the work clean and free from blemishes, hardware, stone, glass and any other materials shall be thoroughly cleaned of all paint to the satisfaction of the Department.
- E. After painting is completed, joints between sash and frame shall be struck with a knife or other tool so that windows can be opened and not held closed by a paint film.

END OF SECTION

DIVISION 10 - SPECIALTIES

SECTION 10155

TOILET PARTITIONS (SOLID PLASTIC)

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 DESCRIPTION

- A. Work included but limited to:
 - 1. Provide and install toilet compartments, floor mounted, braced to ceiling to be suicide proof.

1.3 SUBMITTALS

- A. Submit manufacturer's product data and shop drawings and installation instructions for evaluation and coordination before installation of materials.

1.4 REFERENCES

- A. PA Act 235 and ADAAG Regulations
- B. Standard specification for solid plastic.

Part 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering "or equal" products which may be incorporated in the work and can include, but are not limited to, the following:
 - 1. Santana Solid Products Company
 - 2. Capital Partitions, Inc.
 - 3. Comtec Industries

2.2 MATERIALS

- A. General: Provide manufacturer's standard components, accessories and hardware for complete installation.

2.3 SOLID POLYMER RESIN COMPONENTS

- A. High Density Polyethylene (HDPE).
- B. Panels: One (1) inch thick nominal by height and depth as shown on the drawings.
- C. Doors: One (1) inch thick, door swing as shown on drawings. Door dimensions to comply with ADA Regulations for handicapped. Cut doors on angle to provide antiligature.
- D. Pilasters: One (1) inch thick. Height and depth as noted on the drawings.
- E. Shelves: One (1) inch thick. Length and width as noted on the drawings.

2.4 HARDWARE AND ACCESSORIES

- A. General: Manufacturers standard design, heavy duty operating types; stainless steel No. 304.
- B. Hinges: Stainless Steel: Fabricated from solid metal with no seams or welds.
 - 1. Pivot Hinge: Wrap around internal mortise gravity type; stainless steel pins; adjustable opposing nylon cams, factory set for door swing. Through belted at two (2) positions minimum.
 - a. Surface mounted hinges not acceptable.
 - 2. Continuous Hinge: Piano type, spring loaded with nylon bearings and separators at the knuckles, stainless steel pins and fastener snap on cover strip.
 - 3. Integral Type: Door inset into pilaster; both machined out to accept nylon or nylon reinforced with stainless steel pins, designed to allow for gravity door closing action.
- C. Brackets:
 - 1. Continuous Bracket: Double ear for panel to wall connections; single ear for pilaster to wall connections. Aluminum, 6463-T5 alloy.
 - 2. Wall Brackets: Nominal one (1) inch high – intermediate use as permitted by manufacturer and Department.
 - 3. Head Rail (cross bracing): Shall be a one (1) piece, 6" wide, fabricated HDPE rail.
 - 4. Ceiling Shoes: 5/8" aluminum plate welded to a continuous aluminum bracket and attached to a ceiling beam.

D. Fasteners and Anchors: Manufacturers standard for required installation.

1. Fasteners: Stainless steel tamperproof heads where exposed
2. Anchors: Stainless steel as recommended by manufacturer.

E. Latches and Strikes: Heavy Aluminum Extrusion

1. Strikes: Wraparound type, through bolted concealed latch, (Non-handicapped installations): Throw bolt with emergency access capability without lifting door.
2. Concealed Latch (Non-handicapped installations): Throw bolt with emergency access capability without lifting door.
3. Slide Latch (Handicapped installations) with emergency access capability without lifting door.

F. Door Pulls, Wall Bumpers: Heavy duty chrome plated ("Zamac"), non-ferrous cast alloy.

1. All handicap and outswing doors to have door pulls.

2.5 FINISHES

A. Solid Polymer Resin

1. Color: Integral homogeneous uniform color with mar resistant finish – Color shall be selected by the Department.
2. Finish: All exposed edges with uniformly machined radiuses.

B. Stainless Steel; Type 304, Satin Finish #4

C. Aluminum; Anodized Finish, as per manufacturer.

Part 3 EXECUTION

3.1 EXAMINATION

- A. Verify that site conditions are ready to receive work and opening dimensions are as required.
- B. Verify correct location of plumbing fixtures.
- C. Verify correct location of built-in framing, blocking, anchorage and bracing where required.
- D. Beginning of installation means acceptance of existing substrates.

3.2 INSTALLATIONS

- A. Install partitions and screen secure, plumb and level in accordance with manufacturer's instructions.
 - 1. Compartments shall be floor mounted, overhead braced to ceiling system.
- B. Maintain manufacturers minimum recommended clearances for spaces between wall and panels, and between wall and end pilasters.
- C. Attach panel brackets securely to walls and ceilings using anchor devices as recommended by the manufacturer for the conditions encountered.
- D. Attach panels and pilasters to brackets with through sleeve tamper-proof bolts and nuts.
- E. Provide aluminum plates, brackets, and beams for attaching pilasters to new ceilings.
- F. Equip each door with two (2) hinges, one (1) door latch, and one (1) coat hook and bumper.
- G. Install door strike and keeper with door bumper on each pilaster in alignment with door latch.
- H. Adjust hinges to locate doors in partial opening position when unlatched, and to return out-swinging doors to near-closed position.

3.3 REPLACEMENT TRIM AND BRACKETS

- A. Remove existing panel/wall brackets and plastic panel braces, where noted on drawings.
- B. Install new continuous aluminum brackets and braces.
 - 1. Butt all joints and adjust panels and brackets to eliminate open spaces.

3.4 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

3.5 CLEANING

- A. Remove protective maskings. Clean surfaces.
- B. Field touch-up of scratches or damage to finishes will not be permitted.
- C. Replace damaged or scratched materials with new materials.

END OF SECTION

SECTION 10800

TOILET ACCESSORIES

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 WORK INCLUDED

- A. The work of this section includes but is not necessarily limited to the following:
 - 1. Toilet Room Accessories
 - 2. All fittings, hardware and fastenings
 - 3. NOTE: All items must be ‘**Suicide Proof**’, if possible.

1.3 RELATED WORK

- A. Ceramic Wall Tile/Plastic Wall Covering

1.4 SUBMITTALS

- A. Shop Drawings – Submit shop drawings showing layout in relation to and oriented with building construction details, gauges, hardware, fittings and other pertinent information.
- B. Submit manufacturer’s installation instructions.
- C. Submit manufacturer’s descriptive data.

1.5 REGULATIONS

- A. PA Act 235 and ADA Regulations

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to job site in good condition and properly protected from damage to finishes.
- B. Minimize handling, store in dry location with ventilated protection from water, wetness, dampness and excessive humidity.

- C. Protection – Protect all finish work from damage and marring. Provide suitable impervious wrapping, covering or coating as required and do not remove until time of final completion of the work.

Part 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers specified are specified for the purpose of establishing standards of type and quality for estimating purposes. Similar approved materials or other approved manufacturers will be acceptable provided the substitution has been approved by the Department.

2.2 FINISHES

A. Toilet Accessories

- 1. Stainless steel Type 304 - #4 Satin finish

2.3 TOILET ACCESSORIES

- A. For the purpose of establishing a standard for this specification the manufacturer for the toilet accessories shall be Northwest Specialty Hardware, Inc., of Clackamas, Oregon or approved equal.

B. Grab Bars

- 1. Grab bars shall be suicide proof and approved by Pennsylvania Department of Labor & Industry, stainless steel with wall, end and center supports, 1 ¼" diameter, 1 ½" standoff, 36" and 42" long minimum (see drawing), mounted 34" above floor.
- 2. Mount grab bars to partition walls with stainless steel Phillips head machine screws, cap nuts and backing plates (reinforce to new steel stud walls). Mount grab bars to ceramic tile/CMU with stainless steel expansion anchors, approved by the grab bar manufacturer.
 - a. Provide concealed mounting with set screws.
 - b. Provide fasteners as required by the approved manufacturer.
 - c. Provide spacers where grab bar is fastened to the solid toilet partition. Spacers shall be mounted solidly through the partition. Spacers shall be rounded.
- 3. Grab bars shall support 250 lbs/lineal foot of force applied from any direction when installed.

C. Accessories:

- 1. Surface mounted toilet tissue dispenser; Using Agency will provide, Contractor shall install.
- 2. Similar to Model #5402, Bradley, with a satin finish.

- D. Soap Dispenser: Model No. 4112, Bobrick; satin finish.
- E. Paper Towel Dispenser/Trash Receptacle: Using Agency will provide, Contractor shall install.
- F. Mirror: Model No. 781-1836, Bradley.

Part 3 EXECUTION

3.1 INSTALLATION

- A. Install all accessories according to manufacturer's instructions and all applicable ADA guidelines.
- B. Make all attachments to develop a connection to allow for rugged usage of accessories. Wood plugs shall not be used. Metal fasteners shall be non-corrosive.
 - 1. Fasteners shall be concealed where possible. Where exposed, fasteners shall be stainless steel countersunk or flush type.

3.2 CLEANING

- A. Follow manufacturer's instructions.

3.3 DEFECTIVE WORK

- A. Remove stained, damaged, miscolored or otherwise defective work as directed by the Department. Replace with material that meets specifications.

END OF SECTION

CONTRACT

FOR

HVAC CONSTRUCTION

XXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXX COUNTY, PENNSYLVANIA

CONTRACT NO. D.G.S. A XXXXXX.2

DIVISION 15 – HVAC

SECTION 15000

HVAC GENERAL

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specification section "General Conditions of Contract" and "General Requirements" form a part of this section and shall have the same force and effect as if printed herewith in full.

1.2 SCOPE

- A. The work in this Division of the specification covers all items specified or illustrated on the project drawings under the Heating, Ventilating and Air Conditioning (HVAC) contract work, and every part herein is binding upon this Contractor.
- B. Those responsible for work covered by other sections of the specifications will be indicated by trade, such as, "Others", "Plumbing Contractor", "Electrical Contractor", or "General Contractor". All items not so indicated shall be the responsibility of this Contractor.
- C. The work shown is intended to include a complete and proper heating system for the existing building at 22nd & Forster streets, Harrisburg, PA; all as shown on plans and as specified herein. All labor, equipment, materials, and accessories for a complete and proper installation as hereinafter specified, or as shown on drawings, or as may be required for a proper system shall be furnished under this Contract.

1.3 GENERAL

- A. This Contractor must comply with all laws, ordinances, or regulations of all Authorities having jurisdiction, either borough, city, county, state or public utility.
- B. Nothing contained in these specifications or shown on the drawings shall be construed to be in conflict with any state or local codes, ordinances or regulations governing the installation of the class of work specified herein.
- C. The Minimum Standard of Work under this Contract shall be as required by the Commonwealth of Pennsylvania, Department of Labor and Industry, Boiler Division and the American Society of Heating, Refrigeration and Air Conditioning Engineers, and the Department of General Services.
- D. All laws, ordinances, rules, codes and regulations, including those of the Department of Environmental Resources, Department of Labor and Industry, the National Fire Protection Association, ASME, OSHA, SMACNA, ASHRAE, NEC, IBC and all public bodies (Federal, State and/or local) are hereby incorporated and made a part of these specifications.

- E. All materials must be installed by skilled mechanics in accordance with best practices of the industry.
- F. THIS CONTRACTOR MUST CONFER AND COORDINATE HIS WORK WITH THAT OF ALL THE OTHER CONTRACTORS SO THAT THE WORK OF ALL THE TRADES WILL BE PERFORMED IN AN ORDERLY MANNER AND WITH THE LEAST POSSIBLE INTERFERENCE. IN CASE INTERFERENCE WITH THE WORK OF OTHER CONTRACTORS SHOULD OCCUR, THE DECISION OF THE PROFESSIONAL AS TO CHANGES TO BE MADE IN THE WORK SHALL BE FINAL.

1.4 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

- 1. AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

- a. ARI 350 Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment
 - b. ARI 410 Forced-Circulation Air-Cooling and Air-Heating Coils
 - c. ARI 880 Standard for Air Terminals

- 2. AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

- a. AMCA 210 Laboratory Methods of Testing Fans for Rating
 - b. AMCA 300 Reverberant Room Methods for Sound Testing of Fans

- 3. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- a. ASTM A 47 Ferritic Malleable Iron Castings
 - b. ASTM A 53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
 - c. ASTM A 123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - d. ASTM A 181 Forgings, Carbon Steel, for General-Purpose Piping
 - e. ASTM A 183 Carbon Steel Track Bolts and Nuts
 - f. ASTM A 525 Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
 - g. ASTM A 536 Ductile Iron Castings

- h. ASTM A 733 Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
- i. ASTM B 62 Composition Bronze or Ounce Metal Castings
- j. ASTM B 75 Seamless Copper Tube
- k. ASTM B 88 Seamless Copper Water Tube
- 4. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
 - a. ASME-16 Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage
 - b. ASME-17 Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
 - c. ASME B1.20.1 Pipe Threads, General Purpose (Inch)
 - d. ASME B16.3 Malleable Iron Threaded Fittings, Classes 150 and 300
 - e. ASME B16.5 Pipe Flanges and Flanged Fittings
 - f. ASME B16.9 Factory-Made Wrought Steel Buttwelding Fittings
 - g. ASME B16.11 Forged Steel Fittings, Socket-Welding and Threaded
 - h. ASME B16.18 Cast Copper Alloy Solder Joint Pressure Fittings
 - i. ASME B16.21 Nonmetallic Flat Gaskets for Pipe Flanges
 - j. ASME B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
 - k. ASME B16.26 Cast Copper Alloy Fittings for Flared Copper Tubes
 - l. ASME B16.39 Malleable Iron Threaded Pipe Unions (Class 150, 250, and 300)
 - m. ASME B40.1 Gauges - Pressure Indicating Dial Type - Elastic Element
- 5. AMERICAN WATER WORKS ASSOCIATION (AWWA)
 - a. AWWA C606 Grooved and Shouldered Joints
- 6. AMERICAN WELDING SOCIETY (AWS)
 - a. AWS D1.1 Structural Welding Code - Steel

7. FEDERAL SPECIFICATIONS (FS)

- a. FS GG-T-321 Thermometers, Self-Indicating, Liquid-in-Glass for Machinery and Piping Systems
- b. FS WW-V-35 Valve, Ball

8. MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

- a. MSS SP-25 Standard Marking System for Valves, Fittings, Flanges and Unions
- b. MSS SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture
- c. MSS SP-69 Pipe Hangers and Supports - Selection and Application
- d. MSS SP-70 Cast Iron Gate Valves, Flanged and Threaded Ends
- e. MSS SP-71 Cast Iron Swing Check Valves, Flanged and Threaded Ends
- f. MSS SP-80 Bronze Gate, Globe, Angle and Check Valves
- g. MSS SP-85 Cast Iron Globe and Angle Valves - Flanged and Threaded Ends

9. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- a. NEMA MG1 Motors and Generators

10. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- a. NFPA 70 National Electrical Code
- b. NFPA 90A Installation of Air Conditioning and Ventilating Systems

11. UNDERWRITERS LABORATORIES (UL)

- a. UL-01 Building Materials Directory
- b. UL-03 Electrical Construction Materials Directory
- c. UL-05 Fire Resistance Directory
- d. UL 94 Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

e. UL 214

Tests for Flame-Propagation of Fabrics and Films

f. UL 883

Fan-Coil Units and Room Fan-Heater Units

1.5 DRAWINGS AND SPECIFICATIONS

- A. The drawings are generally diagrammatic and indicative of the work to be performed. However, it is not intended that they show every pipefitting or appurtenance required for a complete installation. Exact locations of equipment and points of termination shall be approved by the Professional. Should it be found that any system or equipment cannot be installed as shown on the drawings; the Professional shall be consulted before installing or making changes to the layout.
- B. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. This Contractor shall carefully examine the Architectural, Structural, Heating, Ventilating and Air Conditioning, Plumbing, Electrical, and other Project Documents that would affect the work to be performed and shall arrange such work accordingly, furnishing required offsets, fittings, and accessories to meet such conditions. If any discrepancies occur between the drawings or between the drawings and specifications, he shall report such discrepancies to the Professional in writing and obtain written instructions as to the manner in which to proceed. No departures from the Project Documents shall be made without prior written acceptance of the Professional.
- C. The drawings and specifications are intended to function as a common set of documents. Anything shown on the drawings but not in the specifications, or mentioned in the specifications and not shown on the drawings, shall be equally binding as if both noted on the drawings and called for in the specifications.
- D. The drawings must be followed as closely as circumstances will permit. However, this Contractor will be held responsible for the proper installation of all materials and equipment required for a complete installation within the intent and meaning of the Contract Documents.
- E. No measurement of a drawing by scale shall be used as a working dimension. Working measurements shall be taken from figured dimensions and through cooperation with all other Contractors.
- F. This Contractor must thoroughly familiarize himself with the specifications so that he clearly understands his responsibility in relationship to the work to be performed under this Contract. This Contractor must perform and plan his work so as to permit the use of the building at the earliest possible date.

1.6 DEFINITIONS

- A. The term "agency" or "using agency" refers to the authorized representative of the Commonwealth of Pennsylvania Department of General Services.
- B. The term "C.M." or "CM" refers to the Construction Manager representing the Agency.

- C. The term "Commonwealth" means the Commonwealth of Pennsylvania.
- D. The term "Contractor" or "this Contractor", refers to the Contractor or any of his subcontractors, sub-subcontractors, materials persons, company(ies), corporation(s), partnership(s), sole proprietorships and others, et al, responsible for work described in this DIVISION and/or on the project drawings.
- E. The term "Department" refers to the authorized representative of the Commonwealth of Pennsylvania Department of General Services.
- F. The term "drawings" refers to the drawings which show the character and scope of the work to be performed and which are prepared by the Engineer, referred to in the Contract Documents, and enumerated in the Supplemental General Conditions.
- G. "Finished Area" shall be defined as any space with the wall either tiled, plastered, covered or painted except certain concrete or concrete block foundation walls below grade. Vertical piping running through finished areas must be run in chases. Where there are ceilings in finished areas, all piping and conduit shall be concealed above the ceilings unless indicated "at ceiling" in which case piping shall be exposed below ceilings. Areas shall be considered finished areas where bottoms of floor or roof slabs serve as finished ceilings.
- H. The term "furnish", when used separately, shall mean to "obtain and deliver on the job, for installation by the indicated Trade Contractor".
- I. The terms "he, him, his" is a reference to a person or business with no gender intended.
- J. The term "install", when used separately, shall mean to "install in full operating condition equipment supplied to this Contractor by other Trade Contractors".
- K. The term "Professional" refers to the representative of the Commonwealth of Pennsylvania Department of General Services.
- L. The term "project documents" refers to the General Conditions, Supplemental General Conditions, Contract, Technical Specifications, Standard Drawings, Drawings, and any and all other components enumerated in the "General Conditions", "Special Requirements" and/or bound herein.
- M. The term "provide" shall mean to "furnish and install".
- N. "Unfinished areas" shall be defined as any space without a wall finish (with or without ceilings).
 - 1. Where in doubt as to the classification of a specific space, the Contractor shall obtain written direction from the Professional before roughing-in.

Part 2 PRODUCTS

2.1 MATERIALS, EQUIPMENT AND WORKMANSHIP

A. General

1. All details of the installation shall be mechanically and electrically correct, and the mechanical and electrical equipment shall operate without objectionable noise or vibration.
2. Where applicable, all materials and equipment shall bear the label of approval of Underwriters Laboratories, Inc.

B. Materials and Equipment

1. All materials and equipment furnished under this contract shall be new, American made and shall conform to the grade, quality and standards specified herein. Major items of equipment shall be the latest and standard product, as advertised in printed catalogs by reputable manufacturers for the purpose intended and shall have replacement parts readily available.
2. All equipment or apparatus of any one system must be the product of one manufacturer, or equivalent products of a number of manufacturers, which are suitable for, use in a unified or assembled system. All equipment shall be installed according to the manufacturer's recommendations.
3. Mechanical fastenings used throughout on the equipment or parts subject to wear and replacement shall be of a type capable of removal and replacement without physical deformation of the equipment.
4. Belts, pulleys, chains, gears, couplings, projecting set screws, keys and other rotating parts shall be fully enclosed or properly guarded.

C. Workmanship

1. All manufactured articles, material, and equipment shall be applied, installed, connected, erected, adjusted, cleaned, and conditioned, in accordance with the manufacturer's directions, unless hereinafter specified otherwise. This Contractor shall be responsible for obtaining such instructions from the suppliers.
2. Equipment shall be installed in strict accordance with the manufacturer's written instructions for type and capacity of each piece of equipment. This Contractor shall obtain these instructions from the manufacturer and such instructions shall be considered a part of these specifications. Type, capacity and application of equipment shall be suitable and capable of satisfactory operation for the purpose intended in the Heating, Ventilating and Air Conditioning System.

2.2 TRADE NAME REFERENCES

- A. Materials and equipment are described and listed in this specification by trade name, manufacturer's type, or catalog number. It is intended that this reference shall establish standards of quality, performance, capacity, materials and design for the item specified.
- B. Where more than one manufacturer is listed for an item, those mentioned are considered equivalent provided that the quality, style, capacities, materials and performance of the specified item are present. All materials shall be subject to the review of the Professional.
- C. All materials considered for this project, including all equipment and components thereof, shall comply with **ACT 3 OF 1978 - PROVISION FOR USE OF STEEL AND STEEL PRODUCTS (AS AMENDED TO INCLUDE CAST IRON)**.

2.3 GUARANTEE

- A. This Contractor shall guarantee the workmanship, materials and equipment against defects, leaks or non-operation for a period of one (1) year except Automatic Temperature Controls which is three (3) years from date of acceptance by the Professional. Defective workmanship shall be construed as meaning defective materials or unsatisfactory installation and not to mean ordinary wear and tear.
- B. This Contractor shall pay for any repairs or replacements caused by defective workmanship as construed herein within the period covered by the Guarantee.

Part 3 EXECUTION

3.1 GENERAL

- A. Contractor shall install all equipment in accordance with manufacturer's written instructions, all applicable codes, and recognized industry practices.
- B. All equipment, valves, traps, strainers and accessories requiring maintenance shall be installed so as to preserve adequate space for such service, including but not limited to space to remove tubes, coils, filters, strainer baskets and similar items for service, repair or replacement.
- C. After all equipment is installed, it shall be tested to demonstrate proper operation or performance and compliance with the specifications. Equipment not operating correctly shall be field corrected or replaced.

3.2 FAMILIARITY WITH CONTRACT REQUIREMENTS

- A. This Contractor's responsibility, prior to submitting his bid on this Project, is to satisfy himself as to the nature and location of the work, the existing conditions, and the quality and quantity of the materials, which will be required, under this Contract.

- B. Failure to make an on-site inspection prior to submitting a bid, or failure to comply with any or all of the requirements herein will not relieve this Contractor from the responsibilities of properly estimating the requirements of the work nor from the responsibility for the performance of the provisions of this Contract.

3.3 PERMITS, TESTS, AND INSPECTION

- A. This Contractor shall be responsible to obtain and pay for all permits, pay all deposits and fees necessary for the installation, tests and inspection of all work provided under this specification. These tests shall be conducted as required by the regulations of the local and/or state authorities, having jurisdiction.

3.4 LOCATIONS

- A. Each Contractor shall apply for detailed and specific information regarding the location and size of all equipment, as the final or required location and size may differ from that indicated on the drawings. Any material or equipment improperly placed because of the Contractor's failure to obtain this information shall be relocated and reinstalled without additional expense to the Owner.

3.5 LINES AND GRADES

- A. This Contractor shall lay out his work, establishing heights and grades for all exterior and interior piping and ductwork included in these specifications in strict accordance with the intent of the drawings, the physical conditions of the building and the finished site grades. He shall be responsible for the accuracy of such heights and grades and that they meet all physical conditions of the building and the requirements of these specifications.

3.6 DEMOLITION AND SALVAGE

- A. This Contractor shall disconnect and remove all Heating, Ventilating and Air Conditioning equipment, materials, fixtures and connections to equipment no longer required. All piping shall be removed and capped off either below floors, in walls or above ceilings as may be required. (See also, "CUTTING, PATCHING, AND REPAIRING", as hereinafter specified.)
- B. All items noted to be reused or reinstalled shall be carefully removed, cleaned and stored in an approved manner and shall be reinstalled at the proper time.
- C. All materials and equipment removed as a result of this contract shall become the property of the Contractor unless noted otherwise and shall be removed promptly from the project site. Disposal shall be in accordance with the regulations of the authorities at the disposal site. The salvage value of the material removed shall be reflected in the bid price of the Contract.
- D. Any salvage value for items being removed shall be reflected in the Contractor's Bid Price.

3.7 CUTTING, PATCHING AND REPAIRING

- A. Chases and Openings (Existing Building): Unless otherwise noted, this Contractor shall cut, patch and finish all chases and openings required for the installation (or demolition) of this contract's work in the existing building. All patching shall match the adjacent finishes and existing materials.
1. Any penetrations made in an existing fire rated partition shall be resealed with an approved material and method as required to maintain the integrity of the fire separation.
 2. This Contractor shall furnish, install and set all lintels, sleeves, hangers and anchors required for the HVAC work and he will be responsible for their proper and permanent location.
 3. Cutting shall not cause damage to the building or leave unsightly surfaces which cannot be concealed by plates, escutcheons or other construction. Where such unsightly conditions are caused by this Contractor, he shall be required, at his own expense, to engage the General Contractor to repair the damaged area. All holes or openings to be put in existing concrete shall be bored.
 4. Materials to be used for patching and repairing will be subject to review by the Professional.

3.8 PRUDENT WORK-PRACTICE AND PROTECTION OF EQUIPMENT AND PERSONNEL

- A. This Contractor, upon request of the Professional shall expedite the work of a specific area, section or part of the project to make provision for, or protect equipment, or to permit the installation of another part of the work.
- B. Before any piping, conduit, equipment, devices, controls, supports and ductwork are installed, the Contractor shall check with other trades to eliminate any possible interference.
- C. Where two items of equipment, devices, piping, conduits, supporting metal work, hangers, pull boxes, outlets, ductwork or controls are shown on any of the drawings of the various trades in the same location, adjustments shall be made. These adjustments shall be made through cooperation between the trades involved prior to the installation of any work. The modifying changes shall be accomplished within the same space assigned for such construction and at no additional cost to the Owner. All necessary offsets, bends, turns, modifications in piping, ductwork and conduit devices required to install the work without interference with that of other trades or structure, shall be provided and installed without additional cost to the Owner.
- D. Where equipment is indicated on the drawings, it shall be the responsibility of this Contractor to install the equipment, its control or operational devices, with sufficient space provided for proper operation, maintenance, and access.

- E. All equipment, devices, controls, and motors shall be tightly covered and protected during construction and up to the time of operation. The protection shall be arranged and be of such design as to prevent damage from infiltration of dust, dirt, debris, moisture, chemicals or water. All pipe, duct openings, including electrical conduit shall be capped or plugged during installation with temporary dust-tight caps. This Contractor shall be responsible for damage or breakage to his fixtures and equipment and shall make good such damaged items at no cost to the Owner.
- F. All surfaces, either finished, in preparation for finishing or finish material application, shall be protected against damage from welding, cutting, burning, soldering or similar construction activities. This protection shall be accomplished by care in operations, covering and shielding. Special care shall be directed to exposed finished masonry, metal or wood surfaces, and painted surfaces. Corrective measures required shall be accomplished by the trade which made the original installation when and as directed by the Professional at the expense of the Contractor causing the damage, and at no cost to the Owner. The protective coverings and coatings shall be maintained until the work is ready for acceptance by the Owner.
- G. All exposed polished metal fittings, parts and devices, shall have a protective coating applied and maintained during the course of construction, and shall not be installed until adjoining tile or masonry work has been finally acid cleaned.
- H. Install temporary filters in all air handling equipment and temporary screens at all strainers or similar cleaning devices in the installation. At the completion of the work and just prior to acceptance of the system by the Department, remove the temporary screens and filters and install new and final screens and filters. The temporary screens shall be given to the Agency at the time of replacement.
- I. Provide suitable permanent safety guards for all pulleys, belt drives, centrifugal equipment and rotating parts, of the various items of equipment provided under this Contract. Requirements of Pennsylvania Department of Labor & Industry and OSHA shall be met.
- J. The guards and safety devices not noted on the drawings but required by regulations or agencies having jurisdiction shall be included as part of the project requirements.

3.9 INSTALLATION PROVISIONS

- A. Install all equipment, piping and ducts so as to preserve access to all valves and accessories. In general, piping and ducts shall be concealed unless otherwise indicated on the plans, but when exposed they shall be run so as to allow maximum head room consistent with proper pitch. Piping and ducts shall not be installed in front of or interfere with any light, opening, door, window or equipment. Headroom in front of openings, doors or windows shall not be less than the top of the opening.
- B. All piping, valves, ductwork, and fittings shall be kept a sufficient distance from other work to permit a clearance of not less than 1" between the finished covering and all adjacent work.

- C. All equipment, valves, traps, strainers and accessories requiring maintenance shall be installed so as to preserve adequate space for such service, including, but not limited to, space to remove tubes, coils, filters, strainer baskets and similar items for service, repair or replacement.
- D. Where required to allow clearance for ducts, electrical conduits, beams, and piping and to avoid interference with work of other trades, to increase the headroom under pipes or ducts or to improve appearance of the pipe work or ducts this Contractor shall offset the pipes or ducts as directed by the Professional and properly drain and drip same where necessary. He shall provide the necessary special pipe fittings or duct fittings to secure the necessary offsets and maintain good liquid and gas flow.
- E. Pipes carrying liquids or liquid vapors shall not be installed in transformer vaults or electrical equipment rooms. Pipes shall not be installed over, around, in front of, in back of, or below electrical controls, panels, switches, terminals, boxes or similar electrical equipment. Drip pans will not be permitted under any circumstances around electrical equipment.

3.10 PROTECTION OF SERVICES AND EQUIPMENT

- A. This Contractor, at his own expense, shall repair, replace and maintain in service any utilities, facilities or services (underground, aboveground, interior or exterior) damaged, broken, or otherwise rendered inoperative during the course of construction due to fault or neglect on the part of this Contractor.
- B. This Contractor shall effectually protect, at his own expense, such of his work, materials or equipment as liable to injury during the construction period. All openings into any piping, ducts or equipment must be securely covered, or otherwise protected, to prevent injury, due to carelessly or maliciously dropped tools or materials, grit, dirt, or any foreign matter. This Contractor shall be held responsible for all damage so done until his work is fully and finally accepted.
- C. This Contractor shall protect motors, pumps, electrical equipment, and all similar items of equipment from dirt, grime, plaster and water during all phases of construction.

3.11 INTERRUPTION OF SERVICES

- A. This Contractor shall schedule his work to avoid any major interruption of any utility services. Interruption of services shall be done during overtime if necessary at no additional cost to the Owner.
- B. This Contractor shall notify the Professional twenty-one (21) working days prior to any interruption of services. All interruption of services shall be submitted in advance to and approved in writing by the Professional before disruption of services is executed.

3.12 CONNECTIONS

- A. The points of connections and termination of the work under this specification are shown on the drawings or stated in the specifications, but in case of doubt as to such points of connections or terminations, the Contractor shall notify the Professional in writing requesting a review.

3.13 EQUIPMENT INSTALLED IN EXPOSED MASONRY

- A. Where equipment, devices, access panels, radiation enclosure, grilles, registers, and similar items of mechanical construction are installed in exposed masonry construction, utilize and submit for review items of such size, height, and arrangement as to conform to the corresponding masonry unit. Provide the necessary offsets, adjustments and relocations necessary to conform with the instructions of the Professional as to the final location of the equipment item in the exposed masonry.

3.14 FIELD MEASUREMENTS

- A. Before ordering any material or doing any work, this Contractor shall verify all measurements at the building and he shall be held responsible for the correctness of same.
- B. No extra compensation will be allowed on account of difference between actual dimensions and measurements and those indicated on the drawings.
- C. Any difference, which may be found, shall be submitted to the Professional for consideration before proceeding with the work.

3.15 CHANGES FROM CONTRACT DRAWINGS

- A. Changes from the contract drawings necessary to make the work of this Contractor conform to the building as constructed, or to fit the work of other contractors, or to conform to the rules and/or regulations of authorities having jurisdiction, shall be made by this Contractor at his own expense.

3.16 SUBMITTALS

A. General

1. Unless otherwise specified, this Contractor shall submit to the Professional for review the minimum number of copies of shop drawings as stated in the GENERAL CONDITIONS, certificates, reports, detailed fabrication drawings, engineering data or catalog information as required by the following list, and of any other items of mechanically operated equipment. Contractor's stamp must be issued on submittal prior to sending to the Professional for review.
2. When shop drawings are submitted on equipment different from the equipment specified, this Contractor shall relate each item of the submitted equipment to its specified equivalent.

3. Prior to submission to the Professional, this Contractor shall review the submission for completeness and conformance to the project documents. Submittal data shall note the applicable specification section, page(s), and paragraph number(s). Each submittal shall bear the Contractor's approval stamp indicating that the submittal meets the requirements of the project documents. Submittals not conforming to the previous will be considered in conflict with the project documents and returned to the Contractor rejected without further review.
4. See also, Heading "TRADE NAME REFERENCES" - specified hereinafter.

B. Samples

1. This Contractor shall furnish, for review by the Department or the Professional all samples specified or requested. Finished work shall match accepted samples and shop drawings.
2. At the request of the Department or the Professional, samples of items that are to be used in substitution of specified items shall be submitted. If such a request is made, a sample of both the specified item and the proposed substitute item shall be submitted simultaneously. The scheduling of the submission of such samples shall be as directed and shall in no way delay the progress of the project.
3. Neither the Department nor the Professional will assume any liability whatsoever for any samples submitted.

3.17 TEMPORARY HEAT

- A. If the heating system is advanced to provide temporary connections to air handling units, heaters, etc., for temporary heat, this Contractor shall connect same for temporary heat. The installation of all permanent heating system equipment shall be expedited for this purpose.

3.18 CLEAN-UP

A. General

1. After completion of work, and periodically during the course of the work, this Contractor shall be held responsible to clean all areas of debris and rubbish, which have been left, by himself or his sub-contractor. The Contractor shall immediately remove water present in any area, due to leaking fittings, broken pipe, etc., caused by defective materials or improper installation by himself or his sub-contractors. Internal and external areas of all equipment must be cleaned of all construction dust, etc., prior to pre-final inspection.
- B. Daily or when directed by the Professional, this Contractor shall remove all waste and debris resulting from his work. This Contractor shall immediately remove water present in any area, resulting from leaking fittings, broken pipes, etc., or caused by defective materials or improper installation performed under this contract.

- C. Upon completion of his work and when directed by the Professional, this Contractor shall remove all dirt, foreign materials, stains and fingerprints from all equipment, fixtures, panels, plates etc., installed under this contract. Internal areas of all equipment must be cleaned of all construction dust etc., prior to pre-final and/or final inspection.

3.19 COVERING THE WORK

- A. No piping shall be covered until it has been inspected, tested and accepted.
- B. By the contract, if any piping is covered before it has been inspected and tested, and accepted by the Owner's Authorized Representative, it shall be uncovered by the Contractor at his own expense when so notified by the Professional.

3.20 INSTRUCTION OF AGENCY'S REPRESENTATIVE

A. General

- 1. After acceptance of the work by the Professional, this Contractor shall instruct a representative(s), selected by the Agency in the operation and maintenance of all equipment and appliances installed under this Contract.

B. Scope

- 1. These instructions shall include, but not be limited to, instruction in the following items:
 - a. Location and use of all valves and dampers
 - b. Operation and Maintenance Schedules for Cooling Plant, Heating Plant, Pumps and Related Refrigeration/Heating Equipment
 - c. Operation and Maintenance Schedules of All Terminal Equipment
 - d. Operation and Maintenance Schedules for Fans, Hoods, Filtration Systems, and other Air Distribution Equipment
 - e. Operation of Automatic Temperature Control and BMS
 - f. Operation and Maintenance Schedules for Chemical Water Treatment
 - g. Start-up, operational and shut-down procedures including seasonal and emergency considerations.
 - h. Warranties: What they cover and how to use them.
 - i. Maintenance: routine, periodic, service, lubrication, overhaul and factory.
 - j. Smoke Control System: Initiation, actuation, manual and testing operations.

C. Deliverables

1. A minimum of three (3) sets of all parts lists and instruction sheets received with any equipment or appliance shall be bound in standard 3-ring binders, indexed and turned over to the Professional for review and delivery to the Professional.
2. Approximately 90 days after acceptance of the building, on dates set by the Professional, representatives of the temperature control installation, HVAC equipment installation and of the Electrical Contractor shall be present at the site. They shall thoroughly review with the Agency staff and supervising personnel the operation of all the equipment furnished and/or installed under this contract, along with the maintenance of the same.

3.21 CONSTRUCTION RECORD DRAWINGS

- A. This Contractor shall keep accurately dimensioned records of changes and deviations from the original Contract Drawings, including precise locations of underground or concealed work and the location and elevation of all utility lines, including valves, connections and changes in directions, installed under this Contract within the property lines and outside the building walls, and for all concealed utility lines within the building. The points where utility lines leave the property shall be located from building corners.
- B. Recordings shall be made by ruled lines on a separate set of prints maintained at the job site for that purpose. When detailed drawings are more effective, attach them to the marked set of record drawings. Recording shall be made immediately after the work is completed and not less often than weekly.
- C. The marked-up record set of drawings shall be delivered to the Professional before final acceptance of the project.

END OF SECTION

SECTION 15700

HVAC TERMINAL EQUIPMENT

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specification section "General Conditions of Contract" and "General Requirements" form a part of this section and shall have the same force and effect as if printed herewith in full.
- B. The specification Section 15040 – BASIC MATERIALS AND METHODS forms a part of this section and shall have the same force and effect as if printed herewith in full.

Part 2 PRODUCTS

2.1 FIN TUBE RADIATION (HEAVY-DUTY SECURITY TYPE - HOT WATER)

- A. Furnish and install where shown on drawing and schedules slope, heavy-duty enclosure with fin-tube heating elements. Radiation shall be installed in strict accordance with manufacturer's recommendation.
- B. The enclosure shall be 12 gauge steel, the entire height and length having perforations of 1/8" diameter on 3/16" staggered centers. The enclosure shall be secured to the wall at the top by means of a pre-punched, continuous, steel mounting bracket and, at the bottom by the use of tamper-proof security bolts, 1/4" diameter minimum. The enclosure shall be flush to the wall, top and bottom, and shall not use mounting backplates or mounting brackets lighter than 14 gauge.
- C. All accessories; end caps, splice plates, corner panels, closure boxes, etc.; shall be 14 gauge non-perforated steel, shall be over-lapping and shall be fastened with tamper-proof security bolts.
- D. Heating elements shall be suspended by adjustable J-hooks attached to wall mounting brackets.
- E. Non-ferrous heating elements shall consist of aluminum fins bonded to copper tube by mechanical expansion. Ferrous heating elements shall be steel fins bonded to steel tube. Rating of elements shall be in accordance with approved I-B-R test methods and CS-140. Heater elements shall be suspended by adjustable J-hooks attached to wall mounting brackets.
- F. Radiation shall have a factory-dipped prime coat of paint and/or a factory finish coat of baked enamel in a color as selected by the Professional. Accessories shall be provided to conceal all valving and piping appurtenances shown on project drawings.
- G. Radiation shall be Shaw-Perkins Crownline Series, Mark II Panelvector, Vulcan, Trane Dunham Bush or approved equal.

Part 3 EXECUTION

3.1 WALL FIN TUBE RADIATION

- A. Install equipment where shown, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes. Coordinate with other work, including floor construction, wall construction, electrical and piping, as necessary to interface installation of equipment with other work.
- B. Contractor is responsible for proper mounting height of all units.

END OF SECTION

SECTION 15838

POWER VENTILATORS

PART 1 GENERAL

1.1 STIPULATIONS

- A. The "General Conditions of Contract" and "General Requirements" shall be incorporated into this section by reference.
- B. The specification Section 15040 – Basic Mechanical Materials and Methods forms a part of this section and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This section includes the following:
 - 1. Centrifugal roof ventilators.
- B. Products furnished and installed under this section include roof curbs for roof mounted exhaust fans.

1.3 PERFORMANCE REQUIREMENTS

- A. Operating Limits: Classify according to AMCA 99.
- B. Fan Schedule: The following information is described in an equipment schedule on the drawings.
 - 1. Fan performance data including capacities, outlet velocities, static pressures, motor requirements, and electrical characteristics.
 - 2. Fan arrangement including wheel configuration, inlet and discharge configurations, and required accessories.

1.4 SUBMITTALS

- A. Products Data: Include rated capacities of each unit, weights, furnished specialties, accessories and the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound power ratings.
 - 3. Motor ratings and electrical characteristics plus motor and electrical accessories.
 - 4. Material gauges and finishes, including color charts.

- 5. Dampers, including housings, linkages, and operators.
- B. Shop Drawings: Detailed equipment assemblies indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Coordination Drawings: Show roof penetration requirements and reflected ceiling plans drawn accurately to scale and coordinating penetrations and units mounted above ceiling. Show the following:
 - 1. Roof framing and support members relative to duct penetrations.
- D. Wiring Diagrams: Detailing wiring for power and control systems and differentiating clearly between manufacturer installed and field installed wiring.
- E. Maintenance Data: For power ventilators to include in the operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL or a testing agency acceptable to authorities having jurisdiction marked for intended use.
- B. Listing and Labeling: Provide electrically operated equipment specified in this section that are listed and labeled.
 - 1. The term 'Listed' and 'Labeled': As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A 'Nationally Recognized Testing Laboratory' (NRTL) as defined in OSHA Regulation 1910.7.
- C. AMCA Compliance: Provide products that meet performance requirements and are licensed to use the AMCA seal.
- D. NEMA Compliance: Provide components required as part of fans that comply with applicable NEMA standards.
- E. UL Standard: Provide power ventilators that comply with UL 705.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver fans as factory assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements. Verify clearances.
- B. Do not operate fans until ductwork is clean, filters are in place, bearings are lubricated, and fans have been commissioned.

1.8 COORDINATION AND SCHEDULING

- A. Coordinate the size and location of structural steel support members.
- B. Coordinate the installation of roof curbs, equipment supports, roof penetrations, and roof membrane restoration. Refer to Division 7, Section 07500 – Roofing Membrane.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide power ventilators meeting these specifications and manufactured by the following:
 - 1. Centrifugal Roof Ventilators:
 - a. Greenheck
 - b. Penn Ventilator Corporation.
 - c. Or approved equal.

2.2 CENTRIFUGAL ROOF VENTILATORS

- A. Description: Direct drive centrifugal fans, as indicated, consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- B. Housing: Removable, spun aluminum dome top and outlet baffle; square, 1-piece aluminum base with venturi inlet cone.
- C. Fan Wheels: Aluminum hub and wheel with backward inclined blades.
- D. Accessories shall be provided as follows:
 - 1. Variable Speed Controller: Solid state control to reduce speed from 100% to less than 50%.
 - 2. Disconnect Switch: Non-fusible type, with thermal overload protection mounted inside fan housing, factory wired through internal aluminum conduit.
 - 3. Bird Screens: Removable, 1/2" mesh, aluminum or brass wire.

4. Dampers: Counterbalanced, parallel blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
5. Roof Curbs: Galvanized steel; mitered and welded corners; 2" thick, rigid, fiberglass insulation adhered to inside walls; and 2" wood nailer. Size as required to suit roof opening and fan base.
 - a. Configuration: Built-in cant and mounting flange.
 - b. Overall Height: 12".
 - c. Hinged Subbase: Galvanized steel hinged construction to permit service and maintenance.

2.3 MOTORS

- A. Refer to Division 15, Section 15055 – HVAC Electrical Equipment and Wiring Requirements, for general requirements for factory installed motors.
- B. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.
- C. Enclosure Type: The following features are required as indicated:
 1. Open drip-proof motors where satisfactorily housed or remotely located during operation.

2.4 SOURCE QUALITY CONTROL

- A. Testing Requirements: The following factory tests are required as indicated:
 1. Sound Power Level Ratings: Comply with AMCA 301, 'Methods for Calculating Fan Sound Ratings from Laboratory Test Data'. Test fans according to AMCA 300, 'Reverberant Room Method for Sound Testing of Fans'. Label fans with the AMCA seal.
 2. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, 'Laboratory Methods of Testing Fans for Rating'.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements of installation tolerances and other conditions affecting performance of the power ventilators. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install power ventilators according to manufacturer's written instructions.

- B. Install units with clearances for service and maintenance.

3.3 CONNECTIONS

- A. Duct installation and connection requirements are specified in Division 15 sections. Drawings indicate the general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.
- B. Install ducts to power ventilators to allow service and maintenance.
- C. Electrical: Conform to applicable requirements in Division 16 sections.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Installation Instructions: Strictly observe manufacturer's installation instructions regarding field assembly of components and installation of fans, including duct and electrical connections.

3.5 COMMISSIONING

- A. Final Checks Before Start-Up: Perform the following operations and checks before start-up:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and those connections for ducts, conduit and electrical components are complete. Verify that proper thermal overload protection is installed in motors, starters, and disconnects.
 - 3. Perform cleaning and adjusting specified in this section.
 - 4. Verify that manual and automatic volume control dampers in connected ductwork systems are in the fully open position.
- B. Starting procedures for fans are as follows:
 - 1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicate rpm.
 - 2. Measure and record motor voltage and amperage.
- C. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are complete.

3.6 BALANCING

- A. Balancing shall be accomplished with a flow hood and with the adjustment of register dampers and speed control of the exhaust fan.

3.7 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Lubricate bearings if required.

END OF SECTION

SECTION 15890

DUCTWORK, ACCESSORIES AND SHEETMETAL SPECIALTIES

PART 1 GENERAL

1.1 STIPULATIONS

- A. The "General Conditions of Contract" and "General Requirements" shall be incorporated into this section by reference.
- B. The specification Section 15040 – BASIC MATERIALS AND METHODS forms a part of this section and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This section include rectangular, round metal ducts and plenums for heating, ventilating and air conditioning systems in pressure classes from -2" to +2" w.g.
- B. Related sections include the following:
 - 1. Division 15 – Section 15936 – Air Inlets and Outlets.

1.3 SYSTEM DESCRIPTION

- A. Duct system design, as indicated, has been used to select the size air moving and distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by the Department. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 SUBMITTALS

- A. Product Data: For sealing materials.
- B. Shop Drawings: Show details of the following:
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components and attachments to other work.
 - 2. Duct layout indicating pressure classifications and sizes on plans.
 - 3. Fittings.
 - 4. Reinforcement and spacing.
 - 5. Seam and joint construction.
 - 6. Penetrations through fire rated and other partitions.

- 7. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.
- C. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver sealant and fire stopping materials to site in original containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.

PART 2 PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Galvanized, Sheet Steel: Lock forming quality; ASTM A 653/A 653M, G90 (Z 275) coating designation.
- B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts.
- C. Tie Rods: Galvanized steel, 1/4" minimum diameter for 36" length or less; 3/8" minimum diameter for lengths longer than 36".

2.2 SEALANT MATERIALS

- A. Joint and Seam Sealants, General: The term 'sealant' is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open weave fabric strips and mastics.
 - 1. Joint and Seam Sealant: 1-part, non-sag, solvent release curing, polymerized butyl sealant, formulated with a minimum of 75% solids.
 - 2. Flanged Joint Mastics: 1-part, acid curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.3 HANGERS AND SUPPORTS

- A. Building Attachments: Masonry or structural steel fasteners appropriate for building materials. Powder actuated fasteners are prohibited.
- B. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.
 - 1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all thread rod or galvanized rods with threads painted after installation.

- 2. Straps and Rod Sizes: Comply with SMACNA's 'HVAC Duct Construction Standards – Metal and Flexible' for sheet steel width and thickness and for steel rod diameters.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Galvanized steel shapes and plates complying with ASTM A 36/A 36M.

2.4 RECTANGULAR DUCT FABRICATION

- A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA's 'HVAC Duct Construction Standards – Metal and Flexible'. Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
 - 1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
 - 2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
- B. Static Pressure Classifications: Unless otherwise indicated, construct ducts to the following:
 - 1. Supply, Return and Exhaust Air Ducts: 2" w.g., negative pressure.
- C. Cross Breaking or Cross Beading: Cross break or cross bead duct sizes 19" and larger and 0.0359" thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.

2.5 Duct Wrap Insulation

- A. Furnish and install best grade insulation for all sheet metal work as specified herein or as may be necessary for properly insulated heating, ventilating and air conditioning systems. Covering shall not be applied until all piping and equipment has been tested and cleaned.
- B. All ductwork insulation shall be as manufactured by Owens-Corning, or accepted equal as manufactured by Certain-Teed, Manville Products and Knauf. For purposes of setting a standard of quality and thermal efficiency the insulation materials mentioned hereinafter are as manufactured by Owens-Corning. Insulations, adhesives and mastics of equal performance by other manufacturers are acceptable.
- C. Duct insulation shall be Owens-Corning Fiberglass Commercial Grade Faced Duct Wrap Insulation, with 2" taping flange and vapor barrier laminate for exposed and concealed ductwork operating at temperatures from +40°F to +250°F. Jacket shall have a water vapor permeance of not more than .02 Perms.
- D. Insulation shall be installed on all supply, return and exhaust ductwork. Insulation thickness shall be 2 inches. Thermal conductivity of insulation shall be a minimum of 0.27 BTU in/hr. ft²-F at 75°F mean temperature. No insulation shall be installed over ductwork until the duct has been pressure tested as previously specified.

PART 3 EXECUTION

3.1 DUCT INSTALLATION, GENERAL

- A. Install ducts with fewest possible joints.
- B. Install fabricated fittings for changes in directions, changes in size and shape, and connections.
- C. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.
- D. Coordinate layout with suspended ceiling, fire control dampers, lighting layouts, and similar finished work.
- E. Non-Fire Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four (4) sides by at least 1-1/2".
- F. Fire Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke dampers, firestopping materials and installation methods are specified in Division 15, Section 15820, Duct Accessories.

3.2 SEAM AND JOINT SEALING

- A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's 'HVAC Duct Construction Standards – Metal and Flexible'.
- B. Pressure Classification Less Than 2" w.g.: Transverse joints.
- C. Seal externally insulated ducts before insulation installation.

3.3 HANGING AND SUPPORTING

- A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA's 'HVAC Duct Construction Standards – Metal and Flexible'.
- B. Support horizontal ducts within 24" of each elbow and within 48" of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16' and at each floor.

3.4 FIELD QUALITY CONTROL

- A. Duct Leakage Test: If the Department determines that excessive duct leakage may occur, the Department shall direct the HVAC Contractor (.2) to conduct a duct leakage test of a section or sections of ductwork in accordance with SMACNA Standards. This test shall be performed without additional cost to the Commonwealth.

- B. Maximum Allowance Leakage: Comply with requirements for Leakage Classification 3 for round and flat oval ducts, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2" w.g. (both positive and negative pressures).
- C. Remake leaking joints and retest until leakage is less than maximum allowable. Tests and required repairs shall be completed prior to concealment of ducts.
- D. Leakage Test: Perform tests according to SMACNA's 'HVAC Air Duct Leakage Test Manual'.

3.5 ADJUSTING

- A. Adjust volume control dampers in ducts, outlets, and inlets to achieve design airflow.

3.6 DUCT WRAP INSULATION

- A. Do not use staples for securing any insulation.
- B. Apply insulation only on clean, dry surfaces.
- C. Continue insulation through wall and ceiling openings and sleeves, except terminate duct insulation at fire dampers and at flexible duct connections at air handling units.
- D. Verify that ductwork has been tested before applying insulation materials.

3.7 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect the system.

END OF SECTION

SECTION 15936

AIR INLETS AND OUTLETS

PART 1 GENERAL

1.1 STIPULATIONS

- A. The specification section "General Conditions of Contract" and "General Requirements" form a part of this section and shall have the same force and effect as if printed herewith in full.
- B. The specification Section 15040 – HVAC General forms a part of this section and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This section includes

- 1. Grilles
- 2. Registers

- B. Related sections include the following:

- 1. Division 15 – Section 15890 – Ductwork, Accessories and Sheetmetal Specialties.

1.3 DEFINITIONS

- A. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling or floor. No Damper
- B. Register: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling or floor. Has a Damper

1.4 SUBMITTALS

- A. Product Data: For each model indicated, include the following:

- 1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish and mounting details.
- 2. Performance Data: Include throw and drop, static pressure drop, and noise ratings for each type of air outlet and inlet.
- 3. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

- B. Color Selection: White.

1.5 QUALITY ASSURANCE

- A. Product Options: Drawings and schedules indicate specific requirements of grilles and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to General Conditions, Sections 15.21 and 15.22.
- B. NFPA Compliance: Install grilles and registers according to NFPA 90A, 'Standard for the Installation of Air Conditioning and Ventilating Systems'.

PART 2 PRODUCTS

2.1 DIFFUSERS, REGISTERS AND GRILLES

A. MANUFACTURED UNITS

- 1. Registers and grilles specified here are scheduled on the drawings.
- 2. Subject to compliance with requirements, manufacturers of products specified here that may be incorporated into the work include, but are not limited to the following:
 - a. Price
 - b. Anemostat Products
 - c. Or approved equal.

B. SOURCE QUALITY CONTROL

- 1. Testing: Test performance according to ASHRAE 70, 'Method of Testing for Rating the Performance of Air Outlets and Inlets'.

C. EXHAUST AIR REGISTERS (ER)

- 1. Exhaust air registers shall be lightweight extruded aluminum construction furnished with 0.055" thick flat borders for standard surface mounted installation. Registers shall have cores of 0.025" thick aluminum cells with 1/2" x 1/2" x 1/2" grid core dimensions. Free area of the grid shall be 90%. Registers shall be furnished with a temperature set white finish.
- 2. Exhaust air registers shall be furnished with an opposed blade volume control damper operable from the face of the register. Registers shall be tested and rated in accordance with the Air Diffusion Council (ADC) and shall be of the sizes and capacities noted on the plans.
- 3. Exhaust air registers shall be Model GC50 as manufactured by Anemostat Products Division or approved equal.

D. TRANSFER AIR GRILLE (TG)

1. Relief air grilles shall be lightweight extruded aluminum construction furnished with 0.055" thick flat borders for standard surface mounted installation. Grilles shall have cores of 0.025" thick aluminum cells with 1/2" x 1/2" x 1/2" grid core dimensions. Free area of the grid shall be 90%. Grilles shall be furnished with a temperature set white finish.
2. Relief air grilles shall be Model GC5L as manufactured by Anemostat Products Division or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas where grilles and registers are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Examine wall construction materials and opening for compliance with installation requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install grilles and registers level and plumb, according to manufacturer's written instructions, coordination drawings, original design, and referenced standards.
- B. Ceiling Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify the professional for a determination of final location.
- C. Install grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 BALANCING

- A. Balancing shall be accomplished with a flow hood and with the adjustment of register dampers and speed control of the exhaust fan.

3.4 CLEANING

- A. After installation of grilles and registers, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt and smudges. Replace grilles that have damaged finishes.

END OF SECTION

CONTRACT

FOR

PLUMBING CONSTRUCTION

XXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXX COUNTY, PENNSYLVANIA

CONTRACT NO. D.G.S. A XXXXXX.3

DIVISION 15 - PLUMBING

SECTION 15040

BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.1 STIPULATION

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This section covers all items specified or illustrated on the project drawings under the Plumbing contract and every part herein is binding upon the Plumbing (.3) Contractor.
- B. Those responsible for work covered by other sections of the specifications will be indicated by read, such as 'Others', 'HVAC Contractor', 'Electrical Contractor', or 'General Contractor'. All items not so indicated shall be the responsibility of this Contractor.
- C. The work shown is intended to include a complete and proper plumbing as shown on plans and as specified herein. All labor, equipment, materials, and accessories for a complete and proper installation as hereinafter specified, or as shown on drawings, or as may be required for a proper system shall be furnished under this Contract.

1.3 GENERAL

- A. The Contractor shall comply with all laws, ordinances, or regulations of all authorities having jurisdiction, either borough, city, county, state or public utility.
- B. The Contractor shall obtain all licenses, permits and inspections required by authorities and shall pay all fees and charges related to regulatory authorities and utilities.
- C. Nothing contained in these specifications or shown on the drawings shall be construed to be in conflict with any state or local codes, ordinances or regulations governing the installation of the class of work specified herein.
- D. The minimum standard of work under this contract shall be as required by the Commonwealth of Pennsylvania, Department of Labor and Industry, and the Department of General Services and shall be in accordance with the current edition, with local amendments, of the following model building codes:
 - 1. International Building Code

2. NFPA - National Fire Protection Association

- E. All laws, ordinances, rules, codes and regulations, including those of the Department of Environmental Protection, Department of Public Welfare, Department of Labor and Industry, the National Fire Protection
- F. All materials must be installed by skilled mechanics in accordance with best practices of the industry.
- G. THIS CONTRACTOR MUST CONFER AND COORDINATE ITS WORK WITH THAT OF ALL THE OTHER CONTRACTORS SO THAT THE WORK OF ALL THE TRADES WILL BE PERFORMED IN AN ORDERLY MANNER AND WITH THE LEAST POSSIBLE INTERFERENCE. IN CASE INTERFERENCE WITH THE WORK OF OTHER CONTRACTORS SHOULD OCCUR, THE DECISION OF THE DEPARTMENT OF GENERAL SERVICES CONSTRUCTION REPRESENTATIVES AS TO CHANGES TO BE MADE IN THE WORK SHALL BE FINAL.

1.4 REFERENCES

- A. The publications listed below form a part of this specifications to the extent referenced. All publications shall be the latest edition as adopted by the authority having jurisdiction. The publications are referred to in the text by basic designation only.

1. American National Standards Institute (ANSI)

- a. ANSI A 21.51 Ductile-Iron Pipe
- b. ANSI B16.4 Cast Iron Screwed Fittings
- c. ANSI B.12 Cast Iron Drainage Fittings, Threaded
- d. ANSI B16.15 Pipe Fittings, Bronze, and 250 lb. Cast
- e. ANSI B16.18 Cast Copper Alloy Solder-Joint Pressure Fittings
- f. ANSI B16.22 Solder-Joint Fittings, Pressure Wrought Copper and Copper Alloy
- g. ANSI B16.23 Cast Copper Alloy Solder-Joint Drainage Fittings
- h. ANSI B16.24 Bronze Pipe Flanges and Flanged Fittings
- i. ANSI B16.29 Solder-Join fittings, Drainage, DWV Wrought
- j. ANSI B31.1 Copper and Copper Alloy
- k. ANSI S1.32 Precision Methods for the Determination of Sound Power Levels of Discrete-Frequency and Narrow-Band Noise Sources in Reverberation Rooms

2. American Society of Heating Refrigeration (ASHRAE) and Air Conditioning Engineers
 - a. ASHRAE 90A
 - b. ASHRAE 68
3. American Society of Mechanical Engineers (ASME)
 - a. ASME B16.18 Cast Copper Alloy Solder Joint Pressure Fittings
 - b. ASME B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
 - c. ASME B16.26 Cast Copper Alloy Fittings for Flared Copper Tubes
 - d. ASME B16.39 Malleable Iron Threaded Pipe Unions (Class 150, 250, and 300)
 - e. ASME B40.1 Gauges - Pressure Indicating Dial Type - Elastic Element
4. American Society of Testing and Materials (ASTM)
 - a. ASTM A 74 Cast Iron Soil Pipe and Fittings Hub and Spigot
 - b. ASTM B88 Seamless Copper Water Tube
 - c. ASTM B306 Copper Tube, Drainage DWV
 - d. ASTM C-12 PVC Pipe – Schedule 40
 - e. ASTM D1785 Pipe Fittings, PVC, Schedule 40
 - f. ASTM D1557 Method D and ASTM D1556 Sand Cone Method
5. Cast Iron Soil Pipe Institute (CISPI)
 - a. CISPI301 Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems
6. Compressed Gas Association (CGA)
 - a. Pamphlet P-2.1
7. Manufacturer's Standardization Society (MSS)
 - a. MSS-SP-72 Unions, Brass or Bronze, 250 pounds

8. National Fire Protection Association (NFPA)
 - a. NFPA 70 National Electrical Code
 - b. NFPA 99 Health Care Facilities
 - c. NFPA 101 Section 18
9. Plumbing Draining Institute (PDI)
 - a. PDI WH 201 Shock Absorbers
10. Underwriter's Laboratories, Inc. (UL)
 - a. UL58-1976

1.5 DRAWINGS AND SPECIFICATIONS

- A. The drawings are generally diagrammatic and indicative of the work to be performed. However, it is not intended that they show every duct or pipe fitting or appurtenance required for a complete installation. Exact locations of equipment and points of termination shall be approved by the Department. Should it be found that any system or equipment would provide unsuitable service or cannot be properly installed as shown on the drawings, the Department shall be consulted before installing or making changes to the layout.
- B. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. This Contractor shall carefully examine the Heating, Ventilating and Air Conditioning, Plumbing, Electrical, and other Project Documents that would affect the work to be performed and shall arrange such work accordingly, furnishing required offsets, fittings, and accessories to meet such conditions. If any discrepancies occur between the drawings or between the drawings and specifications, report such discrepancies to the Department in writing and obtain written instructions as to the manner in which to proceed. No departures from the Project Documents shall be made without prior written acceptance of the Department.
- C. The drawings and specifications are intended to function as a common set of documents. Anything shown on the drawings but not in the specifications, or mentioned in the specifications and not shown on the drawings, shall be equally binding as if both noted on the drawings and called for the specifications.
- D. The drawings must be followed as closely as circumstances will permit. However, the Plumbing Contractor will be held responsible for the proper installation of all materials and equipment required for a complete installation within the intent and meaning of the Contract Documents.
- E. The Plumbing Contractor must thoroughly familiarize itself with the specifications so that it clearly understands its responsibility in relationship to the work to be performed under this Plumbing Contract. The Contractor must perform the plan its work so as to permit the use of the building at the earliest possible date.

- F. No measurement of a drawing by scale shall be used as a working measurement. Working measurements shall be taken from actual site dimensions.

1.6 DEFINITIONS

- A. The term “Agency” or “Using Agency” refers to the Commonwealth of Pennsylvania Department of Public Welfare.
- B. The term “Commonwealth” means the Commonwealth of Pennsylvania.
- C. The term “Contractor” or “this Contractor”, refers to the Plumbing Contractor or any of its subcontractors, sub-subcontractors, materials persons, company(ies), corporation(s), partnership(s), sole proprietorships and others, et al, responsible for work described in this specification and/or on the project drawings.
- D. The term “Department” refers to the authorized representative of the Commonwealth of Pennsylvania Department of General Services.
- E. The term “drawings” refers to the drawings which show the character and scope of the work to be performed and which are prepared by the Engineer, referred to in the Contract Documents, and enumerated in the Supplemental General Conditions.
- F. “Finished Area” shall be defined as any space with the wall either tiled, plastered, covered or painted except certain concrete or concrete block foundation walls below grade. Vertical piping running through finished areas must be run in chases. Where there are ceilings in finished areas, all piping and conduit shall be concealed above the ceilings unless indicated “at ceiling” in which case piping shall be exposed below ceilings. Areas shall be considered finished areas where bottoms of floor or roof slabs service as finished ceilings.
- G. The term “furnish”, when used separately, shall mean to “obtain and deliver on the job, for installation by the indicated Trade Contractor”.
- H. The terms “he, him, his, she, her, her’s, it or its” is a reference to a person or business with no gender intended.
- I. The term “install”, when used separately, shall mean to “install in full operating condition equipment supplied to the Plumbing Contractor by other Trade Contractors”.
- J. The term “project documents” refers to the General Conditions, Supplemental General Conditions, Contract, Technical Specifications, Standard Drawings, Drawings, and any and all other components enumerated in the “General Conditions”, “Special Requirements” and/or bound herein.
- K. The term “provide” shall mean to “furnish and install”.
- L. “Unfinished areas” shall be defined as any space without a wall finish (with or without ceilings).

1. Where in doubt as to the classification of a specific space, the Plumbing Contractor shall obtain written direction from the Department before roughing-in.

PART 2 PRODUCTS

2.1 MATERIALS, EQUIPMENT AND WORKMANSHIP

A. General

1. All details of the installation shall be mechanically and electrically correct, and shall operate without objectionable noise or vibration.
2. Where applicable, all materials and equipment shall bear the label of approval of Underwriters Laboratories, Inc.

B. Materials and Equipment

1. All materials and equipment furnished under this contract shall be new, American made and shall conform to the grade, quality and standards specified herein. Major items of equipment shall be the latest and standard product, as advertised in printed catalogs by reputable manufacturers for the purpose intended and shall have replacement parts readily available.
2. All equipment or apparatus of any one system must be the product of one manufacturer, or equivalent products of a number of manufacturers which are suitable for use in a unified or assembled system. All equipment shall be installed according to the manufacturer's recommendations.
3. Mechanical fastenings used throughout on the equipment or parts subject to wear and replacement shall be of a type capable of removal and replacement without physical deformation of the equipment.

C. Workmanship

1. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, adjusted, cleaned, and conditioned, in accordance with the manufacturer's directions, unless hereinafter specified otherwise. The Plumbing Contractor shall be responsible for obtaining such instructions from the suppliers.
2. Equipment shall be installed in strict accordance with the manufacturer's written instructions for type and capacity of each piece of equipment. The Plumbing Contractor shall obtain these instructions from the manufacturer and such instructions shall be considered a part of these specifications. Type, capacity and application of equipment shall be suitable and capable of satisfactory operation for the purpose intended in the Plumbing System.

2.2 TRADE NAME REFERENCES

- A. Materials and equipment are described and listed in this specification by trade name, manufacturer's type, or catalog number. It is intended that this reference shall establish standards of quality, performance, capacity, materials and design for the item specified.

- B. Where more than one manufacturer is listed for an item, those mentioned are considered equivalent provided that the quality, style, capacities, materials and performance of the specified item are present. All materials shall be subject to the review of the Department.
- C. All materials considered for this project, including all equipment and components thereof, shall comply with **ACT 3 OF 1978 – PROVISION FOR USE OF STEEL AND STEEL PRODUCTS (AS AMENDED TO INCLUDE CAST IRON)**.

2.3 GUARANTEE

- A. The Plumbing Contractor shall guarantee the workmanship, materials and equipment against defects, leaks or non-operation for a period of one (1) year from date of acceptance by the Department. Defective workmanship shall be construed as meaning defective materials or unsatisfactory installation and not to mean ordinary wear and tear.
- B. The Plumbing Contractor shall pay for any repairs or replacements caused by defective workmanship as construed herein within the period covered by the Guarantee.

PART 3 EXECUTION

3.1 GENERAL

- A. The Plumbing Contractor shall install all equipment in accordance with manufacturer's written instructions, all applicable codes, and recognized industry practices.
- B. All equipment, valves, strainers and accessories requiring maintenance shall be installed so as to preserve adequate space for such service.
- C. After all equipment is installed, it shall be tested to demonstrate proper operations or performance and compliance with the specifications. Equipment not operating correctly shall be field corrected or replaced.

3.2 FAMILIARITY WITH CONTRACT REQUIREMENTS

- A. The Plumbing Contractor's responsibility, prior to submitting its bid on this Project, is to satisfy itself as to the nature and location of the work, the existing conditions, and the quality and quantity of the materials, which will be required, under the Plumbing Contract.
- B. Failure to make an on-site inspection prior to submitting a bid, or failure to comply with any or all of the requirements herein will not relieve the Plumbing Contractor from the responsibilities of properly estimating the requirements of the work nor from the responsibility for the performance of the provisions of the Plumbing Contract.

3.3 PERMITS, TEST, AND INSPECTION

- A. The Plumbing Contractor shall be responsible to obtain and pay for all permits, pay all deposits and fees necessary for the installation, tests and inspection of all work provided under this specification. These tests shall be conducted as required by the regulations of the local and/or state authorities, having jurisdiction.

3.4 LOCATIONS

- A. The Plumbing Contractor shall apply for detailed and specific information regarding the location and size of all equipment, piping, ducts and accessories as the final or required location and size may differ from that indicated on the drawings. Any material or equipment improperly placed because of the Contractor's failure to obtain this information shall be relocated and reinstalled without additional expense to the Department.

3.5 AS BUILT DRAWINGS

- A. The Contractor shall keep a record of construction changes and deviations from the original Contract Drawings. All changes shall be recorded on a separate set of prints which shall be kept at the job site specifically for that purpose. The record shall be made immediately after the work is completed. Documentation shall include:
 - 1. Location and elevation of new and existing utility lines
 - 2. Points of connection to existing utility lines
 - 3. Changes in pipe routing location
 - 4. Valve locations
 - 5. Equipment locations, etc.
- B. The marked-up record set of drawings shall be delivered to the Professional before final acceptance of the Plumbing Contract work.

3.6 FIELD MEASUREMENTS

- A. It shall be the Plumbing Contractor's responsibility to verify the location of any and all existing underground utilities in the vicinity of its work. When it has been indicated that these utilities are to remain in place the Plumbing Contractor shall provide adequate means of support and protection during excavation operations.
- B. Before ordering any equipment and material, or performing any work, the Plumbing Contractor shall verify all measurements and dimensions at the job site and shall be held responsible for the correctness of same.
- C. No extra compensation will be allowed on account of differences between actual dimensions and measurements and those indicated on the drawings.
- D. Any difference which may be found shall be submitted to the Professional for consideration before proceeding with the work.

3.7 PROTECTION OF SERVICES AND EQUIPMENT

- A. The Plumbing Contractor, at its own expense, shall repair, replace and maintain in service any utilities, facilities or services (underground, above ground, interior or exterior) damaged, broken, or otherwise rendered inoperative due to its construction activities. The method used in repairing, replacing or maintaining the services shall be approved by the Professional.

- B. The Plumbing Contractor shall protect, at its own expense, such of its work, materials or equipment that is subject to damage during the project duration. All openings into any piping, ducts or equipment must be securely covered, or otherwise protected, to prevent injury due to carelessly or maliciously dropped tools or materials, grit, dirt, or any foreign material. The Plumbing Contractor shall be held responsible for all damage so done until its work is fully and finally accepted.
- C. It shall be the responsibility of the Plumbing Contractor to protect its equipment, and all similar items from dirt, grime, plaster, water, etc., during all phases of construction. This protection shall be provided by covering equipment with transparent plastic sheeting and/or locating the materials and equipment in an area free from the elements.

3.8 INTERRUPTION OF SERVICES

- A. The Plumbing Contractor shall schedule its work to avoid any major interruption of any utility services.
- B. Existing utilities serving facilities occupied and used by the Using Agency or others shall not be interrupted except when such interruptions have been authorized in writing by the Using Agency and the Department. Interruptions shall occur only after acceptable temporary utility services have been provided. The Plumbing Contractor shall provide a minimum of five (5) working days notice to the Using Agency and the Department and receive written notice to proceed before interrupting any utility.

3.9 CLEANUP

- A. The Plumbing Contractor shall maintain buildings, grounds and public properties free from accumulations of waste materials, debris and rubbish. At reasonable intervals during the progress of work, and when directed by the Department, the site and public properties shall be cleaned and waste materials, debris and rubbish shall be disposed of in an appropriate manner. The Plumbing Contractor shall provide containers for collection of waste materials, debris and rubbish. Waste materials, debris and rubbish shall be removed from the job site and legally disposed of at a landfill area in accordance with all applicable regulations. Burning or burying waste materials, debris or rubbish on project site shall not be permitted.
- B. At the completion of the project, remove waste materials, rubbish, tools, equipment, machinery, surplus materials, etc., and clean all sight-exposed plumbing fixtures and equipment. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed plumbing fixtures and equipment. Broom clean paved and concrete surfaces; rake clean other ground surfaces. Repair, patch and touch up marred surfaces to specified finish or to match adjacent surfaces.

3.10 SUBMITTALS

- A. Submittals shall be in accordance with Division 1, Section 01300.

3.11 ELECTRICAL EQUIPMENT

- A. The Plumbing Contractor shall furnish all motors, combination starters/disconnects, overload protection and controls for equipment required to provide complete and workable systems, unless noted otherwise.
- B. All motors, motor control equipment and wiring shall meet the requirements of the National Electrical Code, and shall comply with the requirements of the utility furnishing service and with the rules and regulations of all authorities having jurisdiction.
- C. The Contractor shall verify electrical characteristics at the site before ordering electrical equipment.
- D. Motors under one-half (1/2) horsepower shall be single phase. Motors one-half (1/2) horsepower and over shall be polyphase. Combination motor starters shall be the fused disconnect type, minimum NEMA size 1 with three (3) thermal overload relays of the proper size to protect the motor in a NEMA 1 enclosure.

3.12 CONTROL WIRING

- A. The Plumbing Contractor shall provide all necessary control wiring and related conduit required for complete and workable systems.
- B. All conduit and wiring shall be in accordance with the latest edition of the National Electrical Code. Installation of control wiring shall be performed in a neat and first class manner by competent mechanics as specified in Division 16, Electrical Construction.
- C. Control circuits shall be wired for low voltage control, using fused individual control transformers. Circuits shall be fused and shall be interrupted when the disconnect device is opened.

3.13 CONCRETE

- A. Reinforcing shall conform to ASTM A-615, Grade 60. Concrete shall comply with PennDOT Form 408 Section 704. Concrete shall be obtained from a PennDOT and Bureau approved source.
- B. All concrete shall be PennDOT Class 'A' of minimum 3300 pounds per square inch (psi) strength in twenty-eight (28) days. All concrete shall be mixed by machine. No wet or moistened mixture containing cement shall remain unplaced for a period exceeding thirty (30) minutes and shall not be used after its initial set. Retempering after initial set is prohibited. Exposed surfaces shall be protected from drying for at least seven (7) days. All forms shall be built true and rigid. Form removal shall not injure the concrete.
- C. All concrete is to be finished with a hard, smooth troweled finish and is to be faced smooth with rounded corners.

3.14 INSPECTION AND TESTING

A. General

1. New plumbing systems and parts of existing systems which have been altered, extended or repaired shall be tested to disclose leaks and defects.
2. The Plumbing Contractor shall notify the Department a minimum of five (5) working days prior to testing to coordinate the testing and inspection procedures.
3. If the Department determines that the plumbing systems do not pass the prescribed tests, then the Plumbing Contractor shall be required to make the necessary repairs, at its own expense, and the Plumbing Contractor shall re-inspect and re-test the systems. Repairing, inspection and testing shall be continued until all systems pass as determined by the Department.
4. All new, altered, extended or replaced plumbing shall be left uncovered and unconcealed until it has been inspected, tested and accepted by the Department. Where such work has been covered or concealed before it has been inspected, tested and accepted, it shall be uncovered by the Plumbing Contractor, at its own expense as directed by the Department.
5. All equipment, material, labor, and services required for testing the plumbing systems shall be furnished by the Plumbing Contractor.

B. Sanitary, Vent, and Rainwater Collection Systems

1. Rough Plumbing: Systems shall be tested upon completion of the rough piping installation and proved watertight. The water test shall be applied to the system either in its entirety or in sections after rough piping has been installed.
 - a. Where applied to the entire system, all openings in the piping shall be closed, except the highest opening, and the system filled with water to point of overflow.
 - b. Where the system is tested in sections, each opening shall be plugged, except the highest opening of the section under test, and each section shall be filled with water. A section shall not be tested with less than a ten (10) foot head of water.
 - c. In testing successive sections, at least the upper ten (10) feet of the next preceding section shall be tested, such that a joint or pipe in the building, except the uppermost ten (10) feet of the system, shall not have been subjected to a test of less than ten (10) foot head of water.
 - d. The water shall be kept in the system or in the portion under test for a minimum of two (2) hours before inspection starts. The system shall then be inspected to ensure that it is tight at all points.

2. Finished Plumbing: After the plumbing fixtures have been set and their traps filled with water, the plumbing fixture connections shall be tested and proved gas and water tight.
 - a. A smoke test shall be made by filling all traps with water and then introducing into the system smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, the stack openings shall be closed and a pressure equivalent to a one (1) inch water column shall be introduced and maintained for the period of the inspection.
 - b. Where the Department determines that a smoke test shall not be performed, a peppermint test shall be performed. Two (2) ounces of oil of peppermint shall be poured into the roof terminal of every line or stack to be tested. The oil of peppermint shall be followed at once by ten (10) quarts of hot (140-degrees F) water. All roof vent terminals shall then be sealed. The system shall then be inspected for the detection of odor of peppermint. If odor of peppermint is detected, repairs shall be made and the system shall be retested.

C. Domestic Water Systems

1. The system shall be tested either in its entirety or in sections.
2. The system shall be tested and proved tight under a water pressure of 125 pounds per square inch for a period of two (2) hours.
3. Potable water shall be used for testing.

3.15 STERILIZATION OF THE DOMESTIC WATER SYSTEM

- A. After the system has been tested and approved, the entire new system, including valves and accessories, shall be chlorinated. Disinfections to be in accordance with AWWA C651.
- B. Chlorine may be applied in any of the following forms:
 1. Liquid chlorine gas-water mixture
 - a. Chlorine gas-water mixture shall be applied by a solution feed chlorinating device.
 2. Direct chlorine gas feed
 - a. Chlorine gas shall be fed directly from a chlorine cylinder with a suitable device for regulating the rate of flow and the effective diffusion of gas within the line.
 3. Calcium hypochlorite and water mixture
 4. Calcium hypochlorite shall be HTH, Perchlorene and Maxochlor, or accepted substitute. A solution consisting of five (5) percent powder to ninety-five (95) percent water by weight shall be prepared. The calcium hypochlorite and water mixture, first made into a paste and then thinned to a slurry, shall be injected or pumped into the system.

- C. Water shall be fed into the system with chlorine applied in amounts to produce a dosage of forty (40) to fifty (50) parts per million (ppm) and shall be retained in the line for a period of not less than eight (8) hours. A residual of not less than five (5) ppm shall be produced in all parts of the line. During the chlorination process all valves and accessories shall be operated.
- D. After the chlorination process, the chlorine shall be flushed from the system until the system water is equal chemically and bacteriological to those of the permanent source of water supply.
- E. Laboratory tests of the water shall be paid for by the Plumbing Contractor.

3.16 INSTRUCTION OF THE USING AGENCY'S PERSONNEL

- A. After acceptance of the work by the Department the Plumbing Contractor shall instruct the Using Agency personnel in the proper operation and maintenance of all equipment and appurtenances provided.
- B. The Plumbing Contractor shall provide two (2) weeks advance notice before the instruction session.

3.17 DEMOLITION

- A. The Plumbing Contractor shall disconnect and remove all plumbing equipment, materials, fixtures and existing services no longer required, unless noted otherwise. All exposed piping shall be removed and capped either below floors, in walls or above ceilings as may be required. All materials used for capping of existing services shall be fully compatible with existing piping materials and appropriate for the pressure involved.
- B. Removal shall include the removal of materials from the site and the proper disposal of such material, unless noted otherwise.
- C. Materials to be retained by the Using Agency shall be stored in a suitable location, as directed by the Department, clear of any access corridors and clear of all new work.
- D. All demolition shall be made in a neat, careful manner so as not to damage any surfaces or equipment to remain.
- E. Demolition of piping shall include the removal of existing hangers and similar items not to be reused. Demolition of equipment shall include the removal of anchors and similar items not to be reused.
- F. The Plumbing Contractor shall patch and finish all holes associated with the demolition work. All patching and finishing shall match existing adjacent undisturbed surfaces to the satisfaction of the Department.

3.18 CUTTING AND PATCHING

- A. Unless otherwise noted, the Plumbing Contractor shall cut, patch and finish all chases and openings required for the installation of its work. All patching and finishing shall match existing adjacent undisturbed surfaces.

- B. Cutting shall not cause damage to the building or leave unsightly surfaces. Where such unsightly conditions are caused by the Plumbing Contractor, it shall be required to repair these.
- C. The Plumbing Contractor shall contact the holder of the guarantee and obtain written approval before cutting the roofing membrane so as not to void the guarantee.
- D. No structural member shall be cut.
- E. Penetrations made in existing fire rated chases, partitions, floors, etc., shall be sealed with an approved material and method as required to maintain the integrity of the fire separation.
- F. All materials and methods to be used for patching and repairing shall be subject to the approval of the Department and the Using Agency.
- G. The Plumbing Contractor shall set all sleeves, hangers and anchors required for its work and shall be responsible for their proper and permanent location.
- H. No cutting shall be done which may affect the building structurally or architecturally without first securing the approval of the Department. Cutting shall be accomplished in such a manner as not to cause damage to the building or leave unsightly surfaces which cannot be concealed by plates, escutcheons or other construction. Where such unsightly conditions are caused, the Plumbing Contractor shall be required, at its own expense, to repair the damaged areas.
- I. Cutting of the construction excessively or carelessly done shall be repaired to match the original work and to the satisfaction of the Department who will make the final decision with respect to excessive or careless cutting work. The Plumbing Contractor shall seal all openings it has made in plenum spaces, fire rated floors, ceilings or partitions after its work has been installed. The material used for sealing the openings shall have a fire rating equal to or greater than the rating of the floor, ceiling or partition material.
- J. Where existing equipment is removed and unused openings remain in walls, floors, partitions, etc., the Plumbing Contractor shall properly patch all such openings. All patching and repairing shall be done by skilled mechanics and shall match existing or new finishes.
- K. Cutting, patching, and repairing of openings in the existing exterior walls and roof shall be by the Plumbing Contractor.

3.19 CHASES AND OPENINGS

- A. All chases and openings required for the installation of plumbing work shall be provided by the Plumbing Contractor. The Plumbing Contractor shall be responsible for all work required to cut and patch the required openings. The work shall be performed to the satisfaction of the Department and Using Agency.
- B. Penetrations made in fire rated chases, partitions, floors, etc., shall be sealed with an approved material and method as required to maintain the integrity of the fire separation.

- C. The Plumbing Contractor shall provide all sleeves, hangers, and anchors required for installation of the work in chases and openings.

3.20 PAINTING

- A. The Plumbing Contractor shall provide all materials, equipment, labor and services to perform painting for its work as follows:
 - 1. Paint all new supplementary supporting steel black.
 - 2. Paint all new exposed hangers, brackets and supports black.
 - 3. Paint all interior disturbed surfaces (walls, ceilings, floors, etc.); color as directed by the Using Agency.
- B. All items to be painted shall be provided with one (1) coat of primer and two (2) coats of finish paint. Colors shall be selected by the Using Agency. Iron primer paint shall be used on all metal work and exterior alkyd semi-gloss enamel paint shall be used on all work.
- C. All painting materials shall be as manufactured by Rustoleum, Sherwin Williams Company, or approved equal.

3.21 RELATED WORK

- A. All work related to providing complete plumbing systems and equipment shall be responsibility of the Plumbing Contractor. The following related work shall be provided as indicated:
 - 1. Using Agency:
 - a. Relocation of existing furniture and storage items.
 - 2. General (.1) Contractor:
 - a. Final painting of existing walls, floors and ceilings where the surfaces are being refinished and remodeled under the General (.1) Contract. Refer to the General Construction Drawings.
 - 3. Electrical Contractor:
 - a. Verification of the proper rotation of three (3) phase equipment, and making modifications as required to correct improper rotation.
 - b. Installation of all combination starters/disconnects and overload protectors.

3.22 SUPPLEMENTARY STRUCTURAL STEEL

- A. The Plumbing Contractor shall provide all necessary steel angles, channels, pipe, rods, nuts, bolts, and accessories as shown on plans, as specified, or as may be required for complete and proper installation of plumbing fixtures, systems and equipment. All material and workmanship shall be of the best quality and shall be installed in accordance with the best practices of the trade.

3.23 ACCESS DOORS

- A. The Plumbing Contractor shall provide access doors for installation in ceilings, walls, partitions and floors for access to valves, traps, fittings, and all appurtenances provided under the Plumbing Contract.
- B. Access panels shall be of sufficient size to permit removal or access to equipment, except that the minimum size shall be 12 inches by 16 inches.
- C. Access door locations shall be as determined by field conditions for optimum access to equipment, and shall be reviewed by the Department before final installation, and shall be subject to the following:
 - 1. Bottom of access doors shall not be lower than the top of the partition base, or a minimum of 6 inches above floor.
 - 2. Tops and/or sides of access panels shall be a minimum of 6 inches from the ceilings or opening or from the edge of a wall return.
 - 3. Access doors shall be suitable for installation in the finish material of the ceilings, walls, partitions and floors.
 - 4. Frame and panel access doors in restrooms, kitchens and as indicated shall be stainless steel.
- D. Access doors with UL Listing shall be provided in fire rated construction assemblies. Access doors shall be "B-Label" and shall have a UL one and one-half (1 ½) hour rating at 250 degrees F rating for both door and frame. Maximum size shall be 20" x 20" or 400 square inches in area. Frame shall be minimum sixteen (16) gauge steel, panel shall be minimum twenty (20) gauge steel. Access doors shall be provided with a baked-on enamel finish (prime coat), continuous type hinge on one side, flush-face type lock with key operation and self-latching cylinder locks.
- E. Access doors without UL label shall be provided in all non-rated construction assemblies: Frame shall be minimum sixteen (16) gauge steel, panel shall be minimum fourteen (14) gauge steel. Access doors shall be provided with a baked-on enamel finish (prime coat), concealed spring type hinges and flush-face type lock with key operation and self-latching cylinder locks. Door shall open 175 degrees (minimum).
- F. All access doors shall be keyed alike.

3.24 LEAD PROHIBITION

- A. All materials used on plumbing systems shall comply with the following lead prohibitions:
 - 1. Solder shall be lead free
 - 2. Brass and bronze shall contain no more than eight (8) percent lead.

END OF SECTION

SECTION 15100

PIPING MATERIAL, EQUIPMENT AND METHODS

PART 1 GENERAL

1.1 STIPULATIONS

- A. The "General Conditions of Contract" and "General Requirements" shall be incorporated into this section by reference.
- B. The specification Section 15040 - Basic Plumbing Materials And Methods forms a part of this section and shall have the same force and effect as if printed herewith in full.

PART 2 PRODUCTS

2.1 GENERAL

- A. Furnish and install pipe, fittings, valves and accessories as shown on plans and/or as specified herein.
- B. Fittings and Joints:
 - 1. All pipe and tube 2" and smaller shall have their final connections to apparatus made with threaded ground joint unions, unless otherwise specified, or noted on plans.
 - 2. The process known as "TEE DRILL" will not be an accepted method for the fitting and joining of tube.
- C. Piping: All piping shall follow the general arrangement shown and shall be accurately cut to measurements established from the work by the Contractor and shall be installed in place without springing or forcing. The location of all piping shall be such that a neat and first class installation shall be secured.
- D. Pipe and Fitting Materials:
 - 1. Domestic Water: All new above grade domestic water piping shall be Type 'L' hard copper tube conforming to ASTM B 88 with wrought copper fittings conforming to ASTM B 75 and ANSI B 16.22 or cast bronze fittings conforming to ASTM B 584 and ANSI B 16.78. Joints shall be assembled with lead free solder such as 'Bridgit' manufactured by Harris Company or approved equal.
 - 2. Sanitary DWV: All new above grade sanitary drain, waste and vent piping shall be at the Contractor's option, one or a combination of the following:
 - a. No hub cast iron (CINH) plain end pipe and fittings conforming to CISPI Standard 301 with standard neoprene no hub gasket couplings to CISPI Standard 310.

- b. Type DWV hard copper tube conforming to ASTM B 306 with cast bronze drainage fittings conforming to ANSI B 16.23 or wrought copper drainage fittings conforming to ANSI B 16.29. Joint shall be assembled with lead free solder such as 'Bridgit' manufactured by Harris Company or approved equal.
3. Heating Hot Water Supply and Return: All new above grade heating hot water supply and return piping shall be Type 'L' hard copper tube conforming to ASTM B 88 with wrought copper fittings conforming to ASTM B 75 and ANSI B 16.22 or cast bronze fittings conforming to ASTM B 584 and ANSI B 16.78. Joints shall be assembled with lead free solder such as 'Bridgit' manufactured by Harris Company or approved equal.

2.2 MATERIALS

A. General:

1. Where specification numbers are indicated, they shall include the latest amendment in effect at the date of this contract.
2. Each length of pipe and each pipe fitting, valve, etc., or device, used in this contract shall have stamped, cast or indelibly marked on it the maker's name or mark, the weight, type and class of product, when such marking is required by the approved standard that applies.

B. Unions:

1. 2" and smaller: Unions shall be provided adjacent to all equipment or wherever necessary to facilitate the removal of equipment for repair or replacement.
2. Unions shall be ground joint, brass body with brass seats, 150 lbs. working pressure.

C. Sleeves, Floor Plates and Penetration Seals:

1. All pipes passing through floors, walls and ceilings shall be provided with steel sleeves, and where exposed, shall have a chrome plated floor or ceiling plate securely fastened around each pipe as manufactured by Pipe Shields, Inc. or accepted equal.
2. Sleeves in bearing and masonry walls, floors and partitions shall be of standard weight steel pipe finished with smooth edges. For other than masonry partitions and through suspended ceilings, sleeves shall be No. 26 USG galvanized steel. All sleeves shall be properly installed and securely connected in place.
3. Each sleeve shall extend through its respective floor, wall or partition and shall be cut flush with each surface unless otherwise required. Sleeves in masonry construction shall be two (2) pipe sizes larger than the pipe when uncovered. Sleeves in other than masonry construction shall be of such size as to provide a minimum of 1/4 inch all around clearance between bare pipe and sleeves.
4. All pipes passing through exterior walls above grade shall be sealed water tight with a commercial grade sealer between sleeve and wall and between sleeve and pipe through the entire thickness of the wall.

5. All pipes passing through fire-rated separations shall be sealed around sleeve and pipe with Flameseal as manufactured by Nelson or equal as accepted to provide a vapor tight seal and a 2-hour UL listed firestop.

D. Pipe Hangers:

1. Hangers for pipe up to 6" in diameter shall be carbon steel, electro-galvanized ASTM - Type LS, UL listed, FM approved, Figure No. 65, as manufactured by ITT Grinnell Corporation, Penn Construction Industries, or Milwaukee.
2. On pipe over 4" in diameter use Clevis ring Figure 260 or as required for copper piping.
3. Pipe hangers supporting insulated pipe shall be ITT Grinnell Corporation No. 260 with insulation protection shield Figure 167.
4. Where two or more pipes run parallel the Contractor may use trapeze hangers made of 1-1/2" black steel pipe, ends capped. Hanger rods shall be 3/8" minimum for pipe sizes 1/2" to 1-1/4", 1/2" minimum for pipe sizes 1-1/2" to 3", 5/8" minimum for pipe 3-1/2" to 6", 7/8" minimum for pipe 8" to 12" and 1" for pipe 14" to 20".

2.3 VALVES

A. General:

1. The Plumbing Contractor shall furnish and install all valves shown on the drawings and specified. All valves are not shown in every instance on the drawings, but whether shown or not, all valves necessary for the proper operation of the system shall be furnished and installed by the Contractor. A valve shall be placed where each branch leaves the main and at such other points as required for the proper control and shut-off of all lines.
2. The working pressure, size and manufacturer's name shall be cast in raised letters on each valve body. Figure numbers are taken from the NIBCO catalog.
3. Valves shall be so placed that automatic valves, check valves and equipment may be entirely isolated for repairs while the system is in operation.
4. Valves offered under these specifications shall be limited to products of a type regularly produced and recommended by the manufacturer for the services intended and capacities required. All capacities, ratings and service recommendations shall be in accordance with the manufacturer's latest catalog and engineering data, or other literature made available by the manufacturer to the public and in effect at the time of opening the bids. Valves shall be as specified or approved equal.

B. Materials:

1. Shutoff Valves:

- a. Domestic Water: All shutoff valves 2-1/2" and larger for domestic water service shall be gate valves. All shutoff valves 2" and smaller for domestic water service shall be ball valves.

- (1). All ball valves shall be 2-piece bronze body rated 400 psi non-shock CWOG with teflon seats and seals, full port, chrome plated bronze ball and bronze stem, lever handle with threaded or solder ends. Ball valves shall be NIBCO T-FP-600 or S-FP-600 or approved equal.
 - b. Heating Hot Water Supply and Return: All shutoff valves 2" and smaller for heating hot water service shall be ball valves. All ball valves shall be 2-piece bronze body rated 150 psi saturated steam and 600 psi non-shock CWOG with reinforced teflon seats and seals, full port, stainless steel ball and stem, lever handle with solder or threaded ends. Ball valves shall be NIBCO Figure No. S/T-585-70-66 or approved equal.
2. Calibrated Balance Valves:
- a. Hot Water Supply and Return: All calibrated balance valves for hot water supply and return service shall be as follows:
 - (1). Valves shall be designed to allow installing Contractor to preset balance points for proportional system balance prior to system start-up in accordance with pre-set balance schedule. Valves shall be prevision machined ball type triple purpose balancing instrument precisely calibrated for use as a presettable balance valve, variable orifice flow meter and positive shutoff service valve.
 - b. All valves 1/2" to 3" pipe size shall be of bronze body brass ball construction with glass and carbon filled TFE seat rings. Valves shall have differential pressure readout ports across valve seat area. Readout ports shall be fitted with internal EPT insert and check valve. Valve bodies shall have 1/2" NPT tapped drain purge port. Valves shall have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves shall have calibrated name plate to assure specific valve settings. Valves shall be leaktight at full rated working pressure. Valves shall be constructed for a maximum working pressure of 300 psig and maximum operating temperature of 250oF and shall have NPT pipe connections. Calibrated balance valves shall be Circuit Setter Plus, Model CB as manufactured by ITT Bell and Gossett, or approved equal.

2.4 PIPING SYSTEM SPECIALTIES

- A. The Contractor shall provide various specialties for the piping systems. Specialties shall include the following:
 1. Drain valves in the piping system where indicated on the drawings and where required to properly drain the system and conform to good piping practice.
 2. Manual air vents in the piping system where indicated on the drawings and where required to properly vent the system and conform to good piping practice.
 3. Traps in drain piping to prevent air and gas infiltration.

2.5 PIPE INSULATION

A. General:

1. All pipe insulation shall be as manufactured by Owens-Corning, or accepted equal by Armstrong, Certain-Teed, Manville Products and Knauf. For purpose of setting a standard of quality and thermal efficiency the insulation materials mentioned hereinafter are manufactured by Owens-Corning, and adhesives and mastics by Foster Div. of H. B. Fuller. Insulation, adhesives and mastics of equal performance by other accepted manufacturers shall be acceptable.
2. Insulate all fittings and valves with the proper factory precut uni-fit fiberglass insulation inserts with factory premolded, one-piece PVC insulated fitting covers placed over the inserts for each fitting or valve. PVC fitting covers shall be manufactured by Foster, Zeston or approved equal.
3. Insulation shall be applied to clean dry surfaces.

B. Materials:

1. All insulation systems shall have composite surface burning characteristics of 25/50 for flame/smoke in accordance with ASTM E84, NFPA 255 and UL 723.
2. Insulation shall be one piece UL rated and labeled glass fiber pipe insulation system with a "k" factor of 0.24 at 75 degrees F. mean temperature.
3. Piping shall be insulated with the following thickness of insulation:

<u>Piping System</u>	<u>Thickness (Inches)</u>
Heating Hot Water Supply & Return	1-1/2
Domestic Water Piping	1

PART 3 EXECUTION

3.1 TESTING

- A. General: This work shall include the testing of all piping and apparatus in the system for leaks, faulty joints, improper connections, etc. This Contractor shall notify the Department in sufficient time so that it can be represented for all tests.

B. Piping Systems

1. All new piping shall be tested as hereinafter specified.
2. All equipment and apparatus necessary for tests shall be furnished by the Contractor. All defects disclosed by the tests shall be immediately rectified without additional cost to the Department.
3. During the period of tests, any leaks that are disclosed by the tests shall be made tight and all joints left free of all imperfections. All testing shall be repeated after any imperfections have been corrected.

4. Gauges, diaphragms, equipment and other apparatus that may be damaged by test pressure shall be removed before test pressures are applied.
5. The following piping systems shall be pressure tested for a period of four (4) hours as follows:

<u>Piping System</u>	<u>Test Pressure (psig)</u>
Domestic Water	100
Sanitary Sewer	10
Heating Hot Water Supply & Return	100

3.2 MATERIALS

A. Sleeves, Floor Plates and Penetration Seals

1. All pipes passing through floors, walls or ceilings, shall be provided with a steel sleeve and where exposed, shall have a chrome plated floor or ceiling plate securely fastened around pipe as manufactured by Pipe Shields, Inc.
2. Pipes passing through concrete or masonry walls or concrete floors shall be provided with pipe sleeves fitted and grouted into place. Sleeves shall not be installed in structural members except where indicated or approved. Each sleeve shall extend through its respective wall, floor, or roof, and shall be cut flush with each surface. Sleeves in masonry walls shall be two (2) pipe sizes larger than the pipe. Sleeves in non-masonry walls shall be of such size as to provide a minimum of 1/4 inch all around clearance between bare pipe and sleeves. Sleeves in masonry construction walls, concrete floors, and wet areas shall be standard weight steel pipe or cast iron pipe. Sleeves in non-masonry walls or ceilings may be steel pipe, cast iron pipe or galvanized sheet metal with lock-type longitudinal seam and of the metal thickness indicated. The annular space between pipe and sleeve shall be sealed with a commercial grade caulk. Pipes passing through exterior masonry walls shall be sleeved as specified above, and a commercial grade water-proof, non-shrink caulk suitable for outdoor applications shall be used to seal the annular space between the pipe and sleeve. Sleeves to be installed in exterior walls shall have a rust prohibiting coating applied before installation in the wall.
3. Pipes passing through roof or floor waterproofing membrane shall be installed through a pipe portal curb. Portal shall be suitably formed, and skirt or flange shall extend not less than 8 inches from the pipe and shall be set over the roof or floor membrane and sealed in a manner approved by the roof membrane manufacturer. The flashing sleeve shall extend up the pipe a minimum of 2 inches above highest flood level of the roof or a minimum of 10 inches above the floor. The annular space between the sleeve and the bare pipe shall be sealed.
4. Escutcheons shall be provided at all finished surfaces where exposed piping passes through floors, walls, or ceilings except in boiler, utility, or equipment rooms.

3.3 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

Pipe Size	Steel Pipe		Copper Tube	
	Spacing	Rod Size	Spacing	Rod Size
1/2"	5'-0"	3/8"	5'-0"	3/8"
3/4"	6'-0"	3/8"	6'-0"	3/8"
1	7'-0"	3/8"	6'-0"	3/8"
1-1/4"	8'-0"	3/8"	7'-0"	3/8"
1-1/2"	10'-0"	3/8"	8'-0"	3/8"
2"	10'-0"	3/8"	9'-0"	3/8"
2-1/2", 3"	10'-0"	1/2	10'-0"	1/2"

- B. Where unusual concentrated loads of valves and fittings occur, closer spacing shall be required. Submit specific cases for review and comments.
- C. Where piping changes direction, supports shall be placed in each direction adjacent to joints and no more than 12" from the joint.
- D. Install hangers to provide minimum 1/2 inch space between pipe and adjacent work.
- E. Use hangers with 1-1/2 inch minimum vertical adjustment.
- F. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers. Hanger spacing shall be as scheduled above for the smallest pipe on the trapeze.
- G. Hangers shall be securely fastened to building construction. Where necessary, beam clamps, expansion bolts or through bolts and plates or concrete hooks shall be used. Wooden plugs shall not be permitted.

3.4 VALVES

A. General:

1. Provide valves as shown on the drawings, herein specified or as required by code. To the extent possible, all valves shall be of one manufacturer.
2. Valves shall be located and arranged to ensure proper accessibility and operation. Where valves are concealed behind ceilings or inaccessible partitions, provide access panels.

END OF SECTION

SECTION 15410

PLUMBING FIXTURES

PART 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.
- B. The specification Section 15040 – Basic Plumbing Materials and Methods, form a part of this section and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This section includes plumbing fixtures and related components.
- B. Related sections include the following:
 - 1. Division 15 – Section 15100 – Plumbing Piping
 - 2. Division 15 – Section 15430 – Plumbing Specialties

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, shower heads and tub spouts, drains and tailpieces, 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. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer installed and field installed wiring.
- C. Maintenance Data: For plumbing fixtures to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
 - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. 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.
- C. Regulatory Requirements: Comply with requirements in ICC A 117.1, 'Accessible and Usable Buildings and Facilities'; Public Law 90-480, 'Architectural Barriers Act'; and Public Law 101-336, 'Americans with Disabilities Act'; about plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's 'Uniform Federal Accessibility Standards (UFAS), 1985-494-187' about plumbing fixtures for people with disabilities.
- E. Regulatory Requirements: Comply with requirements in Public Law 102-486, 'Energy Policy Act', about water flow and consumption rates for plumbing fixtures.
- F. NSF Standard: Comply with NSF 61, 'Drinking Water System Components – Health Effects', for fixture materials that will be in contact with potable water.
- G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Vitreous China Fixtures: ASME A 112.19.2M
 - 2. Water Closet, Flushometer Tank Trim: ASSE 1037
- I. Comply with the following applicable standards and other requirements specified for lavatory faucets:
 - 1. Faucets: ASME A 112.18.1M
 - 2. NSF Materials: NSF 61
 - 3. Pipe threads: ASME B 1.20.1
 - 4. Supply and Drain Fittings: ASME A 112.18.1M

- 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 A 112.18.1M
 - 3. Manual Operation Flushometers: ASSE 1037
 - 4. Tubular Brass Drainage Fittings and Piping: ASME A 112.18.1M
- K. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Floor Drains: ASME A 112.21.1M
 - 2. Off Floor Fixture Supports: ASME A 112.6.1M
 - 3. Pipe Threads: ASME B 1.20.1
 - 4. Plastic Toilet Seats: ANSI Z 124.5
 - 5. Supply and Drain Protective Shielding Guards: ICC A 117.1

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.

1.7 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. Faucet Cartridges and O-Rings: Equal to 5% of quantity of each type and size installed; minimum of one (1) each.
 - 2. Faucet Flow Control Fittings: Equal to 10% of quantity of each type and size installed; minimum of two (2) each.
 - 3. Supply Flow Control Fittings: Equal to 5% of quantity of each type and size installed; minimum of two (2) each.
 - 4. Flushometer Valve Repair Kits: Equal to 10% of quantity of each type and size installed; minimum of two (2) each.
- B. Furnish manufacturers installation and maintenance instructions as specified in Division 1, Section 01300, 'Operations and Maintenance Manuals'.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified in the following Part 2 Articles.

2.2 WATER CLOSET (WC-1)

- A. Water Closet: Floor mounted, elongated bowl, 1.6 gallons per flush siphon jet back outlet, 1-1/2" top spud, vitreous china fixture designed for exposed top inlet flushometer valve operation. Mount at wheelchair accessible seat height of 17" to 19" above finished floor. Kohler 'Anglesey K-4386-C' or approved equal.
- B. Seat: White elongated open front solid plastic seat with check hinge. Kohler 'Lustra Lift' K-4679-CA or approved equal.
- C. Flushometer: Sensor operated water closet flushometer, 24 VAC-50/60 Hz. solenoid operator, corrosion resistant internal components, 1.6 gallon per flush, exposed, 1-1/2" top spud, 1" IPS angle stop, flush over-ride button, vacuum breaker, bumper on angle stop, chrome plated brass body. Sloan 'Optima Royal' 111 ES-S-YO or approved equal.
 - 1. Transformer: 50VA, 120 x 24 VAC-50/60 Hz. Class II, UL listed. Sloan EL-154 or approved equal. Provide a minimum of one (1) transformer per ten (10) flushometers installed as a battery.
- D. Controls: Provide electrical control conductors, conduit, electrical boxes and covers and all related accessories required for a complete installation in accordance with the following:
 - 1. Manufacturer's installation instructions, applicable portions of the NEC and specifications Division 16-Electrical.
 - 2. Low voltage control wiring shall be UL approved conductor for application.

2.3 LAVATORY (L-1)

- A. Lavatory: Wall hung, multiple lavatory module shall provide three (3) hand washing stations with centerlines of each station located on 30" centers. Mount at wheelchair accessible rim height of 34" above finished floor.
 - 1. Bowl Material: Cast polyester resin complying with ANSI Z 124.3 and .6 with decorative stone finish.
 - 2. Bowl Color: Selected by Using Agency from manufacturer's optional color material samples.
 - 3. Rigid Base: Lavatory stations shall be secured to a wall hung rigid base, concealing all waste and supply connections, capable of supporting all hand washing stations to ANSI Z 124.3 load ratings.

4. Waste and Supply Connections: Module shall include all waste and supply connections to wall.
5. Manufacturer: Bradley 'Express Deck Lavatory System' EXD-3WH97 or approved equal
- B. Faucet: 4" center set mechanical metering faucet, 10 second operating cycle with automatic shutoff, replaceable cartridge operating mechanism, chrome plated cast brass body, maximum 5 lb. operating force, vandal resistant nozzle, 0.5 gpm flow rate with 1/4" copper tube for 105°F temperature supply. Bradley 90-75-4 or approved equal.
- C. Thermostatic Mixing Valve Assembly: Rough cast bronze body, thermostatic piston and slider, factory set at 105°F, two (2) combination stop-strainer-check valves. Bradley TMA or approved equal.
- D. Factory Assembled: Multiple lavatory module shall be factory assembled, piped and tested for proper operation ready for field connection to building plumbing waste and supply piping.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water, soil and 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 included.
- 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 manufacturer's 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 fittings 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. Install wall hanging fixtures with tubular waste piping attached to supports.

- E. Install floor mounting, back outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.
- F. Install counter mounting fixtures in and attached to casework.
- G. Install fixtures level and plumb according to manufacturer's written instructions and roughing-in drawings. **Mount fixture to ensure complete drainage of water.**
- H. 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.
 - 1. Exception: Use ball valve if stops are not specified with fixture. Refer to Division 15 – Section 15100, Plumbing Piping.
- I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- K. Install flushometer valves for accessible water closets **with handle mounted on wide side on compartment.** Install other actuators in locations that are easy for people with disabilities to reach.
- L. Install tanks for accessible, tank type water closets with lever handle mounted on wide side of compartment.
- M. Install toilet seats on water closets.
- N. Install faucet spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- O. Install water supply, flow control fittings with specified flow rates in fixture supplies at stop valves.
- P. Install faucet, flow control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters is required.
- Q. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep pattern escutcheons if required to conceal protruding fittings.

- S. Seal joints between fixtures and walls, floors, and counters using sanitary type, 1-part, mildew resistant, silicone sealant. Match sealant color to fixture color.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in Division 15 – Section 15100, Plumbing Piping. 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.
- 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. Operate and adjust controls. Replace damaged and malfunctioning units and controls.
- C. Adjust water pressure at faucets, shower valves, and flushometer valves to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

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

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Using Agency.

END OF SECTION

SECTION 15430

PLUMBING SPECIALTIES

PART 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.
- B. The specification Section 15040, Basic Plumbing Materials and Methods forms a part of this section and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This Section includes plumbing specialties for the following:
 - 1. Water distribution systems
- B. Related Sections include the following:
 - 1. Division 15 Section 15100, Plumbing Piping
 - 2. Division 15 Section 15410, Plumbing Fixtures

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Water Distribution Piping: 125 psig

1.4 SUBMITTALS

- A. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:
 - 1. Water hammer arresters
 - 2. Wall hydrants
 - 3. Sleeve penetration systems

- B. Reports: Specified in “Field Quality Control” Article.
- C. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 1. Include the following:
 - 1. Water hammer arresters
 - 2. Wall hydrants

1.5 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, dimensional requirements, and characteristics of plumbing specialties and are based on the specific types and models indicated.
- B. Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.
- C. Comply with ASME B31.9, “Building Services Piping”, for materials, products, and installation.
- D. Listing and Labeling: Provide electrically operated plumbing specialties specified in this Section that are listed and labeled.
 - 1. Terms “Listed” and “Labeled”: As defined in National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: “Nationally Recognized Testing Laboratory” as defined in OSHA Regulation 1910.7.
- E. Comply with NFPA 70, “National Electrical Code,” for electrical components.

1.6 EXTRA MATERIALS

- A. Deliver extra materials to the Department. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Operating Key Handles: Furnish one (1) extra key for each key-operated hose bib and hydrant installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

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

1. Water Hammer Arresters:
 - a. Zurn Industries, Inc.
 - b. Jay R. Smith Manufacturing Co.
 - c. Wade
 - d. Or approved equal
2. Wall Hydrants:
 - a. Zurn Industries, Inc.
 - b. Jay R. Smith Manufacturing Co.
 - c. Wade
 - d. Or approved equal

2.2 WATER HAMMER ARRESTERS

- A. Water Hammer Arrester (WHA-1): ASME A112.26.1M, ASSE 1010, or PDI-WH 201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M sizes A through F and PDI-WH 201 sizes A through F, Zurn Z-1700 or approved equal.

2.3 WALL HYDRANTS

- A. Wall Hydrant (WH-1): ANSI A112.21.3, bronze nickel plated, quarter turn, non-freeze hydrant with 3/4" hose connection, 1/2" FPT and 3/4" MPT inlet connection, backer plate with adjustable wall clamp, integral vacuum breaker with vandal resistant cap and "T" handle operator and key, Jay R. Smith Manufacturing Co. Fig. 5609QT or approved equal.

2.4 SLEEVE PENETRATIONS SYSTEMS

- A. 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, cast-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and cast-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.

PART 3 EXECUTION

3.1 PLUMBING SPECIALTY INSTALLATION

- A. General: Install plumbing specialty components, connections, and devices according to manufacturer's written instructions.
- B. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve, and where indicated.
- C. Install wall hydrants with integral or field-install vacuum breaker.
- D. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
- E. Fasten recessed, wall-mounting plumbing specialties to reinforcement built into walls.
- F. Secure supplies to supports or substrate.
- G. Install individual stop valve in each water supply to plumbing specialties. Use ball valves if specific valve is not indicated.
- H. Install water-supply stop valves in accessible locations.
- I. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- J. Install escutcheons at walls, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.
- K. Include wood-blocking reinforcement for recessed and wall-mounting plumbing specialties.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in Division 15 Section 15100, Plumbing Piping. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
 - 1. Install piping connections between plumbing specialties and piping specified in Division 15 Section 15100, Plumbing Piping.
 - 2. Install piping connections indicated between appliances and equipment; connect directly to plumbing piping systems.
 - 3. Install piping connections indicated as indirect wastes from appliances and equipment to spill over receptors connected to plumbing piping systems.
- B. Install hoses between plumbing specialties and appliances as required for connections.

- C. Arrange for electric-power connections to plumbing specialties and devices that require power. Electric power is specified in Division 16, Electrical Construction.
- D. Supply Runouts to Plumbing Specialties: Install hot and cold water supply piping of sizes indicated, but not smaller than required by authorities having jurisdiction.
- E. Drainage Runouts to Plumbing Specialties: Install drainage and vent piping, with approved trap, of sizes indicated, but not smaller than required by authorities having jurisdiction.
- F. Ground electric-powered plumbing specialties.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Test and adjust plumbing specialty controls and safeties. Replace damaged and malfunctioning controls and components.

3.4 COMMISSIONING

- A. Before startup, perform the following checks:
 - 1. System tests are complete.
 - 2. Damaged and defective specialties and accessories have been replaced or repaired.
 - 3. Clear space is provided for servicing specialties.
- B. Before operating systems, perform the following steps:
 - 1. Close drain valves, hydrants, and hose bibs.
 - 2. Open general-duty valves to fully open position.
 - 3. Remove and clean strainers.
 - 4. Verify that drainage and vent piping are clear of obstructions. Flush with water until clear.
- C. Startup Procedures: Follow manufacturer's written instructions. If no procedures are prescribed by manufacturer, proceed as follows:
 - 1. Energize circuits for electrically operated units. Start and run units through complete sequence of operations.
- D. Adjust operation and correct deficiencies discovered during commissioning.

3.5 DEMONSTRATION

- A. Startup Services: Engage a factory-authorized service representative to perform startup services and train Using Agency maintenance personnel as specified below:
 - 1. Train Using Agency maintenance personnel on procedures and schedules related to maintenance of plumbing specialties.
 - 2. Startup of and servicing grease recovery units.
 - 3. Review data in the maintenance manuals. Refer to Division 1 Section 01300 1.8, Operation and Maintenance Manuals.
 - 4. Schedule training with the Department with at least 7 days' advance notice.

3.6 PROTECTION

- A. Protect drain 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

CONTRACT

FOR

ELECTRICAL CONSTRUCTION

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXX COUNTY, PENNSYLVANIA

CONTRACT NO. D.G.S. A XXXXX.4

DIVISION 26 – ELECTRICAL

SECTION 260500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections “General Conditions of the Contract” and “General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.
- B. Sub-Contractor: Any reference to, or letting of work contained in these specifications to any Sub-Contractor or Manufacturer does not relieve this Contractor for all work, material and equipment in these specifications.
- C. All references made to any item in the singular number shall apply to as many identical items that the work may require.
- D. Where applicable, all materials and equipment shall bear the label of the Underwriters Laboratory, Inc., or other nationally recognized testing laboratory and shall be used and/or installed in accordance with any instructions included with the listing or labeling.
- E. The sizes of conductors and thickness of metals shown on the drawings or mentioned herein shall be understood to be American Wire Gauge.

1.2 SUMMARY

- A. Section Includes:
 - 1. Electrical equipment coordination and installation
 - 2. Sleeves for raceways and cables
 - 3. Sleeve seals
 - 4. Grout
 - 5. Common electrical installation requirements

1.3 DEFINITIONS

- A. For the definitions of words and expressions that are commonly used through out the Contract Documents, refer to the definitions listed in the General Conditions of the Contract, and the following:

1. Approved Equal: Where the phrase “or approved equal,” “or equal,” or “approved” appears, it shall refer to the approval of the Professional on the materials or equipment involved.
2. Concealed: Where the word “concealed” is used in conjunction with raceways, equipment and the like, the word is understood to mean hidden from sight as in chases, furred spaces or suspended ceilings.
3. Electrical Contractor, (.4) Contractor, or Contractor: The person or organization identified as such in the Agreement and is referred to throughout the Contract Documents.
4. Engineer: Any reference made to the “Engineer” shall refer to the “Professional” who is the authorized representative or designee of the Department of General Services.
5. Exposed: Where the word “exposed” is used in conjunction with raceways, equipment and the like, the word is understood to mean open to view.
6. Provide: The term “provide” shall be understood to mean “the Contractor shall furnish and install, complete and operational, with all required hardware, accessories and appurtenances.” Unless indicated otherwise, this shall also include all associated power and/or signal wiring required for electrical systems furnished under this Contract.
7. Using Agency: Any reference made to the “Using Agency” shall refer to the Personnel of the Department of Public Welfare.

1.4 INTENT

- A. Refer to the General Conditions of the Construction Contract; and the following:
- B. The drawings are diagrammatic and approximately to scale, unless noted otherwise. They establish scope, material, and quality and are not detailed installation instructions.
- C. In cases of discrepancies between the drawings and the specifications, the Professional shall make the final determination. In cases where items appear in the specifications but not on the drawings, or appear on the drawings but not in the specifications they shall be considered as noted on both. Unless written clarification is received, the bid shall be interpreted to include the most expensive installation, equipment or work and all associated costs.

1.5 PERMITS AND FEES

- A. Refer to the General Conditions of the Construction Contract.
- B. The Contractor shall pay all electric power, telephone, and cable company connection fees, and be reimbursed for the actual cost of such items by change order. The Contractor will not be entitled to any mark-up on these items.

1.6 PROTECTION OF WORK, MATERIALS, AND EQUIPMENT

- A. Any damage caused by neglect on the part of this Contractor or his representative, or by the elements due to neglect of the part of this Contractor or his representatives, either to the existing work, or to his work, or to the work of any other Contractor, shall be repaired at his expense to the satisfaction of the Department.

1.7 PROTECTION OF SERVICES AND EQUIPMENT

- A. This Contractor shall, at his own expense, repair, replace, and maintain in service any utilities, facilities, or service (underground, overhead, interior or exterior) damaged, broken, or otherwise rendered inoperative during the course of construction by him or his representatives. The method used by this Contractor in repairing, replacing or maintaining the services shall be approved by the Department.

1.8 SEQUENCING, SCHEDULING AND COORDINATION

- A. Refer to Division 1 - General Requirements.
- B. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- C. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- D. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- E. Coordinate sleeve selection and application with selection and application of penetration firestopping.
- F. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- G. Contract Interface:
 - 1. Work performed in cooperation with other contracts: The responsibility for performing work of this contract in cooperation with work of other contracts rests solely with this Contractor.
 - a. Make connections of electrical systems specified in the various sections of this contract to those systems or installations of other contracts requiring such connections.

1.9 INCOMING ELECTRIC SERVICE FACILITIES

- A. The entire installation shall be in accordance with the area Electric Utility Company rules and regulations. All required fittings, meter bases, terminations, etc. shall be verified with the area Electric Utility Company prior to installation.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: EPDM (Ethylene-propylene-diene terpolymer rubber) or NBR (Acrylonitrile-butadiene rubber) interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 3. Pressure Plates: Plastic, Carbon steel, or Stainless steel based on application. Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or Stainless steel based on application. Length as required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.4 FIRESTOPPING

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Specified Technologies Inc.
 - 2. 3M
 - 3. Hilti Corp.
 - 4. Nelson Fire Stop, Emerson Industrial Automation
 - 5. Or approved equal.
- B. Use only that manufacturer listed in the UL Fire Resistance Directory for the UL system involved.
- C. All firestopping materials used on this project shall be the products of one manufacturer. Each trade shall use products of the same manufacturer.
- D. Standards: The firestop systems and products shall have been tested in accordance with the procedures of UL 1479 (ASTM E814-81) and material shall be UL classified as Fill, Void, or Cavity Materials for use in Through-Penetration Firestops. The firestop system shall comply with NEC Paragraph 300-21. All work shall comply with NFPA 101-Life Safety Code, latest edition.

2.5 ACCESS PANELS

- A. Furnish factory-fabricated access panels for access to all concealed pull boxes, junction boxes, capped conduits and other electrical equipment where no other means of access is available. Access panels for electrical work, along with all required auxiliary or supporting steel, hardware, etc., shall be furnished by the electrical contractor to the general contractor, who shall install them. Access panels are not required at lift-out removable tile ceilings.
- B. Access panels shall be of appropriate size but not less than 16" x 12". Panels shall be all steel construction with a #16 gauge wall or ceiling frame and a #14 gauge panel door. Doors shall be provided with concealed hinges and cylinder lock except doors for wall panels which may be secured with suitable clips and countersunk screws. Outside of access panels shall be finished flush with finished walls or ceilings surfaces and shall be prime painted.
- C. At locations where access panels are installed in fire-rated ceilings, access panels shall contain the 1-1/2" hour fire-rated "B" label, and, in addition, shall also be provided with layers of gypsum wallboard in a thickness which will supply an additional one-hour fire rating.

- D. Determine the exact locations and sizes of required access panels and coordinate same with the Department. Access panels shall not be installed without prior approval of the Department. All panels shall be installed and located to present a neat and symmetrical appearance.
- E. Junction boxes, capped conduits and other electrical equipment above removable tile ceilings or above panels shall be suitably identified by small, inconspicuous adhesive-backed labels attached to the ceiling surface or the surface of the access panel. Labels shall be additionally secured with screws or rivets. Labels shall be white with 3/8" high black letter and shall be a manufactured item for that purpose.

2.6 CONCRETE WORK

- A. Refer to Division 03 for requirements.
- B. This Contractor shall provide all concrete for equipment foundations, duct-banks and patching as specified or otherwise required for completion of work.

2.7 PAINTING

- A. This Contractor shall paint all exposed raceways, hangers, junction boxes, etc., that this Contractor installs in finished areas. Finished areas shall be those areas where the surfaces are plastered, glazed tile, painted block, etc. This Contractor is not responsible for any other painting except as otherwise noted.
- B. Where the Contractor is the only Contractor working in a specified area, he shall be responsible for painting equipment and related raceway, if classified a finished area.

2.8 TOUCH-UP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.
- C. Panelboard trims and doors, safety switch and circuit breaker enclosures, and items of similar nature shall be baked enamel finished at the place of manufacture. Damage to the factory finish due to shipment or installation shall be "touched-up" by this Contractor with factory supplied paint

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. All work shall be installed in a neat and workmanlike manner by craftsmen experienced in the trade involved and shall be acceptable to the Department. All details of installation shall be mechanically and electrically correct. All materials and equipment shall be new, and without imperfections or blemishes, unless otherwise noted. Before ordering any material or doing any work, the Contractor shall verify all measurements at the site and shall be responsible for the correctness of same.

- B. The Contractor shall lay out his work from dimensions of bid documents, actual dimensions taken at the site, and from the approved dimensions of equipment being installed. Layouts in congested areas should not be scaled from the electrical and mechanical drawings. No extra compensation will be allowed on account of difference between actual dimensions and measurements and those indicated on the drawings. Any difference, which may be found, shall be submitted to the Department for consideration before proceeding with the work.
- C. The drawings and specifications shall include under each item all labor, material and equipment necessary to properly install complete, adjust, and place in operating condition, satisfactory to the Department, the several branches of work described herein. This shall include all necessary interconnections between the several branches of work described herein, and connections to work under other sections of specifications and other contractors.
- D. All items of labor, material or equipment not described in detail by specifications or drawings, but which are incidental to or necessary for complete installation and proper operation of several branches of work described herein, or reasonably implied in connection therewith, shall be furnished and/or installed as if called for in detail by drawings or specifications.
- E. The drawings are generally indicative of the work required and shall be followed as closely as circumstances will permit, however they do not indicate all bends, fittings, boxes and accessories which may be required. The Contractor shall carefully investigate structural and finish conditions affecting work and arrange work accordingly, furnishing such fittings, accessories, etc., required to meet such conditions. Contractor will be held responsible for proper installation of materials and equipment to the true intent and meaning of contract documents.
- F. The Contractor shall carefully examine all contract documents including those of all other trades, and carry on his work so as not to delay or interfere with the work of other trades. He shall obtain in writing from the other contractors such data as is necessary to coordinate his work with other trades.
- G. The drawings indicate approximate location of wiring, outlets, equipment, etc., and the actual location shall be confirmed at the site with the Department. The Department reserves the right to make minor changes in the locations of conduits, outlets, equipment, etc. prior to roughing-in, without incurring additional expense to the Department.
- H. Coordinate location of luminaires, conduit, wire, wiring devices, equipment, etc., to be clear of windows, doors, openings, diffusers, return grilles, sprinklers and other services and utilities. This Contractor shall be held responsible to coordinate his work with that of the other trades so that all work may proceed in an orderly manner and conflicts and delays may be avoided. Where drawings indicate special space allocation for different contracts, contractors shall rigidly adhere to sequence of installation designated by the Department or as required to allow all the trades to work equipment or materials into place in respective order. Special attention shall be paid to work under the floor slabs, above ceilings and in locations otherwise concealed. All work shall be inspected and/or tested before it is closed in.

- I. Secure dimensions of all recessed lighting fixtures, telephone, data and similar device outlets and other equipment immediately upon the award of the Contract. Work closely with the General, HVAC, Plumbing and other Contractors and provide them with the necessary information and dimensions so that there will be no interference between piping, duct work, structural steel, furring channels, etc., and recessed lighting fixtures or other electrical equipment.
- J. In case interference or fouling results, the Department shall decide which item is to be relocated, regardless of which is installed first. The Contractor shall receive no additional compensation for relocating items that result from interference with other work.
- K. Contractor shall determine in advance, location and size of chases and openings necessary for proper installation of his work, and have same provided during erection of work in which chases and openings occur. He shall furnish and set sleeves, hangers, and anchors, and be responsible for their proper and permanent location.
- L. In cases where cutting of new building construction is necessary due to failure to set proper sleeves or inserts, or due to the failure to provide proper openings and chases such cutting shall be done and repaired to match the original condition of the work by the contractor under this specification.
- M. Points of connection and termination of work under this specification are shown on drawings or stated within the specification, but in case of doubt as to such points, the Department's decision will be final.
- N. Follow manufacturer's published recommendations for installation methods not otherwise specified. The Contractor shall furnish the services of manufacturer's representatives for each piece of major equipment furnished under these contract documents. The amount of factory service provided by the contractor shall be as normally recommended and furnished by the various equipment manufacturers unless specified otherwise. Testing of equipment shall be made under the direct supervision of competent authorized service representatives. Any and all expenses incurred by the equipment manufacturers' representatives shall be borne by the contractor.
- O. Upon completion of the work, all remaining waste materials and rubbish resulting from the contract work shall be removed from the building and premises.
- P. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Department for clarification. Do not proceed with work without clear instructions.
- Q. Headroom Maintenance: If mounting height or other location criteria is not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- R. Materials and Components: Install level, plum, parallel and perpendicular to other building systems and components, unless otherwise indicated.
- S. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect for ease of disconnecting, with the minimum interference with other installations.
- T. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 EQUIPMENT CONNECTION

- A. Terminate all circuits feeding equipment or furniture in safety switch, receptacles or outlet as shown on the drawings or as directed by the Department.
- B. Each piece of equipment requiring electric service shall be provided with a finished outlet.
- C. Make final connections to each piece of equipment requiring electric service.
- D. The drawings show generally the location of electric service to each piece of equipment. However, this contractor shall secure detailed shop drawings showing dimensioned locations for electric service to each piece of equipment from various contractors supplying such equipment prior to roughing-in.
- E. This contractor will be required to relocate any misplaced outlet at his own expense if he fails to secure detailed shop drawings prior to roughing-in for equipment.

3.3 DEMOLITION

- A. Existing Equipment:
 - 1. To accommodate the renovations, disconnect and remove or relocate existing equipment and services as indicated on the plans or as required (whether or not the existing equipment is shown on the drawings). All other existing equipment shall remain intact, unless otherwise noted.
 - 2. If new equipment such as receptacles, light fixtures, etc. is to be installed where an existing device is located, the existing outlet box may be reused if it complies with all applicable codes.
 - 3. It is this Contractor's responsibility to pay disposal fees for equipment removed. Equipment shall be disposed of in accordance with governing environmental regulations (i.e. ballasts, lamps, transformers, batteries, etc.).
- B. Removal of Existing Circuits:
 - 1. Where it is noted for switches, receptacles, fixtures or other electrical equipment to be disconnected and removed; it shall be understood that all wiring, junction boxes, supports, appurtenances and accessories associated with the equipment (not required to remain, due to continuity or other necessity) shall be removed in their entirety.
- C. Extension of Existing Circuits:
 - 1. Where existing equipment is indicated as being relocated and a circuit connection is not shown or noted, this Contractor shall extend and connect the existing circuit as required.
 - 2. In areas where the general construction work interrupts the continuity of an existing circuit, this Contractor shall relocate portion of the circuit required to maintain continuity.
- D. Coordination: Coordinate all demolition work with the other trades and the Department.

3.4 EXISTING PANELBOARDS

- A. Existing panelboards to remain or to be relocated:
 - 1. Clean interiors and exteriors.
 - 2. Inspect for damage. Notify Professional if repairs are necessary or damaged components need replacing.
 - 3. Tighten conduit and wire terminations in accordance with applicable codes.
- B. Verify panelboards and panelboard feeders are of adequate capacity for loads to be served.
 - 1. Activate loads connected to panelboards to achieve full load condition.
 - 2. Measure and record amperage readings of phase and neutral conductors of panelboard feeders.
- C. **Circuit Directory: After balancing panelboard loads, create a typewritten circuit directory to indicate new and existing loads and their corresponding locations. Obtain Department approval before installing circuit directory. Use a computer or typewriter to create directory; handwritten directories are not acceptable.**
- D. New circuit breakers for existing switchboards, panelboards or loadcenters shall match the existing circuit breaker type, manufacturer, and AIC rating. If the existing breaker type is no longer available, submit proposed substitution to Professional for approval.

3.5 EXISTING WIRING

- A. Inspect existing wiring which is to be disturbed for damage. Notify Professional if repairs are necessary or damaged wiring needs replacing.
- B. Insure integrity of existing wiring insulation:
 - 1. Megger wiring phase-to-phase, phase to neutral, phase to ground, and neutral to ground.
 - 2. Repair defective insulation to a dielectric value equal to that of wire of the same type and age.
- C. Secure and label existing wiring which is to be disturbed.
- D. Tighten existing wiring terminations and connections in accordance with applicable codes.

3.6 BALANCING

- A. Each system of feeder and branch circuits for power and lighting shall be connected to panelboard buses in such a manner that loads connected thereto will be balanced on all phases as closely as practicable. Should there be any unfavorable condition of balance on any part of the electrical system, the Electrical Contractor shall make changes to the electrical system that may be required by the Department to remedy the unbalanced condition. Should there be an unbalance on existing equipment, not included under this contract, the contractor shall report the unbalance to the Department so that the condition may be corrected by the Department under a separate contract.

3.7 EXCAVATION AND BACKFILLING

- A. Refer to Division 2 for requirements.
- B. The contractor shall do all necessary excavating of widths and to depths required for the installation of manholes, box pads, concrete foundation slabs, for the installation of underground duct banks, and for the installation of other equipment and materials as shown on the drawings and herein specified.
- C. Final grading, finishing, paving and seeding at all excavated areas shall be included under this contract, except where new surfaces are being provided as a part of the site work under the General Contract. The Electrical Contractor will be responsible for all backfilling and paving of roadways, sidewalks and other paved areas associated with this contract. All surfaces shall be restored to the satisfaction of the Department.

3.8 CORE DRILLING

- A. This Contractor shall core drill holes associated with new feeders and branch circuits as indicated on the drawings.
- B. All core drilled holes shall be sealed after installation of conduits as hereinafter specified. The materials used shall consist of the appropriate sealant and/or firestop materials required for the application.

3.9 CUTTING AND PATCHING

- A. Refer to Division 1 - General Requirements.
- B. This Contractor shall be responsible for all cutting, patching, and finishing of existing construction for the proper installation of all electrical equipment and materials to be installed in the building. This will also be required for the removal of the existing equipment and materials. All cutting shall be kept to a minimum consistent with the requirements of the project. Cutting, patching, and finishing shall be done by workmen skilled in this type of work. All patching shall be done utilizing materials of the same quality and texture as the adjacent undisturbed areas perfectly and to the satisfaction of the Department. Painting of the final disturbed areas, where general construction work occurs, will be the responsibility of the General Contractor, unless otherwise indicated. Painting of the final finished areas, where no general construction work occurs, shall be by this Contractor. Paint entire plane in which damage occurs.
- C. No cutting shall be done which may affect the building structurally or architecturally without first securing the approval of the Department. Cutting shall be accomplished in such a manner as not to cause damage to the building or leave unsightly surfaces, which cannot be concealed by plates, escutcheons or other construction. Where such unsightly conditions are caused, this Contractor shall be required, at his own expense, to repair the damaged areas.
- D. Where openings are to be made in existing roof, obtain bonding company approval, if roof bond is still in effect, before such openings are made. Perform finishing and roof flashing, in areas of existing building or roof not being disturbed under general construction, for installation of work under this Division.

- E. Cutting of the construction excessively or carelessly done shall be repaired by this Contractor to match the original work and to the satisfaction of the Department who will make the final decision with respect to excessive or careless cutting work.
- F. This Contractor shall seal all openings he has made in walls, floors, ceilings, etc., after his work has been performed (including installation and demolition). The materials used shall consist of the appropriate sealant and/or firestop materials required for the application.

3.10 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.11 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.12 FIRESTOPPING

- A. Where conduits, conduit sleeves, wireways and other electrical raceways or cables pass through fire partitions, fire walls, fire floors, or smoke walls, the Contractor shall provide a fire or smoke stopping that provides an effective barrier against the spread of fire, smoke or gases.
- B. Installation of Fire-Stopping Materials: Install materials to fill openings around electrical services penetrating floors and walls and provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Install materials in accordance with printed instructions of the UL Fire Resistance Directory and per manufacturer's published instructions.
- C. All cables that are installed in conduit sleeves or in wireways through fire or smoke floors or partitions shall be provided with an equally rated re-enterable UL listed fire and smoke rated fire-stopping material in the opening.
- D. Examine fire/smoke-stopped areas to ensure proper installation before concealing or enclosing areas.
- E. Keep areas of work accessible until inspected by applicable code authorities.

3.13 CLEANING

- A. Refer to the General Conditions of the Contract.
- B. Prior to painting, clean as required to remove plaster, dirt, grease, dust, labels, burrs, etc.
- C. Prior to final inspection, the Contractor shall clean all equipment and surfaces within the scope of the project (for example: lighting fixtures, switch and receptacle plates, engine generators, electrical distribution equipment, etc.). In addition, the Contractor shall clean anything else that requires cleaning as a result of the Contractor's work.

- D. Any damage in the electrical system or other damage to any part of the building, its finish or furnishings, due to failure to properly clean electrical equipment and or associated components, shall be repaired by the Contractor with no additional cost to the Department.

3.14 REFINISHING AND TOUCH UP PAINTING

- A. Refinish and touch up paint.
 - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 - 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 - 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.
- B. Conduit and equipment to be painted: Clean all conduit exposed to view in completed structure by removing plaster and dirt. Remove grease, oil and similar material from conduit and equipment by wiping with clean rags and suitable solvents in preparation for paint.

3.15 MOUNTING HEIGHTS

- A. In addition to careful review of the electrical drawings, this Contractor shall refer to all applicable details, plans, etc. and perform a site survey to determine exact positioning of electrical, telephone, data, television, video, etc. outlets prior to installations. Unless otherwise specifically instructed, centerline-mounting heights of outlets and other equipment shall be located as follows:
 - 1. Local Lighting Control Switches: Locate all outlets for single or gang switches 44" above finish floor on strike side of door. If this location is such that it places the switch group partly in tiles or other finishes, the outlet shall be lowered sufficiently to bring the plate entirely on a flat surface (confirm the mounting height with the Department).
 - 2. Convenience Outlets: 18" above finished floor except as otherwise noted.
 - 3. Telecommunications Outlets: 18" above finished floor except as otherwise noted. Outlets for wall phones shall be located 44" above finished floor or as directed.
 - 4. CATV Outlets: 18" above finished floor except as otherwise noted. Coordinate locations for wall-mounted televisions with Architectural details and features.
 - 5. Outlets Above Countertops: 8" above top of counter without backsplash or 6" above top edge of backsplash except as otherwise noted.
 - 6. Blank Outlets: Coordinate location with served equipment manufacturers shop drawing and installation details for service connection point of access except as otherwise noted.
 - 7. Where similar types of outlets/devices are indicated on the drawings as being installed adjacent to each other on the same wall or in the same general area, but are indicated above as having different mounting heights, all similar outlets/devices shall be installed at the same mounting height. In such situations, confirm the mounting height with the Department.

8. Fire Alarm Pull Stations: 44" above finished floor to center of operating handle.
9. Fire Alarm Audio/Visual and Visual Only Devices: The lower of 80" above finished floor or 6" below ceiling, measured to the bottom of visual device.
10. All fire alarm pull stations and audio/visual devices shall be installed on same vertical centerline.
11. Safety Switches: 4' above finished floor, except as otherwise noted.

END OF SECTION

SECTION 260510

ELECTRICAL EQUIPMENT WIRING

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Specification sections “General Conditions of the Contract” and “General Requirements” form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SECTION INCLUDES

- A. Electrical, Mechanical, and General Equipment wiring.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Products are specified within Division 26 Sections.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The General, HVAC and Plumbing Contractors shall furnish all motors, starters, pushbuttons for local and remote control, controllers, pressure switches, aquastats or similar items together with all appurtenances, accessories and control wiring required to operate the equipment furnished under their respective sections of the contract, which is necessary to perform the operating functions as specified, shown on the drawings or as otherwise required.
- B. The General, HVAC and Plumbing Contractors shall set and mount all motors, starters and controls. This Contractor shall furnish and install all safety switches at the equipment and make all power connections to the safety switches, starters and the motors. All control wiring necessary for the required performance and operation of the equipment shall be installed and connected under each respective and associated contract. Where the starter and/or safety switch is an integral part of the equipment assembly, the assembly shall be furnished with the wiring being complete between the starter, controller and motor and this Contractor shall make the power connections only at the unit.

- C. If procurement requirements necessitate a change in the electrical characteristics of any motor or equipment being furnished under the General, HVAC or Plumbing Contract, the respective Contractor shall first obtain approval of such changes from the Department. The same Contractor shall also be responsible for all necessary arrangement and shall pay all costs, if any, for all required changes to this contract.

3.2 GENERAL REQUIREMENTS

- A. This Contractor shall furnish, install and connect all power wiring to all equipment and all associated controls and appurtenances provided under this section of the contract. In addition, this Contractor shall furnish, install and connect all power wiring to all equipment, associated controls and appurtenances provided under other sections of this contract, unless otherwise specified herein or indicated on the drawings. All necessary and required control wiring for the aforementioned equipment and systems shall be furnished, installed and connected by the respective Contractors providing the equipment, unless otherwise specified herein or indicated on the drawings.

3.3 WIRING FOR HEATING, VENTILATING AND AIR CONDITIONING

- A. All equipment for the heating, ventilating and air conditioning systems shall be furnished and installed under the HVAC Contract, unless otherwise indicated.
- B. This Contractor shall be responsible for furnishing all labor and materials required for the installation and connection of all electrical power wiring to and for the HVAC equipment, unless otherwise indicated.
- C. In general, all starters and special control equipment required for the heating, ventilating and air conditioning equipment such as the unit heaters, air handling units, etc., will be furnished and installed under the temperature control section of the HVAC Contract, unless otherwise indicated.

3.4 TEMPERATURE CONTROL WIRING

- A. All interconnecting control wiring associated with the temperature control system(s) for heating and air conditioning system(s) shall be furnished, installed and connected under the HVAC Contract.
- B. This Contractor shall provide a source of power and make final power connections for all temperature control system equipment (air handling units, etc.) and at each apparatus control panel location. Temperature Control Panels shall be furnished and installed under the HVAC Contract.

3.5 ELECTRICAL WORK FOR ROOF VENTILATORS AND/OR EXHAUST FANS

- A. For single-phase units, a motor starting disconnecting type snap switch shall be furnished as an integral part of the roof ventilator or exhaust fan. However, this Contractor shall furnish a remote control thermal overload switch with pilot light switch shall be installed within the room to be ventilated or exhausted, as indicated on the drawings.
- B. For 3-phase units, this Contractor shall furnish and install remote control switches, together with pilot lights, within the room to be ventilated or exhausted at location as indicated on the drawings. In addition, the Contractor shall furnish and install a disconnect switch (in proper NEMA rated enclosure) at motor location.

3.6 WIRING FOR PLUMBING EQUIPMENT

- A. All equipment for the plumbing system shall be furnished and installed under the Plumbing Contract, unless otherwise indicated.
- B. This Contractor shall be responsible for furnishing all labor and materials required for the installation and connection of all electrical power wiring to and for the Plumbing equipment, unless otherwise indicated.
- C. In general, all starters and special control equipment required for electrically operated equipment furnished under the Plumbing Contract, such as the pumps and electric water heaters will be furnished and installed by the Plumbing Contractor.

3.7 ELECTRICAL EQUIPMENT BY OTHERS

- A. All electrical equipment furnished and installed under contracts other than this contract shall be furnished with full complement of control equipment, control wiring, conduit and all other items necessary for satisfactory operation.
- B. Remote motor starters for equipment furnished under contracts other than this contract shall be furnished and installed by the respective Contractor providing the equipment.
- C. This Contractor shall furnish and install disconnect switches for all 3-phase equipment unless otherwise indicated.
- D. This Contractor shall furnish and install thermal overload switches for each single phase motor except where units are furnished with built-in thermal protection, in which case this Contractor shall furnish and install a single pole switch, with or without pilot light as indicated on the drawings or directed by the Department.
- E. This Contractor shall complete all power wiring through the disconnect switch and/or thermal cutouts and local control stations to the equipment as required.

- F. This Contractor shall complete all electrical connections, through the disconnect switch, starter and motor terminals of all 3-phase equipment. This Contractor shall be responsible for final connections.
- G. This Contractor shall be responsible for proper direction of rotation of 3-phase motors.
- H. This Contractor shall provide disconnect switches for all 3-phase equipment. Combination motor starter/disconnect switches shall be furnished and installed under the contracts providing the equipment. This Contractor shall provide disconnect switches at motor when motors are located away from combination starter/disconnect switches.

3.8 LOCATIONS

- A. This Contractor shall apply for detailed and specific information regarding the location of all equipment as the final location may differ from that indicated on the drawings. Outlets, equipment or wiring improperly placed because of this Contractor's failure to obtain this information shall be relocated and reinstalled without additional expense to the Department.
- B. The design shall be subject to such revisions as may be necessary to overcome building obstructions. No changes shall be made in location of outlets or equipment without written consent of the Department.
- C. This Contractor is cautioned that all outlet information must be checked and verified before installation; and all stub-ups into equipment must be as indicated and detailed on the respective shop drawings.
- D. Unless otherwise detailed on the drawings, rough-in of proper size and capacity of mechanical equipment indicated on the drawings as "Future" or "N.I.C." shall be provided and installed in such a manner and location that future final connections can be made with a minimum of work and without cutting or patching permanent walls, partitions, ceiling or floors.
- E. Contract drawings are, of necessity, schematics for special equipment as exact roughing-in and requirements may vary with different manufacturers. Each trade shall connect its respective services to all special equipment indicated on the drawings at no additional cost to the Department.

END OF SECTION

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Specification sections “General Conditions of the Contract” and “General Requirements” form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

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. Comply with NFPA 70, National Electrical Code.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.
6. Or approved equal.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THW, THHN-THWN, and XHHW.

D. Metal-Clad, Multi-conductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire. MC Cable may only be used as lighting fixture whips or to fish existing walls. In no case shall MC Cable extend beyond the perimeter of the room served.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.
6. Or approved equal.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN, single conductors in raceway.
- E. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.
- F. Feeders in Cable Tray: Type THHN-THWN, single conductors in raceway.
- G. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- H. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway; or Metal-clad cable, Type MC (use restricted as indicated in part 2 of this section).
- I. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN, single conductors in raceway.
- J. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.
- K. Branch Circuits in Cable Tray: Type THHN-THWN, single conductors in raceway.
- L. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- M. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- N. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Each receptacle branch circuit shall contain a separate neutral conductor.
- B. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling methods, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to "Hangers and Supports For Electrical Systems" specification section.

- G. Identify and color-code conductors and cables according to "Identification For Electrical Systems " specification section.

3.4 CONNECTIONS

- A. 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.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

END OF SECTION

SECTION 260526

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Specification sections “General Conditions of the Contract” and “General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. Section Includes: Grounding systems and equipment.

1.3 SUBMITTALS

- A. Product Data: For each type of product, include data on features, accessories and finishes.
- B. Shop drawings: For each type of product, indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. As-Builts: Plans showing dimensioned locations of grounding features, including the following:
 - 1. Test wells
 - 2. Ground rods
 - 3. Ground rings
 - 4. Grounding arrangements and connections for separately derived systems
 - 5. Grounding for sensitive electronic equipment

1.4 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. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction, and NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits and equipment.

- C. UL Compliance: Comply with applicable requirements of UL 467, 486A, and 869, pertaining to grounding and bonding of systems, circuits and equipment. Provide grounding and bonding products which are UL-listed and labeled for their intended usage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grounding Conductors, Connectors, and Grounding Electrodes.
 - a. Copperweld Corp.
 - b. Framatome Connectors/Burndy Electrical
 - c. O-Z/Gedney
 - d. RACO
 - e. Thomas & Betts
 - f. Or approved equal

2.2 GROUNDING CONDUCTORS

- A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3
 - 2. Stranded Conductors: ASTM B 8
 - 3. Tinned Conductors: ASTM B 33
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick
- C. Bare Grounding Conductor and Conductor Protector for Wood Poles:
 - 1. No. 4 AWG minimum, soft-drawn copper
 - 2. Conductor Protector: Half-round PVC or wood molding; if wood, use pressure-treated fir, cypress, or cedar
- D. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V

2.3 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression or exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type
 - 1. Size: $\frac{3}{4}$ inch by 10 feet, 10 mil coating
 - 2. Use copper-clad couplers for joining ground rods to obtain longer length rods

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper or copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches below grade
 - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors
2. Underground Connections: Welded connectors except at test wells, and as otherwise indicated
3. Connections to Ground Rods at Test Wells: Bolted connectors
4. Connections to Structural Steel, and Steel Reinforcement in Foundations: Welded connectors

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 1. Feeders and branch circuits
 2. Lighting circuits
 3. Receptacle circuits
 4. Single-phase motor and appliance branch circuits
 5. Three-phase motor and appliance branch circuits
 6. Flexible raceway runs
 7. Armored and metal-clad cable runs
 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway
 9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units
 10. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- G. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.
 - 1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
 - 3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- C. Panelboards and Disconnects:
 - 1. The Main Service Disconnect device shall have the neutral and equipment ground bonded together.
 - 2. The first panelboard or disconnect device on the secondary side of a transformer shall have the neutral and equipment ground bonded together.
 - 3. All other equipment shall have the neutral isolated from the equipment ground, including panelboards in remote buildings or structures supplied from another building. The exception to this is separately derived systems.
 - 4. Ground bars in panelboards and switchboards shall have sufficient lugs for each overcurrent device and incoming equipment ground conductor.
 - 5. Ground bar shall be bonded to device enclosure.

- D. Grounding Electrode System: All grounding electrodes as described in items 1 through 7 below that are present at each building or structure served shall be bonded together to form the grounding electrode system (Exception: Concrete-encased electrodes of existing buildings or structures shall not be required to be part of the grounding electrode system where the steel reinforcing bars or rods are not accessible for use without disturbing the concrete). Where none of these grounding electrodes exist, one or more of the grounding electrodes described in items 4 through 8 below shall be installed and used.
1. Metal Underground Water Pipe
 - a. Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - b. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 2. Metal Frame of the Building or Structure
 - a. Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
 3. Concrete-Encased Electrode (Ufer Ground)
 - a. Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
 - b. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
 - c. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
 4. Ground Ring
 - a. Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of the building.
 - b. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
 - c. Bury ground ring not less than 24 inches from building's foundation.
 5. Rod and Pipe Electrodes
 - a. Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

- b. Interconnect ground rods with grounding electrode conductor below grade, unless otherwise indicated. Connection to rod shall be by non-reversible connection only. Make connections without exposing steel or damaging coating if any.
 - c. For grounding electrode system, install at least three (3) rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
 - d. Test Well: Install at least one test well for each service unless otherwise indicated. Test Well shall consist of a ground rod driven through drilled hole in bottom of handhole. Handhole shall be at least 12 inches deep, with cover. Set top of test well flush with finished grade or floor. Install at the ground rod electrically closest to service entrance.
 - 6. Other Listed Electrodes
 - 7. Plate Electrodes
 - 8. Other Local Metal Underground Systems or Structures
 - E. The following systems and materials shall NOT be used as grounding electrodes:
 - 1. Metal Underground Gas Piping Systems
 - 2. Aluminum
 - F. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
 - G. Gas Piping:
 - 1. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
 - H. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned-copper or copper bonding jumper to bond across flexible duct connections to achieve continuity.
- 3.4 LABELING
- A. Comply with requirements in Division 26 Section "Electrical Identification".
 - B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
 - 1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm.
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Department promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Specification sections “General Conditions of the Contract” and “General Requirements” form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated, submit as required in the General Conditions of the Contract and the General Requirements.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70, National Electrical Code.

1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are detailed in "Concrete" specification section.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - h. Or approved equal.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.

- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16 inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
 - e. Or approved equal.
 2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
 4. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel or Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 - 5) Or approved equal.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 6) Or approved equal.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength steel. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in "Metal Fabrications" specifications section for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are more restrictive.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70, National Electrical Code. Minimum rod size shall be 1/4 inch in diameter.
- C. Support individual horizontal raceways with separate, steel or malleable-iron pipe hangers or clamps.

- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps, or single-bolt conduit clamps using spring friction action for retention in support channel.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified herein.
- B. Install support devices to securely and permanently fasten and support electrical components from building structure. Support electrical equipment from building structure independently of other equipment, piping, ducts, suspended ceiling T-bars, etc.
- C. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- D. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- E. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts; beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69; or Spring-tension clamps.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

- F. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
- G. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- H. Arrange supports in vertical runs so that the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals. Simultaneously install vertical conductor supports with conductors.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in "Metal Fabrications" specification section for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in "Concrete" specification section.
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

- B. Touchup: Comply with requirements in "Painting" specification section for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 260533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Specification sections “General Conditions of the Contract” and “General Requirements” form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RNC: Rigid nonmetallic conduit.
- H. RSPVC: PVC coated rigid steel conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Custom enclosures and cabinets.

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. Comply with NFPA 70, National Electrical Code.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Alflec Inc.
 - 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 5. Electri-Flex Co.
 - 6. Manhattan/CDT/Cole-Flex.
 - 7. O-Z Gedney; a unit of General Signal.
 - 8. Wheatland Tube Company.
 - 9. Or approved equal.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. PVC-Coated Steel Conduit (RSPVC): PVC-coated rigid steel conduit or IMC (as indicated on drawings).
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch, minimum.
- F. EMT: ANSI C80.3.
- G. FMC: Zinc-coated steel.
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 - 2. Fittings for EMT: Steel or die-cast, set-screw or compression type.

- 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.
- J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Arnco Corporation.
 - 4. CANTEX Inc.
 - 5. CertainTeed Corp.; Pipe & Plastics Group.
 - 6. Condux International, Inc.
 - 7. ElecSYS, Inc.
 - 8. Electri-Flex Co.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Manhattan/CDT/Cole-Flex.
 - 11. RACO; a Hubbell Company.
 - 12. Thomas & Betts Corporation.
 - 13. Or approved equal.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- D. LFNC: UL 1660.
- E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- F. Fittings for LFNC: UL 514B.

2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Arnco Corporation.
 - 2. Endot Industries Inc.
 - 3. IPEX Inc.
 - 4. Lamson & Sessions; Carlon Electrical Products.
 - 5. Or approved equal.
- B. Description: Comply with UL 2024; flexible type, approved for plenum, riser, or general-use based on installation application.

2.4 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Square D; Schneider Electric.
 - 4. Or approved equal.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, 12, or 3R based on the application, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type.
- E. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Hoffman.
 - 2. Lamson & Sessions; Carlon Electrical Products.
 - 3. Or approved equal.
- B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.
- D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.6 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Department.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Thomas & Betts Corporation.
 - b. Walker Systems, Inc.; Wiremold Company (The).
 - c. Wiremold Company (The); Electrical Sales Division
 - d. Or approved equal.
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Department from manufacturer's standard colors.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Butler Manufacturing Company; Walker Division.
 - b. Enduro Systems, Inc.; Composite Products Division.
 - c. Hubbell Incorporated; Wiring Device-Kellems Division.
 - d. Lamson & Sessions; Carlon Electrical Products.
 - e. Panduit Corp.
 - f. Walker Systems, Inc.; Wiremold Company (The).
 - g. Wiremold Company (The); Electrical Sales Division.
 - h. Or approved equal.

2.7 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 2. EGS/Appleton Electric.
 3. Erickson Electrical Equipment Company.
 4. Hoffman.
 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 6. O-Z/Gedney; a unit of General Signal.
 7. RACO; a Hubbell Company.
 8. Robroy Industries, Inc.; Enclosure Division.
 9. Scott Fetzer Co.; Adalet Division.
 10. Spring City Electrical Manufacturing Company.
 11. Thomas & Betts Corporation.
 12. Walker Systems, Inc.; Wiremold Company (The).
 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
 14. Or approved equal.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.
- D. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum or galvanized cast iron, with gasketed cover.
- G. Hinged-Cover Enclosures: NEMA 250, Type 1, steel with continuous-hinge cover with flush latch, unless otherwise indicated. Finished inside and out with manufacturer's standard enamel.
- H. Cabinets:
 - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit.
 - 2. Concealed Conduit, Aboveground: IMC.
 - 3. Feeders: IMC for entire length.
 - 4. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or 4.
- B. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: IMC.
 - 3. Feeders: IMC for entire length.
 - 4. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Garage areas.

5. Concealed in Ceilings and Interior Walls and Partitions: EMT.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
7. Damp or Wet Locations: IMC.
8. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical fiber/communications cable raceway or EMT.
9. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: Riser-type, optical fiber/communications cable raceway or EMT.
10. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: General-use, optical fiber/communications cable raceway; Riser-type, optical fiber/communications cable raceway; Plenum-type, optical fiber/communications cable raceway; or EMT.
11. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Aluminum raceways are permitted for such circuits, but where they pass through concrete they shall be installed in a nonmetallic sleeve. Do not install aluminum conduits in contact with concrete.

F. Aluminum conduits are not acceptable for any application, unless otherwise noted.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in "Hangers and Supports For Electrical Systems" specification section.
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Change from RNC to Rigid steel conduit or IMC (based on application) before rising above the floor.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
 - 1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
 - 2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet .
 - 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet.

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- O. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors. Use LFMC in damp or wet locations.
- P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- Q. Set metal floor boxes level and flush with finished floor surface.
- R. Do not install aluminum boxes, enclosures, or cabinets in contact with concrete.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Specification sections “General Conditions of the Contract” and “General Requirements” form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. Section includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Warning labels and signs.
 - 5. Instruction signs.
 - 6. Equipment identification labels.
 - 7. Miscellaneous identification products.

1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pre-tensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and polyester or nylon cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer; or machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer; or machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- D. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer; or machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.5 FLOOR MARKING TAPE

- A. 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.
- D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396 inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4 inch grommets in corners for mounting. Nominal size, 10 by 14 inches.
- E. Warning labels and signs shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
- F. Arc Flash Warning: Apply in the field, the factory supplied arc flash warning label to all panelboards, switchboards, motor control centers, etc., that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized to warn qualified persons of potential electrical arc flash hazards.

2.7 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength: 50 lb, minimum.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black, except where used for color-coding.
- B. Paint: Paint materials and application requirements are specified in "Painting" specification section.
 - 1. Exterior Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry):
 - a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Exterior concrete and masonry primer.
 - 2) Finish Coats: Exterior semi-gloss acrylic enamel.
 - 2. Exterior Concrete Unit Masonry:
 - a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over block filler.
 - 1) Block Filler: Concrete unit masonry block filler.
 - 2) Finish Coats: Exterior semi-gloss acrylic enamel.

3. Exterior Ferrous Metal:
 - a. Semi-gloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Exterior ferrous-metal primer.
 - 2) Finish Coats: Exterior semi-gloss alkyd enamel.
4. Exterior Zinc-Coated Metal (except Raceways):
 - a. Semi-gloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Exterior zinc-coated metal primer.
 - 2) Finish Coats: Exterior semi-gloss alkyd enamel.
5. Interior Concrete and Masonry (Other Than Concrete Unit Masonry):
 - a. Semi-gloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Interior concrete and masonry primer.
 - 2) Finish Coats: Interior semi-gloss alkyd enamel.
6. Interior Concrete Unit Masonry:
 - a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over block filler.
 - 1) Block Filler: Concrete unit masonry block filler.
 - 2) Finish Coats: Interior semi-gloss acrylic enamel.
7. Interior Gypsum Board:
 - a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Interior gypsum board primer.
 - 2) Finish Coats: Interior semi-gloss acrylic enamel.
8. Interior Ferrous Metal:
 - a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Interior ferrous-metal primer.
 - 2) Finish Coats: Interior semi-gloss acrylic enamel.
9. Interior Zinc-Coated Metal (except Raceways):
 - a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Interior zinc-coated metal primer.
 - 2) Finish Coats: Interior semi-gloss acrylic enamel.

- C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Painted Identification: Comply with requirements in the painting specification section for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Install labels at 30-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

- a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Conductors to Be Extended in the Future: Attach write-on tags or marker tape to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
- 1. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels, Baked-enamel warning signs, or Metal-backed, butyrate warning signs.

1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer, load shedding, etc.
- L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Adhesive film label; Adhesive film label with clear protective overlay; Self-adhesive, engraved, laminated acrylic or melamine label; or Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label; or Stenciled legend 4 inches high.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION

SECTION 260923

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of the Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Indoor occupancy sensors.
- B. See Division 26 Section "Wiring Devices" for manual light switches.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 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.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Hubbell Lighting.
 - 2. Leviton Mfg. Company Inc.
 - 3. Sensor Switch, Inc.

4. TORK.
5. Watt Stopper (The).
6. Or approved equal.

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a fixed time delay for turning lights off, adjustable over a range of 5 to 30 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 10 to 300 fc; keep lighting off when selected lighting level is present.

C. Dual Technology Ultrasonic/PIR Type: Detect occupancy by detecting doppler shifts in transmitted ultrasound and passive infrared heat changes in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot-high ceiling.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 3/4 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
 - 1. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections.
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work and shall be replaced.

END OF SECTION

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Specification sections “General Conditions of the Contract” and “General Requirements” form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI
 - 2. Hospital-grade receptacles
 - 3. Snap switches
 - 4. Solid-state fan speed controls
 - 5. Wall plates

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

- B. 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.
- C. Comply with NFPA 70, National Electrical Code.

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
 - 5. Or approved equal.

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, General Description: 125 V, 20 A, Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
- B. Tamper-Resistant, Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; TR8300
 - b. Hubbell; HBL8300SG
 - c. Leviton; 8300-SGI
 - d. Pass & Seymour; 2095TR
 - e. Or approved equal
 - 2. Description: Labeled to comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. GFCI, Tamper-Resistant, Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; TR8300
 - b. Hubbell; HBL8300SG
 - c. Leviton; T7899-HGT
 - d. Pass & Seymour; 2095HGTR
 - e. Or approved equal
 - 2. Description: Labeled to comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
 - e. Or approved equal.
- C. Pilot Light Switches, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 2221PL for 120 V and 277 V.
 - b. Hubbell; HPL1221PL for 120 V and 277 V.
 - c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
 - d. Pass & Seymour; PS20AC1-PLR for 120 V.
 - e. Or approved equal.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 2221L.
 - b. Hubbell; HBL1221L.
 - c. Leviton; 1221-2L.
 - d. Pass & Seymour; PS20AC1-L.
 - e. Or approved equal.
2. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.5 FAN SPEED CONTROLS

- A. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters. Comply with UL 1917.
1. Continuously adjustable slider, 5 A.
 2. Three-speed adjustable slider, 1.5 A.

2.6 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: 0.035 inch thick, satin-finished stainless steel.
 3. Material for Unfinished Spaces: Galvanized steel.
 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant die-cast aluminum with lockable cover.

2.7 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color. Colors shall be determined by the Department for all products listed.
1. Wiring Devices Connected to Normal Power System: Almond, Gray, Ivory and/or White (may be noted on submittal when returned), unless otherwise indicated or required by NFPA 70 or device listing.
 2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
 - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with "Identification for Electrical Systems" specification section.

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. In healthcare facilities, comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Test straight blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

END OF SECTION

SECTION 262813

FUSES

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Specification sections “General Conditions of the Contract” and “General Requirements” form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, panelboards, switchboards, enclosed controllers and motor-control centers.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- B. 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.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper Bussmann, Inc.
 - 2. Edison Fuse, Inc.
 - 3. Ferraz Shawmut, Inc.
 - 4. Littelfuse, Inc.
 - 5. Or approved equal.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Class RK1, time delay; class RK1, fast acting; class L, fast acting; class L, time delay; class J, fast acting; class J, time delay; or class T, fast acting.
2. Feeders: Class RK1, time delay; class RK1, fast acting; class RK5, time delay; class RK5, fast acting; class L, fast acting; class L, time delay; class J, fast acting; or class J, time delay.
3. Motor Branch Circuits: Class RK1, time delay; or class RK5, time delay.
4. Other Branch Circuits: Class RK1, time delay; class RK5, time delay; class J, fast acting; or class J, time delay.
5. Control Circuits: Class CC, time delay; or class CC, fast acting.

3.3 INSTALLATION

- #### A.
- Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

- #### A.
- Install labels complying with requirements for identification detailed in "Identification for Electrical Systems" specification section and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

END OF SECTION

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Specification sections “General Conditions of the Contract” and “General Requirements” form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches
 - 2. Nonfusible switches
 - 3. Molded-case circuit breakers (MCCBs)
 - 4. Molded-case switches
 - 5. Enclosures

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of NRTL listing for series rating of installed devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device, when requested by the Professional.

- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in General Conditions and Requirements Specification Sections include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device, when requested by the Professional.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- 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, National Electrical Code.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 - 2. Altitude: Not exceeding 6600 feet.
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Using Agency or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Department and Using Agency no fewer than five days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without Department's written permission.
 - 4. Comply with NFPA 70E.

1.7 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. Siemens Energy & Automation, Inc.
 - 3. Square D; a brand of Schneider Electric.
 - 4. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 5. Or approved equal.
- B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Six Pole, Single Throw, 240 or 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Double Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum conductors.
 - 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.

6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical or Compression type, suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment.
9. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac, 120-V ac, 208-V ac, 240-V ac, 6-V dc, 12-V dc, or 24-V dc, as required.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. Siemens Energy & Automation, Inc.
 3. Square D; a brand of Schneider Electric.
 4. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 5. Or approved equal.
- B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Six Pole, Single Throw, 240 or 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Double Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum conductors.
 4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
 5. Hookstick Handle: Allows use of a hookstick to operate the handle.
 6. Lugs: Mechanical or Compression type, suitable for number, size, and conductor material.
 7. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac, 120-V ac, 208-V ac, 240-V ac, 6-V dc, 12-V dc, or 24-V dc, as required.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. Siemens Energy & Automation, Inc.
 - 3. Square D; a brand of Schneider Electric.
 - 4. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 5. Or approved equal.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, fully rated to interrupt symmetrical short-circuit current available at terminals (series-connected rating **NOT** acceptable).
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
 - 4. Ground-fault pickup level, time delay, and I^2t response.
- F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- G. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- I. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- J. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical or Compression type, suitable for number, size, trip ratings, and conductor material.

3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Communication Capability: Circuit-breaker-mounted, Universal-mounted, Integral, or Din-rail-mounted communication module with functions and features compatible with power monitoring and control system, specified in "Electrical Power Monitoring and Control" Specification Section.
6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
8. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
9. Alarm Switch: One NO or NC contact (as required) that operates only when circuit breaker has tripped.
10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
11. Zone-Selective Interlocking: Integral with electronic or ground-fault trip unit; for interlocking ground-fault protection function.
12. Electrical Operator: Provide remote control for on, off, and reset operations.
13. Accessory Control Power Voltage: Integrally mounted, self-powered; 24-V ac, 120-V ac, 208-V ac, 240-V ac, 6-V dc, 12-V dc, or 24-V dc, as required.

2.4 MOLDED-CASE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. Siemens Energy & Automation, Inc.
 3. Square D; a brand of Schneider Electric.
 4. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 5. Or approved equal.
- B. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- C. Features and Accessories:
 1. Standard frame sizes and number of poles.
 2. Lugs: Mechanical or Compression type, suitable for number, size, trip ratings, and conductor material.
 3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.

4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
6. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
7. Alarm Switch: One NO or NC contact (as required) that operates only when switch has tripped.
8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
10. Electrical Operator: Provide remote control for on, off, and reset operations.
11. Accessory Control Power Voltage: Integrally mounted, self-powered; 24-V ac, 120-V ac, 208-V ac, 240-V ac, 6-V dc, 12-V dc, or 24-V dc, as required.

2.5 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location. Use as described below unless noted otherwise.
 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.
 3. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Non-corrosive Liquids: NEMA 250, Type 12.
 6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7 or Type 9, (as required).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements in "Hangers and Supports for Electrical Systems" specification section.

- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in "Identification For Electrical Systems" specification section.
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Acceptance Testing:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as required.

END OF SECTION

SECTION 265100
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Specification sections “General Conditions of the Contract” and “General Requirements” form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures, lamps, and ballasts
 - 2. Exit signs
 - 3. Lighting fixture supports

1.3 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.
- B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

1.4 LIGHTING FIXTURE SUBSTITUTION

- A. The light fixture manufacturers catalog numbers describing the various types of light fixtures shall be used as a guide only and does not exclude all required accessories or hardware that may be required for a complete installation.
- B. The selected lighting fixtures, which are specified by manufacturer and catalog number, indicate the style, quality and photometric requirements desired and shall be utilized as a guide only by this Contractor in the purchasing of lighting fixtures. However, final approval of all light fixtures, whether it be those specified or their substitution, must be obtained by the Department before installation.

- C. If this Contractor elects to furnish lighting fixtures other than those specified, he shall submit all necessary and required photometric data, distribution curves, isolux charts, glare factor data, etc., along with catalog cuts and data sheets for each light fixture in order to properly analyze, evaluate and compare the light fixtures in question. In addition, the Department reserves the right to request that the Contractor furnish and submit a sample of each proposed substituted lighting fixture to an independent testing laboratory to confirm reports of the data previously submitted. The testing laboratory shall be one selected by the Department and the Contractor shall be responsible for paying all costs incurred thereof for these tests.

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. Comply with NFPA 70, National Electrical Code.
- C. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

1.6 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including but not limited to HVAC equipment, fire-suppression system, partition assemblies, etc.

1.7 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
 - 2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: 7 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.
- B. Special Warranty for Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Electronic Ballasts: 5 years from date of Substantial Completion.
2. Warranty Period for Electromagnetic Ballasts: 3 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for each lighting fixture is based on the product named in the lighting fixture schedule located on the drawings. Subject to compliance with requirements, provide either the named product or an approved equal.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Incandescent Fixtures: Comply with UL 1598.
- C. Fluorescent Fixtures: Comply with UL 1598.
- D. Metal Parts: Free of burrs and sharp corners and edges.
- E. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools, unless tamperproof type fixture. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- G. Diffusers (lenses), Covers, and Globes:
 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
 - b. UV stabilized.
 2. Glass: Annealed crystal glass, unless otherwise indicated.
- H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 1. Label shall include the following lamp and ballast characteristics:

- a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
 - c. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
 - d. CCT and CRI for all luminaires.
- I. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic-interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.
 - J. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly.
 - 1. Air-Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
 - 2. Heat Removal Units: Air path leads through lamp cavity.
 - 3. Combination Heat Removal and Air-Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air supply units.
 - 4. Dampers: Operable from outside fixture for control of return-air volume.
 - 5. Static Fixture: Air-supply slots are blanked off, and fixture appearance matches active units.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Fluorescent Ballasts:

- 1. Comply with NEC 410.130 (G):
Fluorescent luminaires that utilize double-ended lamps and contain ballast(s) that can be serviced in place shall have a disconnecting means either internal or external to each luminaire. For existing installed luminaires without disconnecting means, at the time a ballast is replaced, a disconnecting means shall be installed. The line side terminals of the disconnecting means shall be guarded.

B. General Requirements for Electronic Ballasts:

- 1. Comply with UL 935 and with ANSI C82.11.
- 2. Designed for type and quantity of lamps served.
- 3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
- 4. Sound Rating: Class A.
- 5. Total Harmonic Distortion Rating: Less than 10 percent.
- 6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
- 7. Operating Frequency: 42 kHz or higher.
- 8. Lamp Current Crest Factor: 1.7 or less.
- 9. BF: 0.88 or higher.
- 10. Power Factor: 0.95 or higher.

- C. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.
- D. Electronic Programmed-Start Ballasts for T5, T8, and T5HO Lamps: Comply with ANSI C82.11 and the following:
 - 1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
 - 2. Automatic lamp starting after lamp replacement.
- E. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.
 - 1. Ballast Manufacturer Certification: Indicated by label.
- F. Single Ballasts for Multiple Lighting Fixtures: Factory-wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.
- G. Ballasts for Low-Temperature Environments:
 - 1. Temperatures 0 Deg F and Higher: Electronic or electromagnetic type rated for 0 deg F starting and operating temperature with indicated lamp types.
 - 2. Temperatures Minus 20 Deg F and Higher: Electromagnetic type designed for use with indicated lamp types.
- H. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR 18, Chapter 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

- A. Description: Electronic programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
 - 1. Lamp end-of-life detection and shutdown circuit.
 - 2. Automatic lamp starting after lamp replacement.
 - 3. Sound Rating: A.
 - 4. Total Harmonic Distortion Rating: Less than 20 percent.
 - 5. Transient Voltage Protection: IEEE C62.41 and IEEE C62.41.2, Category A or better.
 - 6. Operating Frequency: 20 kHz or higher.
 - 7. Lamp Current Crest Factor: 1.7 or less.
 - 8. BF: 0.95 or higher unless otherwise indicated.
 - 9. Power Factor: 0.95 or higher.
 - 10. Interference: Comply with 47 CFR 18, Chapter 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.5 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.6 FLUORESCENT LAMPS

- A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.
- B. T8 rapid-start low-mercury lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 82 (minimum), color temperature 3500 K, and average rated life 20,000 hours, unless otherwise indicated.
- C. T8 rapid-start low-mercury lamps, rated 17 W maximum, nominal length of 24 inches, 1300 initial lumens (minimum), CRI 82 (minimum), color temperature 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.
- D. T5 rapid-start low-mercury lamps, rated 28 W maximum, nominal length of 45.2 inches, 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 3000 K, and average rated life of 20,000 hours, unless otherwise indicated.
- E. T5HO rapid-start, high-output low-mercury lamps, rated 54 W maximum, nominal length of 45.2 inches, 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 4100 K, and average rated life of 20,000 hours, unless otherwise indicated.
- F. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start, and where required, suitable for use with dimming ballasts, unless otherwise indicated.
 - 1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
 - 2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
 - 3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).

4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
6. 57 W: T4, triple tube, rated 4300 initial lumens (minimum).
7. 70 W: T4, triple tube, rated 5200 initial lumens (minimum).

2.7 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with "Hangers and Supports For Electrical Systems" specification section for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2 inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2 inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. The drawings show the lighting fixture locations as accurately as possible, however the Department reserves the right of final approval of all light fixture locations.
- B. This Contractor shall furnish a complete complement of luminaires and required associated appurtenances, including all lamps and accessory wiring. This Contractor shall provide all labor and materials necessary to assemble, install and test the specified equipment in the manner indicated. Lighting equipment shall be as described herein and detailed on the drawings in the lighting fixture schedule.
- C. Every lighting outlet shall have a lighting fixture unless otherwise directed. In instances where a specific type of light fixture has not been assigned to an outlet, provide a complete light fixture of the type and wattage designed for outlets of similar function and/or type as directed by the Department.

- D. This Contractor shall furnish all necessary additional auxiliary supporting steel for light fixture not mounted on building framework, and where necessary to span the ceiling channels of hung ceiling construction. Where light fixtures are installed in lay-in type ceilings, this Contractor shall be responsible to support light fixtures from building framework. The ceiling system shall not support the light fixtures. Light fixture support wires shall be installed as close to vertical as practical. Each light fixture shall have at least two (2) separate support wires at opposite corners. Light fixture support wire shall be #12 plated steel wire.
- E. Light fixtures and/or fixture outlet boxes shall be provided with hangers to adequately support the complete weight of the light fixture. Design of hangers and method of fastening other than shown on the drawings, or herein specified shall be submitted to the Department for approval.
- F. All plaster frames, channels, clips, yokes, and other necessary materials and hardware for the installation and support of the light fixtures shall be furnished and installed by this Contractor. The outlet boxes shall not be used to support the light fixture. Where fixture studs are used, they shall be the type that are inserted from the back of the box.
- G. Light fixtures mounted on outlet boxes shall be rigidly secured to a fixture stud in the outlet box. Hickies or extension pieces shall be installed where required to facilitate proper installation.
- H. Where light fixtures are installed in an accessible or lay-in type ceiling, junction boxes shall be installed at convenient locations above the ceiling. As approved by the NEC, flexible conduits shall be used to connect the junction boxes and the light fixtures to use for the circuit conductors. Where light fixtures are installed flush with the ceiling line over which the light fixtures shall be mounted, insulated conductors, as approved by the NEC, shall be spliced in through a rubber grommited knockout.
- I. Flush mounted recessed light fixtures shall be installed so as to completely eliminate light leakage between the frame and the finished surface. Light fixture housing frame or canopy shall provide a suitable cover for the light fixture outlet box or opening.
- J. This Contractor shall confirm the type of ceiling construction. This Contractor shall be responsible for ordering the proper light fixtures with hardware for installation in or on the specified ceiling, which shall include all necessary and required plaster frames.
- K. Unless specifically noted in the light fixture specification, the finish exposed metal surfaces shall be baked white enamel or satin aluminum. As specified, all recessed light fixtures shall be of size to fit structural conditions. All recessed light fixtures shall be equipped with frames and accessories required to fit the ceiling construction in which they occur, whether or not they are included in the individual light fixture specifications.
- L. When recessed lighting fixtures are installed in fire resistant type suspended ceiling construction, they shall be furnished with fireproof boxes of materials with the same fire rating as the ceiling panels in conformance with the building materials list of the Underwriters' Laboratory, Inc. Minimum clearance between the lighting fixture and the fireproofing box shall be 6".

- M. Clean lighting fixtures of dirt and debris upon completion of installation and protect installed fixtures from damage during remainder of construction period.
- N. Upon completion of installation of lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

3.2 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- C. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.
- D. Adjust aimable lighting fixtures to provide required light intensities.

3.3 FIELD QUALITY CONTROL

- A. Test lighting system to demonstrate compliance with design intent and lighting standards. Correct any deficiencies identified and retest.
- B. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

END OF SECTION

DATE OF ISSUE:
May 4, 2012

DEPARTMENT OF GENERAL SERVICES
BUREAU OF PROFESSIONAL SELECTIONS AND ADMINISTRATIVE SERVICES
18TH AND HERR STREETS
HARRISBURG, PENNSYLVANIA

BULLETIN NO. 1

on

Project No. D.G.S. A 502-87 - RENOVATE HILLTOP WEST WARD 7, CLARKS SUMMIT
STATE HOSPITAL, CLARKS SUMMIT, LACKAWANNA COUNTY, PENNSYLVANIA,
Department of General Services, Bureau of Engineering and Architecture, 18th and Herr
Streets, Harrisburg, Pennsylvania 17125.

Bid Date - Wednesday, May 9, 2012
Time of Opening - 2:00 o'clock P.M.

CLARIFICATIONS/QUESTIONS TO THE SPECIFICATIONS

Question:

Toilet Room Ceiling: Floor plan indicates plaster ceiling. Ceiling plan indicates gypsum board ceiling. Please clarify.

Answer:

Ceiling plan is correct. See Specification Section 09260, Page 1.

Question:

Fireproofing detail number on floor plan are 0440 and 0442. These numbers are not shown on the larger, fireproofing details. Please clarify.

Answer:

Numbering system of Details changed with REVISED Details. See Drawing A-1 of 2 reissued and attached to this Bulletin.

Question:

Do you know the height of the existing corridor partitions? Are the new fireproof walls to extend from top of existing partitions to roof deck.

Answer:

Verify corridor walls at site. There are no 'new' fireproof walls to extend. The existing corridor walls go up to underside of roof deck. These walls need fireproof per Details 1, 2 and 3.

Question:

Antiligature requirements are indicated for wall panels and grab bars. Please explain what this means.

Answer:

Antiligature means 'suicideproof'. The wall hand railings, toilet grab bars, etc., are designated to be antiligature as noted in contract documents.

CMR

Question:

On Drawing A-2: It shows to install a new 16 GA. Steel Door - There are no specifications in the book, is there going to be more information regarding the door made available? Is there just the one (1) door?

Answer:

The information is not in the specifications. Remove existing door; install new to match existing size. See Note 'X' at NEW FLOOR PLAN Drawing A-2 of 2. There is just the one (1) door (at restroom).

Section 07841, Paragraph 3.4 should read:

See Drawing A-1 of 2 (REISSUED) for Firestopping Details. Disregard all Details originally part of specifications.

Section 09775, Paragraph 2.2 ADD the following:

- C. Bumper guards shall be product number, Model SCR-80M.
- D. New handrails shall be Model HRB 4-C

CLARIFICATIONS TO THE DRAWINGS

Drawing Sheet A-1 of 2:

- Sheet A-1 of 2 revisions date 5-2-2012 is reissued and is a part of this Bulletin.

ADDITIONAL INFORMATION/CLARIFICATION TO THE DGS A 502-87.3 CONTRACT

- Provide 5, 24-volt zone valves. One on new fin tube radiator located in toilet room and 4 in adjacent shower/toilet room on existing fin radiator supply lines. Provide plenum rated MC cable to chase area connected to a zone control panel. Provide three new thermostats (1 in toilet room, 1 in adjacent shower room and 1 in adjacent toilet room) with plenum rated control wiring wired down along walls in wire mold to radiation.

ADDITIONS TO THE SPECIFICATIONS

- Section 07810 - Applied Fireproofing

Gary R. Taylor P.E. No 67

GARY R. TAYLOR, P.E., DIRECTOR
BUREAU OF ENGINEERING & ARCHITECTURE

Call Bidders Services, Telephone
No. (717) 787-3923, for names of those
who have secured plans and specifications.

PLEASE ACKNOWLEDGE RECEIPT OF FAX WITHIN 24 HOURS BY COMPLETING
BOTTOM OF PAGE AND FAX TO (717) 772-3399.

NAME

TITLE

DATE

FIRM

SECTION 07810

APPLIED FIREPROOFING

Part 1 GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of Contract" and "General Requirements" form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. Section includes sprayed fire resistive materials (SFRM).

1.3 SUBMITTALS

- A. Provide material submissions for all items as specified in Section 01300, Submittals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

Part 2 PRODUCTS

2.1 MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire resistance design and manufacturer's written instructions.
- B. Fire Resistance Design: Indicated on drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- C. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE RESISTIVE MATERIALS

- A. SFRM: Manufacturer's standard, factory mixed, lightweight, dry formulation complying with indicated fire resistance design, and mixed with water at project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
 - a. Grace, W.R. & Company – Conn. , Grace Construction Products: Monokote MK-6 Series.
 - b. Isolatek International: Cafco 300 or Cafco Blaze Shield II.
 - c. Or another manufacturer approved by the Department as equal.
 2. Application: Designated for exterior use by a qualified testing agency acceptable to authorities having jurisdiction.
 3. Bond Strength: Minimum 200 psf cohesive and adhesive strength based on field testing according to ASTM E 736.
 4. Density: Not less than 15 lb/cu.ft. and as specified in the approved fire resistance design, according to ASTM E 605.
 5. Thickness: As required for fire resistance design indicated, measured according to requirements of fire resistance design or ASTM E 605, whichever is thicker, but not less than 0.375" (9mm).
 6. Combustibility: ASTM E 1354.
 7. Surface Burning Characteristics: Flame spread and smoke developed indexes of 10 or less according to ASTM E 84.
 8. Compressive Strength: Minimum 1200 psf according to ASTM E 761.
 9. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
 10. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
 11. Effect of Impact on Bonding: No cracking, spalling or delamination according to ASTM E 760.
 12. Air Erosion: Maximum weight loss of 0.025 g/sq.ft. in 24 hours according to ASTM E 859.
 13. Resistance to Mold Growth: Treat products with manufacturer's standard antimicrobial formulation to result in no growth after 28 days on specimens per ASTM G 21.
- B. The submission of any product as an equal to the manufacturer and product listed here must include the submission of an equivalent firestopping design with the same hourly rating or better. The design must be approved either by a recognized testing agency or a firestop engineer through an engineering judgment. If approved, any additional products or accessories needed for the comparable design shall be provided at no additional cost to the Department.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer.
- C. Bonding Agency: Product approved by fireproofing manufacturer.

Part 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the work and according to each fire resistance design.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Prime substrates where included in fire resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire resistance design indicated and products as specified, tested and substantiated by test reports; for thickness, primers, sealers, topcoats, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing, as applicable to particular conditions of installation and as required to achieve fire resistant ratings indicated.
- C. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- D. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected and tested and corrections have been made to deficient applications.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special Inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC, 1704.12.
- B. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- C. Prepare test and inspection reports and submit to Professional for review and approval.

3.5 CLEANING AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Repair fireproofing damaged by other work before concealing it with other construction.
- C. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel applied product.

END OF SECTION