# SECTION 220500 - BASIC PLUMBING REQUIREMENTS

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Provide all labor, tools, materials, accessories, parts, transportation, taxes, and related items, essential for installation of the work and necessary to make work, complete, and operational. Provide new equipment and material unless otherwise called for. References to codes, specifications and standards called for in the specification sections and on the drawings mean, the latest edition, amendment and revision of such referenced standard in effect on the date of these contract documents. All materials and equipment shall be installed in accordance with the manufacturer's recommendations.

### 1.2 LICENSING

A. The Contractor shall hold a license to perform the work as issued by the authority having jurisdiction.

B. Plumbing contract work shall be performed by, or under, the direct supervision of a licensed master plumber.

C. Electrical contract work shall be performed by, or under, the direct supervision of a licensed electrician.

### 1.3 PERMITS

A. Apply for and obtain all required permits and inspections, pay all fees and charges including all service charges. Provide certificate of approval from the Authorities Having Jurisdiction prior to request for final payment.

B. Provide electrical inspection certificate of approval from Middle Department Inspection Agency, Commonwealth Inspection Agency, or an Engineer approved Inspection Agency prior to request for final payment.

### 1.4 CODE COMPLIANCE

A. Provide work in compliance with the following:

1. 2020 Building Code of New York State.
2. 2020 Fire Code of New York State.
3. 2020 Plumbing Code of New York State.
4. 2020 Mechanical Code of New York State.
5. 2020 Fuel Gas Code of New York State.
6. 2020 Property Maintenance Code of New York State.
7. 2020 Energy Conservation Code of New York State

8. Accessible and Usable Buildings and Facilities, ICC A117.1 (2009).
9. New York State Department of Labor Rules and Regulations.
10. New York State Department of Health.
11. 2017 National Electrical Code (NEC).
12. Occupational Safety and Health Administration (OSHA).
13. Local Codes and Ordinances.
14. Life Safety Code, NFPA 101.

1.5 GLOSSARY

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| ACI | American Concrete Institute |
| AGA | American Gas Association |
| AGCA | Associated General Contractors of America, Inc. |
| AIA | American Institute of Architects |
| AISC | American Institute of Steel Construction |
| AFBMA | Anti-Friction Bearing Manufacturer's Association |
| AMCA | Air Moving and Conditioning Association, Inc. |
| ANSI | American National Standards Institute |
| ARI | Air Conditioning and Refrigeration Institute |
| ASHRAE | American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. |
| ASME | American Society of Mechanical Engineers |
| ASPE | American Society of Plumbing Engineers |
| ASTM | American Society for Testing Materials |
| AWSC | American Welding Society Code |
| AWWA | American Water Works Association |
| FM | Factory Mutual Insurance Company |
| IBR | Institute of Boiler & Radiation Manufacturers |
| IEEE | Institute of Electrical and Electronics Engineers |
| IRI | Industrial Risk Insurers |
| NEC | National Electrical Code |
| NEMA | National Electrical Manufacturer's Association |
| NESC | National Electrical Safety Code |
| NFPA | National Fire Protection Association |

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| NYS/DEC | New York State Department of Environmental Conservation |
| SBI | Steel Boiler Institute |
| SMACNA | Sheet Metal and Air Conditioning Contractors National Association |
| UFPO | Underground Facilities Protective Organization |
| UL | Underwriter's Laboratories, Inc. |
| OSHA | Occupational Safety and Health Administration |
| XL - GAP | XL Global Asset Protection Services |

1.6 DEFINITIONS

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| Acceptance | Owner acceptance of the project from Contractor upon certification by Owner's Representative. |
| As Specified | Materials, equipment including the execution specified/shown in the contract documents. |
| Basis of Design | Equipment, materials, installation, etc. on which the design is based. (Refer to the article, Equipment Arrangements, and the article, Substitutions.) |
| Code Requirements | Minimum requirements. |
| Concealed | Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade. |
| Coordination Drawings | Show the relationship and integration of different construction elements and trades that require careful coordination during fabrication or installation, to fit in the space provided or to function as intended. |
| Delegated-Design Services | Performance and Design criteria for Contractor provided professional services. Where professional design services or certifications by a design professional are specifically required of a Contractor, by the Contract Documents. Provide products and systems with the specific design criteria indicated.<br>If criteria indicated is insufficient to perform services or certification required, submit a written request for additional information to the Engineer.<br>Submit wet signed and sealed certification by the licensed design professional for each product and system specifically assigned to the Contractor to be designed or certified by a design professional.<br>Examples: structural maintenance ladders, stairs and platforms, pipe anchors, seismic compliant system, wind, structural supports for material equipment, sprinkler hydraulic calculations. |
| Equal, Equivalent, Equal To, Equivalent To, As Directed and As Required | Shall all be interpreted and should be taken to mean "to the satisfaction of the Engineer". |
| Exposed | Work not identified as concealed. |
| Extract | Carefully dismantle and store where directed by Owner's Representative |

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| | and/or reinstall as indicated on drawings or as described in specifications. |
| Furnish | Purchase and deliver to job site, location as directed by the Owner's Representative. |
| Inspection | Visual observations by Owner's site Representative. |
| Install | Store at job site if required, proper placement within building construction including miscellaneous items needed to affect placement as required and protect during construction. Take responsibility to mount, connect, start-up and make fully functional. |
| Labeled | Refers to classification by a standards agency. |
| Manufacturers | Refer to the article, Equipment Arrangements, and the article, Substitutions. |
| Prime Professional | Architect or Engineer having a contract directly with the Owner for professional services. |
| Product Data | Illustrations, standard schedules, performance charts, instructions, brochures, wiring diagrams, finishes, or other information furnished by the Contractor to illustrate materials or equipment for some portion of the work. |
| Provide (Furnish and Install) | Contractor shall furnish all labor, materials, equipment and supplies necessary to install and place in operating condition, unless otherwise specifically stated. |
| Relocate | Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use. |
| Remove | Dismantle and take away from premises without added cost to Owner, and dispose of in a legal manner. |
| Review and Reviewed | Should be taken to mean to be followed by "for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents". |
| Roughing | Pipe, duct, conduit, equipment layout and installation. |
| Samples | Physical full scale examples which illustrate materials, finishes, coatings, equipment or workmanship, and establishes standards by which work will be judged. |
| Satisfactory | As specified in contract documents. |
| Shop Drawings | Fabrication drawings, diagrams, schedules and other instruments, specifically prepared for the work by the Contractor or a Sub-contractor, manufacturer, supplier or distributor to illustrate some portion of the work. |
| Site Representative | Owner's Inspector or "Clerk of Works" at the work site. |
| Submittals Defined (Technical) | Any item required to be delivered to the Engineer for review as requirement of the Contract Documents. |
| | The purpose of technical submittals is to demonstrate for those portions of the work for which a submittal is required, the manner in which the Contractor proposes to conform to the information given and design concepts expressed and required by the Contract Documents. |

1.7 SHOP DRAWINGS/PRODUCT DATA/SAMPLES

A. Provide submittals on all items of equipment and materials to be furnished and installed. Submittals shall be accompanied by a transmittal letter, stating name of project and contractor, name of vendor supplying equipment, number of drawings, titles, specification sections (name and number) and other pertinent data called for in individual sections. Submittals shall have individual cover sheets that shall be dated and contain: Name of project; name of prime professional; name of prime contractor; description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed. Individual piecemeal or incomplete submittals will not be accepted. Similar items, (all types specified) shall be submitted at under one cover sheet per specification section (e.g. valves, plumbing fixtures, etc.). Number each submittal by trade. Indicate deviations from contract requirements on Letter of Transmittal. Submittals will be given a general review only. Corrections or comments made on the Submittals during the review do not relieve Contractor from compliance with requirements of the drawings and specifications. The Contractor is responsible for: confirming and correcting all quantities; checking electrical characteristics and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner. If submitting hard copies, submit four (4) copies for review.

B. If submittals are to be submitted electronically, all requirements in Item A apply. Submittals shall be emailed in PDF format to specific email address provided by the Construction Manager, General Contractor, Architect or Project Manager. Name of project shall be in subject line of email. Send emails to mealbasubmittalclerk@meengineering.com.

C. Refer to Division 01 for additional requirements.

1.8 PROTECTION OF PERSONS AND PROPERTY

A. Contractor shall assume responsibility for construction safety at all times and provide, as part of contract, all trench or building shoring, scaffolding, shielding, dust/fume protection, mechanical/electrical protection, special grounding, safety railings, barriers, and other safety feature required to provide safe conditions for all workmen and site visitors.

1.9 EQUIPMENT ARRANGEMENTS

A. The contract documents are prepared using one manufacturer as the Basis of Design, even though other manufacturers' names are listed. If Contractor elects to use one of the listed manufacturers other than Basis of Design, submit detailed drawings, indicating proposed installation of equipment. Show maintenance clearances, service removal space required, and other pertinent revisions to the design arrangement. Make required changes in the work of other trades, at no increase in any contract. Provide larger motors, feeders, breakers, and equipment, additional control devices, valves, fittings and other miscellaneous equipment required for proper operation, and assume responsibility for proper location of roughing and connections by other trades. Remove and replace doorframes, access doors, walls, ceilings, or floors required to install other than Basis of

Design. If revised arrangement submittal is rejected, revise and resubmit specified Basis of Design item which conforms to Contract Documents.

1.10 SUBSTITUTIONS

A. If Contractor desires to bid on any other kind, type, brand, or manufacture of material or equipment than those named in specifications, secure prior approval. To request such approval, Contractor shall submit complete information comparing (item-for-item) material or equipment offered with design material or equipment. Include sufficient information to permit quick and thorough comparison, and include performance curves on same basis, capacities, power requirements, controls, materials, metal gauges, finishes, dimensions, weights, etc., of major parts. If accepted, an addendum will be issued to this effect ahead of bid date. Unless such addendum is issued, substitution offered may not be used.

1.11 UTILITY COMPANY SERVICES

A. Division 26 shall make arrangements with National Grid for electric service to the Owner's distribution equipment. Provide underground or overhead electric service as called for and transformers, meter sockets or meter compartments as required by the Utility Company. Coordinate all activities between the Owner and Utility Company. The installation of the electric service shall comply with the published Utility Company standards

B. Division 22 shall make arrangements with National Grid for gas service to the Owner's distribution system. Provide service to the building as required by the Utility Company. Coordinate all activities between the Owner and Utility Company. The installation of the gas service shall comply with the published Utility Company standards

1.12 ROUGHING

A. The Contract Drawings have been prepared in order to convey design intent and are diagrammatic only. Drawings shall not be interpreted to be fully coordinated for construction.

B. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, interferences, etc. Make necessary changes in contract work, equipment locations, etc., as part of a contract to accommodate work to avoid obstacles and interferences encountered. Before installing, verify exact location and elevations at work site. DO NOT SCALE plans. If field conditions, details, changes in equipment or shop drawing information require an important rearrangement, report same to Owner's Representative for review. Obtain written approval for all major changes before installing.

C. Install work so that items both existing and new are operable and serviceable. Eliminate interference with removal of coils, motors, filters, belt guards and/or operation of doors. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation. Provide new materials, including new piping and insulation for relocated work.

D. Coordinate work with other trades and determine exact route or location of each duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Obtain from Owner's Representative exact location of all equipment in finished areas, such as thermostat, fixture, and switch mounting heights, and equipment mounting heights. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers, and other items. Do not rough-in contract work without reflected ceiling location plans.

E. Before roughing for equipment furnished by Owner or in other Divisions, obtain from Owner and other Divisions, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. For equipment and connections provided in this contract, prepare roughing drawing as follows:

1. Existing Equipment: Measure the existing equipment and prepare for installation in new location.

2. New Equipment: Obtain equipment roughing drawings and dimensions, then prepare roughing-in-drawings. If such information is not available in time, obtain an acknowledgement in writing, then make space arrangements as required with Owner's Representative.

1.13 COORDINATION DRAWINGS

A. Before construction work commences, Divisions for all trades shall submit coordination drawings in the form of CAD drawing files, drawn at not less than 1/4 in. scale. Such drawings will be required throughout all areas, for all Contracts. These drawings shall show resolutions of trade conflicts in congested areas. Mechanical Equipment Rooms shall be drawn early in coordination drawing process simultaneous with all other congested areas. Prepare Coordination Drawings as follows:

1. Division 23 shall prepare the base plan CAD coordination drawings showing all ductwork, all pertinent heating piping, and equipment. These drawings may be CAD files of the required Ductwork Shop Drawings. The drawings shall be coordinated with lighting fixtures, sprinklers, air diffusers, other ceiling mounted items, ceiling heights, structural work, maintenance clearances, electric code clearance, reflected ceiling plans, and other contract requirements. Reposition proposed locations of work after coordination drawing review by the Owner's Representative. Provide adjustments to exact size, location, and offsets of ducts, pipes, conduit, etc., to achieve reasonable appearance objectives. Provide these adjustments as part of contract. Minor revisions need not be redrawn.

2. Division 23shall provide CAD files and submit the base plan CAD Coordination Drawings to all Divisions.

3. Divisions 21 and 22 shall draw the location of piping and equipment on the base plan CAD Coordination Drawings, indicating areas of conflict and suggested resolutions.

4. Divisions 26, 27 and 28 shall draw the location of lighting fixtures, cable trays, and feeders over 1-1/2 in. on the base plan CAD Coordination Drawings, indicating areas of conflict and suggested resolution.

5. The General Construction Trade shall indicate areas of architectural/structural conflicts or obstacles on the CAD Coordination Drawings, and coordinate to suit the overall construction schedule.

6. The General Construction Trade shall expedite all Coordination Drawing work and coordinate to suit the overall construction schedule. In the case of unresolved interferences, he shall notify the Owner's Representative. The Owner's Representative will then direct the various trades as to how to revise their drawings as required to eliminate installation interferences.

7. If a given trade proceeds prior to resolving conflicts, then if necessary, that trade shall change its work at no extra cost in order to permit others to proceed with a coordinated installation. Coordination approval will be given by areas after special site meetings involving all Divisions.

B. The purpose of the coordination drawing process is to identify and resolve potential conflicts between trades, and between trades and existing or new building construction, before they occur in construction. Coordination drawings are intended for the respective trade's use during construction and shall not replace any Shop Drawings, or record drawings required elsewhere in these contract documents.

1.14 EQUIPMENT AND MATERIAL REQUIREMENTS

A. Provide materials that meet the following minimum requirements:

1. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.

2. All equipment and material for which there is a listing service shall bear a UL label.

3. Potable water systems and equipment shall be built according to AWWA Standards.

4. Gas-fired equipment and system shall meet AGA Regulations and shall have AGA label.

5. Fire protection equipment shall be UL listed and FM approved.

B. Exterior and wet locations shall utilize materials, equipment supports, mounting, etc. suitable for the intended locations. Metals shall be stainless steel, galvanized or with baked enamel finish as a minimum. Finishes and coatings shall be continuous and any surface damaged or cut ends shall be field corrected in accordance with the manufacturer's recommendations. Hardware (screws, bolts, nuts, washers, supports, fasteners, etc.) shall be:

1. Stainless steel where the associated system or equipment material is stainless steel or aluminum.

2. Hot dipped galvanized or stainless steel where the associated system or equipment is steel, galvanized steel or other.

1.15 CUTTING AND PATCHING

A. Each trade shall include their required cutting and patching work unless shown as part of the General Construction Contract. Refer to General Conditions of the Contract for Construction, for additional requirements. Cut and drill from both sides of walls and/or floors to eliminate splaying. Patch cut or abandoned holes left by removals of equipment or fixtures. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering, other finished surfaces. Patch openings and damaged areas equal to existing surface finish. Cut openings in prefabricated construction units in accordance with manufacturer's instructions.

1.16 PAINTING

A. Paint all insulated and bare piping, pipe hangers and supports exposed to view in mechanical equipment rooms, penthouse, boiler rooms and similar spaces. Paint all bare piping, ductwork and supports exposed to the out-of-doors with rust inhibiting coatings. Paint all equipment that is not factory finish painted (i.e. expansion tanks, etc.).

B. All painting shall consist of one (1) prime coat and two (2) finish coats of non-lead oil base paint, unless otherwise indicated herein. Provide galvanized iron primer for all galvanized surfaces. All surfaces must be thoroughly cleaned before painting. Review system color coding prior to painting with the Owner's Representative or Architect.

C. All items installed after finished painting is completed and any damaged factory finish paint on equipment furnished under this contract must be touched up by the Contractor responsible for same.

D. Include painting for patchwork with color to match adjacent surfaces. Where color cannot be adequately matched, paint entire surface. Provide one (1) coat of primer and two (2) finish coats or as called for in the Specifications.

E. All primers and paint used in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits called for in the current version of U.S. Green Building Council LEED Credits EQ 4.1 and EQ 4.2.

F. Refer to Division 9 - Finishes, for additional information.

1.17 CONCEALMENT

A. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his review. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

1.18 CHASES

A. New Construction:

1. Certain chases, recesses, openings, shafts, and wall pockets will be provided as part of General Construction Trade. Mechanical and Electrical trades shall provide all other openings required for their contract work.

2. Check Architectural and Structural Design and Shop Drawings to verify correct size and location for all openings, recesses and chases in general building construction work.

3. Assume responsibility for correct and final location and size of such openings.

4. Rectify improperly sized, improperly located or omitted chases or openings due to faulty or late information or failure to check final location.

5. Provide 18 gauge galvanized sleeves and inserts. Extend all sleeves 2 in. above finished floor. Set sleeves and inserts in place ahead of new construction, securely fastened during concrete pouring. Correct, by drilling, omitted or improperly located sleeves. Assume responsibility for all work and equipment damaged during course of drilling. Firestop all unused sleeves.

6. Provide angle iron frame where openings are required for contract work, unless provided by General Construction trade.

1.19 PENETRATION FIRESTOPPING

A. Fire-Stopping for Openings Through Fire and Smoke Rated Wall and Floor Assemblies:

1. Provide materials and products listed or classified by an approved independent testing laboratory for "Penetration Fire-Stop Systems". The system shall meet the requirements of "Fire Tests of Penetrations Fire-Stops" designated ASTM E814.

2. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.

3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.

4. The methods used shall incorporate qualities which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion, and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.

5. Plastic pipe/conduit materials shall be installed utilizing intumescent collars.

6. Provide a submittal including products intended for use, manufacturer's installation instructions, and the UL details for all applicable types of wall and floor penetrations.

7. Fire-stopping products shall not be used for sealing of penetrations of non-rated walls or floors.

B. Acceptable Manufacturers:

1. Dow Corning Fire-Stop System Foams and Sealants.

2. Nelson Electric Fire-Stop System Putty, CLK and WRP.

3. S-100 FS500/600, Thomas & Betts.

4. Carborundum Fyre Putty.

5. 3-M Fire Products.

6. Hilti Corporation.

1.20 NON-RATED WALL PENETRATIONS

A. Each trade shall be responsible for sealing wall penetrations related to their installed work, including but not limited to ductwork, piping, conduits, etc. See individual specification sections for requirements.

1.21 SUPPORTS

A. Provide required supports, beams, angles, hangers, rods, bases, braces, and other items to properly support contract work. Modify studs, add studs, add framing, or otherwise reinforce studs in metal stud walls and partitions as required to suit contract work. If necessary, in stud walls, provide special supports from floor to structure above.

B. For precast panels/planks and metal decks, support mechanical/electrical work as determined by manufacturer and the Engineer. Provide heavy gauge steel mounting plates for mounting contract work. Mounting plates shall span two or more studs. Size, gauge, and strength of mounting plates shall be sufficient for equipment size, weight, and desired rigidity.

C. For finished areas without a finished ceiling system such as classrooms, offices, conference rooms, etc., where decking and structure is exposed, and ductwork/piping/conduit is exposed: All mounting brackets, channel support systems and mounting hardware for ductwork, piping, lighting, etc. shall be concealed and approved by the Architect/Engineer prior to the installation. AirCraft cable style hanging for ductwork is required. It is recommended that room mockups be done and receive Architect/Engineer approval prior to proceeding with installation.

D. Equipment, piping, conduit, raceway, etc. supports shall be installed to minimize the generation and transmission of vibration.

E. Materials and equipment shall be solely supported by the building structure and connected framing. Gypboard, ceilings, other finishes, etc. shall not be used for support of materials and equipment.

1.22 ACCESS PANELS

A. Provide access panels for required access to respective trade's work. Location and size shall be the responsibility of each trade. Access panels provided for equipment shall provide an opening not smaller than 22 in. by 22 in. Panels shall be capable of opening a minimum of 90 degrees. Bear cost of construction changes necessary due to improper information or failure to provide proper information in ample time. Access panels over 324 square inches shall have two cam locks. Provide proper frame and door type for various wall or ceiling finishes. Access panels shall be equal to "Milcor" as manufactured by Inland Steel Products Co., Milwaukee, Wisconsin. Provide General Construction trade with a set of architectural plans with size and locations of access panels.

1.23 CONCRETE BASES

A. Provide concrete bases for all floor mounted equipment. Provide 3,000 lb. concrete, chamfer edges, trowel finish, and securely bond to floor by roughening slab and coating with cement grout. Bases 4 in. high (unless otherwise indicated); shape and size to accommodate equipment. Provide anchor bolts in equipment bases for all equipment provided for the project, whether mounted on new concrete bases or existing concrete bases.

1.24 HVAC EQUIPMENT CONNECTIONS

A. Contractor is responsible for draining, filling, venting, chemically treating and restarting any systems which are affected by work shown on the Contract Documents unless specifically noted otherwise.

B. Provide final connections to all equipment as required by the equipment. Provide final connections, including domestic water piping, wiring, controls, and devices from equipment to outlets left by other trades. Provide equipment waste, drip, overflow and drain connections extended to floor drains.

C. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, insulation, sheet metal work, controls, dampers, as required.

1.25 PLUMBING EQUIPMENT CONNECTIONS

A. Contractor is responsible for draining, filling, venting, chemically treating and restarting any systems which are affected by work shown on the Contract Documents unless specifically noted otherwise.

B. Provide roughing and final connections to all equipment. Provide loose key stops, sanitary "P" traps, tailpiece, adapters, gas or air cocks, and all necessary piping and fittings from roughing point to equipment. Provide installation of sinks, faucets, traps, tailpiece furnished by others. Provide cold water line with gate valve and backflow prevention device at locations called for. Provide continuation of piping and connection to equipment that is furnished by others. Provide relief valve discharge piping from equipment relief valves.

C. Provide valved water outlet adjacent to equipment requiring same. Provide equipment type floor drains, or drain hubs, adjacent to equipment.

D. Install controls and devices furnished by others.

E. Refer to Contract Documents for roughing schedules, and equipment and lists indicating scope of connections required.

F. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, as required.

1.26 ELECTRICAL EQUIPMENT CONNECTIONS

A. Provide complete power connections to all electrical equipment. Provide control connections to equipment. Heavy duty NEC rated disconnect ahead of each piece of equipment. Ground all equipment in accordance with NEC.

B. Provide for Owner furnished and Contractor furnished equipment all power wiring, electric equipment, control wiring, switches, lights, receptacles, and connections as required.

1.27 STORAGE AND PROTECTION OF MATERIALS AND EQUIPMENT

A. Store Materials on dry base, at least 6 in. aboveground or floor. Store so as not to interfere with other work or obstruct access to buildings or facilities. Provide waterproof/windproof covering. Remove and provide special storage for items subject to moisture damage. Protect against theft or damage from any cause. Replace items stolen or damaged, at no cost to Owner.

B. Refer to Division 01 for additional information.

1.28 FREEZING AND WATER DAMAGE

A. Take all necessary precautions with equipment, systems and building to prevent damage due to freezing and/or water damage. Repair or replace, at no change in contract, any such damage to equipment, systems, and building. Perform first seasons winterizing in presence of Owner's operating staff.

1.29 OWNER INSTRUCTIONS

A. Before final acceptance of the work, furnish necessary skilled labor to operate all systems by seasons. Instruct designated person on proper operation, and care of

systems/equipment. Repeat instructions, if necessary. Obtain written acknowledgement from person instructed prior to final payment. Contractor is fully responsible for system until final acceptance, even though operated by Owner's personnel, unless otherwise agreed in writing. List under clear plastic, operating, maintenance, and starting precautions procedures to be followed by Owner for operating systems and equipment.

1.30 OPERATION AND MAINTENANCE MANUALS

A. Submit by email (preferred) or digital media, thru the normal project submittal process. Include a copy of each final approved Shop Drawing, wiring diagrams, piping diagrams, spare parts lists, final testing and balancing report, as-built drawings and manufacturer's instructions. Include typewritten instructions, describing equipment, starting/operating procedures, emergency operating instructions, summer-winter changeover, freeze protection, precautions and recommended maintenance procedures. Include name, address, and telephone number of installing contractor and of supplier manufacturer Representative and service agency for all major equipment items. Provide a table of contents page and dividers based upon specification section numbers. Submit in a compiled and bookmarked PDF format as outlined below.

B. Provide content for Operation and Maintenance Manuals as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Engineer and Commissioning Agent will comment on whether content of operation and maintenance submittals is acceptable.

2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

C. Submit Operation and Maintenance Manuals in the following format:

1. Submit by uploading to web-based project software site, or by email to Architect, as a formal project submittal in conformance with the project specific submittal procedures. Enable reviewer comments on draft submittals.

2. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

3. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in the table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

D. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing Owner training. Engineer and Commissioning Agent will comment on whether general scope and content of manual are acceptable.

E. Final Manual Submittal: Submit O&M manual in final form prior to requesting inspection for Substantial Completion and at least 2 weeks before commencing Owner training. Engineer and Commissioning Agent will return copy with review comments.

1. Correct or revise O&M manual to comply with Engineer's and Commissioning Agent's comments. Submit copies of each corrected manual within 2 weeks of receipt of Engineer's and Commissioning Agent's comments.

F. Refer to Division 01 for additional requirements.

1.31 RECORD DRAWINGS

A. The Contractor shall obtain at his expense one (1) set of construction Contract Drawings, (including non-reproduction black and white prints or electronic files) for the purpose of recording as-built conditions.

B. The Contractor shall perform all survey work required for the location and construction of the work and to record information necessary for completion of the record drawings. Record drawings shall show the actual location of the constructed facilities in the same manner as was shown on the bid drawings. All elevations and dimensions shown on the drawings shall be verified or corrected so as to provide a complete and accurate record of the facilities as constructed.

C. It shall be the responsibility of the Contractor to mark EACH sheet of the contract documents in red and to record thereon in a legible manner, any and all approved field changes and conditions as they occur. A complete file of approved field sketches, diagrams, and other changes shall also be maintained. At completion of the work, the complete set of red marked contract documents, plus all approved field sketches and diagrams shall be submitted to the engineer and used in preparation of the record drawings.

D. A complete set of red marked contract drawings shall be submitted, at one time, as the "Record" set. If there are no changes to a specific drawing, the contractor shall indicate "NO CHANGES" on that drawing. ALL drawings shall be included in the "Record" set.

E. The complete set of red marked Contract Documents or electronic files shall be certified by the Contractor as reflecting record conditions and submitted to the engineer for review.

F. The Contractor shall have the marked up set scanned, if they are not already electronic files, and then submit them to the Engineer as the "Record Set".

G. Refer to Division 01 for additional requirements.

1.32 FINAL INSPECTION

A. Upon completion of all Engineering Site Observation list items, the Contractor shall provide a copy of the Engineering Site Observation Report back to the Engineer with each items noted as completed or the current status of the item. Upon receipt, the Engineer will schedule a final review.

1.33 COMMISSIONING

A. Refer to General Commissioning Requirements in Division 01 for additional requirements.

1.34 TEMPORARY HEATING AND COOLING

A. Refer to the General Conditions of the Contract for Construction and Supplemental General Conditions.

1.35 MAINTENANCE OF HVAC SYSTEMS DURING TEMPORARY USE PERIODS

A. Provide each air handling system with a set of prefilters in addition to the permanent filters. Furnish four sets of prefilters for each system for use when system is operated for temporary heating or cooling. During such use, change prefilters as often as directed by Owner's Representative. Provide MERV-8 filters in all open ended ducts, return grilles and registers to keep dust out of ductwork. Change as often as necessary. Remove all such temporary filters upon completion. Use supply fans only. Do not operate return fans.

B. Blank-off outside air intake opening during temporary heating period. Install first set of permanent filters and prefilters.

C. Adjust dampers on supply system.

D. Set all heating coil control valves for manual operation.

E. Do not install any grilles or diffusers at room terminal ends of ducts until permission is given.

F. Assume responsibility for systems and equipment at all times, even though used for temporary heat or ventilating. Repair or replace all dented, scratched or damaged parts of systems prior to final acceptance.

G. Remove concrete, rust, paint spots, other blemishes, then clean.

H. Just prior to final acceptance, remove used final filter and install new set. Deliver all unused sets of prefilters to the Owner and obtain written receipt. Properly lubricate system bearings before and during temporary use. Maintain thermostats, freeze stats, overload devices, and all other safety controls in operating condition.

1.36 TEMPORARY FACILITIES

A. Refer to the Division 1 Sections, General Conditions and Supplemental General Conditions.

1.37 TEMPORARY LIGHT AND POWER

A. Refer to the Division 1 Sections, General Conditions and Supplemental General Conditions.

1.38 CLEANING

A. It is the Contractor's responsibility to keep clean all equipment and fixtures provided under this contract for the duration of the project. Each trade shall keep the premises free from an accumulation of waste material or rubbish caused by his operations. The facilities require an environment of extreme cleanliness, and it is the Contractor's responsibility to adhere to the strict regulations regarding procedures on the existing premises. After all tests are made and installations completed satisfactorily:

1. Thoroughly clean entire installation, both exposed surfaces and interiors.

2. Remove all debris caused by work.

3. Remove tools, surplus, materials, when work is finally accepted.

1.39 SYSTEM START-UP AND TESTING

A. Prior to commencement of work, the Division(s) effecting such system shall survey all building mechanical, plumbing, fire protection and electrical systems and components and make written notice to the Owner's Representative regarding any damage, missing items and/or incomplete systems. Prior to the conclusion of this project, the Contractor shall verify with the Owner's Representative that all building systems have been returned to their original conditions.

1.40 TRANSFER OF ELECTRONIC FILES

A. M/E Engineering, P.C. will provide electronic files for the Contractor's use in the preparation of sheetmetal shop drawings, coordination drawings, or record drawings related to the project, subject to a and the following terms and conditions:

1. The Contractor shall submit a formal request for electronic drawing files on the M/E Engineering, P.C. website, by utilizing the following website link: http://www.meengineering.com/contact-pages/contractor-request.

2. M/E Engineering, P.C. makes no representation as to the compatibility of these files with the Contractor's hardware or the Contractor's software beyond the specific release of the referenced specifications.

3. M/E Engineering, P.C. can only provide CAD files of M/E/P/FP drawing levels for which we are the Engineer of Record. CAD files of Architectural backgrounds, reflected ceiling plans, structural plans, etc. must be obtained separately from the Architect of Record.

4. Data contained on these electronic files is part of M/E Engineering, P.C.'s instruments of service shall not be used by the Contractor or anyone else receiving data through or from the Contractor for any purpose other than as convenience in the preparation of shop drawings for the referenced project. Any other use or reuse by the Contractor or by others will be at the Contractor's sole risk and without liability or legal exposure to M/E Engineering, P.C. The Contractor agrees to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against M/E

Engineering, P.C., its officers, directors, employees, agents or sub-consultants which may arise out of or in connection with the Contractor's use of the electronic files.

5. Furthermore, the Contractor shall, to the fullest extent permitted by law, indemnify and hold harmless, M/E Engineering, P.C. from all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from the Contractor's use of these electronic files.

6. These electronic files are not contract documents. Significant difference may arise between these electronic files and corresponding hard copy contract documents due to addenda, change orders or other revisions. M/E Engineering, P.C. makes no representation regarding the accuracy or completeness of the electronic files the Contractor receives. In the event that a conflict arises between the signed contract documents prepared by M/E Engineering, P.C. and electronic files, the signed contract documents shall govern. The Contractor is responsible for determining if any conflicts exist. By the Contractor's use of these electronic files the Contractor is not relieved of the Contractor's duty to comply with the contract documents, including and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, field verify conditions and coordinate the Contractor's work with that of other contractors for the project.

1.41 ENERGY INCENTIVES

A. The Contractor, his Subcontractors and Suppliers shall provide to the Owner all paperwork necessary to support the Owners pursuit of incentives related to energy conservation as offered by the utility company or state sponsored incentive programs. This shall include at a minimum, receipts, and quantities and data sheets for energy efficient equipment such as: lighting, motors, variable frequency drives, etc.

END OF SECTION

SECTION 220523 - VALVES

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Document.

### 1.2 SUBMITTALS

A. Submit manufacturer's data in accordance with Basic Mechanical and Electrical Requirements. Obtain approval prior to ordering material.

B. Provide submittals for all items specified under Part 2 of this section.

## PART 2 - PRODUCTS

### 2.1 VALVES - GENERAL

A. Valves shall have following requirements:

1. Working pressure stamped or cast on bodies.

2. Stem packing serviceable without removing valve from line.

3. All items here-in used to convey water for potable use shall be lead free in accordance with NSF Standard, Standard 61, Section 9 - Standard for Drinking Water and Lavatory Faucets and NSF Standard 372 - Maximum Lead Requirements. Compliance shall be via third party testing and certification.

B. Acceptable Manufacturers:

1. Balance Valves: Armstrong, Bell & Gossett, Red White, Taco, Tour and Anderson.

2. Ball Valves: Apollo, Hammond, Milwaukee, Nibco, Red White, Watts.

3. Butterfly Valves: Bray, Jamesbury, Keystone, Milwaukee, Red White, Watts.

4. Gate and Check Valves: Hammond, Milwaukee, Nibco, Red White, Stockham, Watts.

5. To establish a standard of quality and identify features, certain manufacturer's numbers are given in the following paragraphs.

### 2.2 DOMESTIC WATER VALVES

A. Gate Valves:

1. 4 in. and Larger, Hot Water Service: IBBM, solid wedge disc, OS&Y, flanged ends, 125 SWP; Milwaukee F-2885.

2. 4 in. and Larger, Cold Water Service: Epoxy coated, resilient wedge, OS&Y, flanged ends, 175 wwp, UL/FM; Watts 408 RW.

3. 3 in. and Smaller: Bronze, solid wedge disc, rising stem, 125 SWP; Milwaukee 1152 (threaded ends, union bonnet) or Milwaukee 149 (sweat ends, threaded bonnet.)

B. Check Valves:

1. 3 in. and Larger: IBBM, renewable seat and disc, bolted flange cap, flanged ends, 125 SWP; Milwaukee F-2974.

2. 2 in. and Smaller: Lead-free swing check with silicone bronze body, bonnet and trim, PTFE disc seat and stainless steel seat disc washer, 200 psi working pressure, Nibco T-413-Y-LF (threaded) or Nibco's S-413-Y-LF (solder).

3. Silent Type: Lead-free spring check with silicone bronze body, stainless steel trim and PTFE disc: 250 psi working pressure; Nibco T-480-4-LF (threaded) or Nibco S-480-Y-LF (solder).

C. Ball Valves:

1. 2-1/2 in. and Larger: Lead-free, forged copper silicon 2-piece body, chrome plated brass ball, full port, teflon seats and stem packing, separate packing and handle nut, blowout proof stem extended for insulation, vinyl insulator for handle, 600 WOG, 125 WSP; Watts LF-FBV-3C Series (threaded ends) or Watts LF-FBVS-3C series (sweat ends).

2. 2 in. and Smaller: Lead-free, brass 2-piece body, 316 stainless steel ball and stem, full port, teflon seats and stem packing, separate packing and handle nut, blow out proof stem extended for insulation, vinyl insulator for handle, 600 WOG, 150 SWP: Watts #LFB-6080 (threaded ends) or Watts #LFB-6081 (sweat ends).

3. 2 in. and Smaller: True union style, CPVC body and ball, 150 psi, EPDM O-ring seals, constructed for end entrance with socket, flanged or threaded ends, full port design, conforming to and listed by NSF 14 for potable water.

D. Balance Valves:

1. 2 in. and Smaller: Lead-free, brass body, chrome plated brass ball, glass and carbon filled PTFE seat rings, Viton packing, threaded or solder ends, differential readout ports, calibrated nameplate and memory stop indicator rated for 125 psi; and pre-formed insulation to permit access for balancing and readout; Watt Series LFCSM-61-S.

a. Balance valve sizes shall be based upon gpm range rather than pipe size.

| Balance Valve Size | GPM Range |
|---|---|
| 1/2 in. | Up to 2.5 |

| Balance Valve Size | GPM Range |
|---|---|
| 3/4 in. | 2.5 - 4.5 |
| 1 in. | 4.5 - 10 |
| 1-1/4 in. | 10 - 15 |
| 1-1/2 in. | 15 - 30 |
| 2 in. | 30 - 60 |

E. Valves for Gauges and Instruments:

1. 1/2 in. Size: Brass bar stock for 1000 psi and 300°F; Trerice No. 735 needle valve.

F. Hose Thread Drain Valves:

1. Ball valve, bronze body, hardened chrome ball with hose thread end, cap and chain; Watts #B6001CC (sweat connection), Watts #B6000CC (threaded connection).

2.3 GAS VALVES

A. Plug Valves:

1. 2 in. and Smaller: Semi-steel body and plug, short pattern, 100% pipe area round port, full bore lubricated plug, wrench operated with handle, sealing compound suitable with natural gas, threaded ends, 200 WOG, UL Listed for natural gas; Homestead Figure 651.

2. 2-1/2 in. thru 4 in.: Semi-steel body and plug, short pattern, 100% pipe area round port, full bore lubricated plug, wrench operated with handle, sealing compound suitable with natural gas, flanged ends, 200 WOG, UL listed for natural gas; Homestead Figure 652.

3. 6 in. thru 12 in.: Semi-steel body and plug, short pattern, 100% pipe area round port, full bore lubricated plug, gear operated with handle, sealing compound suitable with natural gas, flanged ends, 200 WOG, UL listed for natural gas; Homestead Figure 652-G.

B. Ball Valves:

1. 2 in. and Smaller: Ball type, two-piece, full port, brass body with chrome plated brass ball, teflon seats, threaded ends, 600 psi WOG, UL listed for natural gas, Watts FBV-3C-UL.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide all shutoff, check, balancing and other type valves as indicated, as required by Code and as required for proper system maintenance, isolation and safety. Provide at major building and systems sections. Provide shutoff valves on all branch lines serving

two fixtures or more, at all equipment, fixtures, before and after automatic control valves, and at future connections.

B. Locate valves for easy access and provide separate support where necessary. Install valves with stems at or above the horizontal position. Install swing check valves in horizontal position with hinge pin level.

C. Provide drain valves with hose thread connections on all equipment. Provide hose thread drain valves at all low points to enable complete drainage of all piping systems including, water mains, branches, at base of vertical risers and at strainers.

D. Provide shutoff valve and wye-strainer before all automatic control valves and pressure reducing valves.

E. Inspect valves for proper operation before installation. Install underground valve boxes vertically over each valve. Adjust top of box to proper grade. Immediately backfill with crushed stone and carefully tamp into place. Unless otherwise noted, leave in the open position.

3.2 DOMESTIC WATER SYSTEM

A. The main water service shutoff valve inside the building and valves for a 3 in. and larger water meter assembly shall be OS&Y gate valves in accordance with the local water authority requirements.

B. Install balance valves in each hot water circulation branch and where noted.

3.3 NATURAL GAS SYSTEM

A. Ball valves shall be UL listed for use in natural gas systems, or certified by another acceptable third-party testing agency.

END OF SECTION

SECTION 220553 - PLUMBING IDENTIFICATION

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

### 1.2 QUALIFICATIONS

A. All identification devices shall comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles.

### 1.3 SUBMITTALS

A. Submit manufacturer's technical product data and installation instructions for each identification material and device. Submit valve schedule for each piping system typewritten on an 8-1/2 in. x 11 in. paper (minimum), indicating valve number, location and valve function. Submit schedule of pipe, equipment and name identification for review before stenciling or labeling.

### 1.4 MAKES

A. Allen Systems, Inc., Brady (W.H.) Co.; Signmark Div., Industrial Safety Supply Co., Inc., Seton Name Plate Corp.

## PART 2 - PRODUCTS

### 2.1 GENERAL

A. Provide manufacturer's standard products of categories and types required for each application. In cases where there is more than one type specified for an application, selection is installer's option, but provide single selection for each product category.

B. All adhesives used for labels in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits as called for in the current version of U.S. Green Building Council LEED Credits EQ 4.1 and EQ 4.2.

### 2.2 PIPING IDENTIFICATION

A. Identification Types:

1. Pressure Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color coded, pressure sensitive vinyl pipe markers complying with ANSI A13.1. Provide a 360° wrap of flow arrow tape at each end of pipe label.

| O.D. PIPE OR COVERING | SIZE STENCIL LETTER |
|---|---|
| 3/4 in., 1 in., 1-1/4 in. | 1/2 in. |
| 1-1/2 in., 2 in. | 3/4 in. |
| 2-1/2 in. and over | 1-1/4 in. |

B. Lettering:

1. Piping labeling shall conform to the following list:

| PIPE FUNCTION | IDENTIFICATION |
|---|---|
| Cold Water | DOMESTIC COLD WATER |
| Hot Water | DOMESTIC HOT WATER |
| Hot Water Recirculating | DOMESTIC HOT WATER RECIRCULATING |
| 140 Degree Hot Water | DOMESTIC HOT WATER - 140°F |
| 140 Degree Hot Water Recirculating | DOMESTIC HOT WATER RECIRCULATING - 140°F |
| Sanitary Waste | SANITARY WASTE |
| Indirect Waste | INDIRECT WASTE |
| Storm | STORM |
| Vent | VENT |
| Pump Discharge | PUMP DISCHARGE |
| Natural Gas | NATURAL GAS |
| Compressed Air | COMPRESSED AIR |
| Acid Vent | ACID VENT |
| Acid Waste | ACID WASTE |
| Soft Water | SOFT WATER |
| Reverse Osmosis | R/O WATER |
| Deionized Water | DEIONIZED WATER |
| Non-Potable Water | NON-POTABLE WATER |
| Vacuum | VACUUM |
| Oxygen | OXYGEN |
| Nitrogen | NITROGEN |
| Medical Vacuum | MEDICAL VACUUM |
| Medical Compressed Air | MEDICAL AIR |
| Nitrous Oxide | NITROUS OXIDE |
| Carbon Dioxide | CARBON DIOXIDE |
| Decontamination Piping | DECON WASTE |
| Waste Anesthesia Gas Disposal | WAGD |
| Propane | PROPANE GAS |
| Exhaust Air | EXHAUST AIR |

2.3 VALVE IDENTIFICATION

A. Valve Tags:

1. Standard brass valve tags, 2 in. diameter with 1/2 in. high black-filled numerals. Attach to valve with brass jack chain and "S" hook. Identify between heating and plumbing services with 1/4 in. letters above the valve number.

2. Acceptable Manufacturers: Seton Style No. M4507, or approved equal.

B. Valve Chart:

1. Provide valve chart for all valves provided as a part of this project. Frame and place under clear glass. Mount in Mechanical Room.

2.4 EQUIPMENT IDENTIFICATION

A. General:

1. Provide engraved vinyl nameplates for each major piece of mechanical equipment provided, 2-1/2 in. x 3/4 in. size.

2. Acceptable Manufacturers: Seton Style No. M4562, or approved equal.

2.5 ABOVE CEILING EQUIPMENT LOCATOR

A. 3/4 in. diameter adhesive stickers placed on ceiling grid and color-coded.

B. The color for all plumbing valves shall be BLUE.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide valve tags for all valves provided on project.

B. Provide equipment tags for all equipment provided on project.

C. Provide piping identification with directional flow arrows for all piping on project, maximum intervals of 20'-0". For piping installed through rooms, provide at least one (1) pipe label in each room, for each pipe function.

END OF SECTION

SECTION 220593 - ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for complete adjusting and balancing Work as required in Contract Documents.

1.2 SUBMITTALS

A. Provide information in report form listing items required by specifications. Report shall be typed and three copies submitted for review. Results shall be guaranteed. Contractor shall be subject to recall to site to verify report information before acceptance of the report by the Owner's Representative.

B. Report format shall consist of the following:

1. Title sheet with job name, contractor, engineer, date, balance contractor's name, address, telephone number and contact person's name and the balancing technician's name.

1.3 QUALIFICATIONS

A. Follow procedures and methods published by one or more of the following:

1. Individual manufacturer requirements and recommendations.

B. Maintain qualified person at project for system operation, trouble shooting and perform mechanical adjustments in conjunction with balancing procedure.

C. Balancing contractor shall be current member of AABC or NEBB.

1.4 GENERAL REQUIREMENTS

A. Before concealment of systems visit the job site to verify and advise on type and location of balancing devices and test points. Make changes as required to balancing facilities.

B. Place systems in satisfactory operating condition.

1. Adjusting and balancing shall be accomplished as soon as the systems are complete and before Owner takes possession.

2. Prior to balancing adjust balancing devices for full flow; fill, vent and clean hydronic systems, replace temporary strainers.

3. Initial adjustment and balancing to quantities as called for or as directed by the engineer, to satisfy job conditions.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS

A. Provide tools, ladders, recording meters, gauges, thermometers, velometers, anemometers, inclined gauge manometers, magnehelic gauges, amprobes, voltmeters, psychrometers and tachometers required. Instruments used shall be accurately calibrated as per AABC or NEBB requirements.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Examine Bid Documents and notify Owner's Representative of any questions regarding balancing, within thirty (30) days after receipt of bid and prior to starting work.

### 3.2 WATER SIDE

A. Test, adjust and record the following:

1. Hot Water Recirculating Pump:

    a. Check rotation
    b. GPM
    c. Running suction pressure
    d. Running discharge pressure
    e. Running load amps
    f. RPM - motor
    g. Complete nameplate motor and pump

2. Recirculation Balancing Valves:

    a. Balance every valve to 1.0 GPM, unless otherwise noted.

END OF SECTION

SECTION 220700 - INSULATION

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

### 1.2 SUBMITTAL

A. Shall include product description, manufacturer's installation instructions, types and recommended thicknesses for each application, and location of materials.

## PART 2 - PRODUCTS

### 2.1 GENERAL

A. Insulation, jackets, adhesive, and coatings shall comply with the following:

1. Treatment of jackets or facing for flame and smoke safety must be permanent. Water-soluble treatments not permitted.

2. Insulation, including finishes and adhesives on the exterior surfaces of pipes and equipment, shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less.

3. Asbestos or asbestos bearing materials are prohibited.

4. Comply with 2020 International Energy Conservation Code as amended by Part 1 of the 2020 Supplement to the New York State Energy Conservation Code.

5. All adhesives and sealants used for insulation in the interior of the building shall comply with the maximum Volatile Organic Compound (VOC) limits as called for in the current version of U.S. Green Building Council LEED Credits EQ E4.1 and EQ E4.2.

6. Provide materials which are the standard products of manufacturers regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least two (2) years prior to bid opening. Provide insulation systems in accordance with the approved MICA or NAIMA Insulation Standards.

7. Insulation shall be clearly marked with manufacturer's name, identification of installed thermal resistance (R) value, out-of-package R value, flame spread and smoke developed indexes in accordance with Energy Code requirements.

### 2.2 ACCEPTABLE MANUFACTURERS

A. Fiberglass: Knauf, Johns Manville, Owen-Corning, Certainteed

B. Polyisocyanurate: Dow Trymer 2000XP, HyTherm.

C. Calcium Silicate: Industrial Insulation Group (ILG).

D. Flexible Elastomeric: Armacell, K-Flex.

E. Adhesives: Childers Products, Foster.

F. Heat Tracing: Raychem, Thermon.

2.3 PIPE INSULATION (RIGID FIBERGLASS TYPE)

A. Product meeting ASTM C 547, ASTM C 585, and ASTM C 795; rigid, molded, noncombustible.

B. 'K' Value: ASTM C 335, 0.23 at 75°F mean temperature. Maximum Service Temperature: 1000°F.

C. Vapor Retarder Jacket: ASJ/SSL conforming to ASTM C 1136 Type I, secured with self-sealing longitudinal laps and butt strips.

D. Field-Applied PVC Fitting Covers with Flexible Fiberglass Insulation: Proto Corporation 25/50 or Indoor/Outdoor, UV-resistant fittings, jacketing and accessories, white or colored. Fitting cover system shall consist of pre-molded, high-impact PVC materials with blanket type fiberglass wrap inserts. Blanket fiberglass wrap inserts shall have a thermal conductivity ('K') of 0.26 at 75°F mean temperature. Closures shall be stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations.

E. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in pre-forming insulation to cover valves, elbows, tees, and flanges.

2.4 PIPE INSULATION (FLEXIBLE TYPE)

A. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials. Adhesive: As recommended by insulation material manufacturer.

B. Insulation (1 in. thickness and smaller) shall have a flame-spread index of less than 25 and a smoke-developed index of less than 50 as tested by ASTM E 84 and CAN/ULC S-102, "Method of Test for Surface Burning Characteristics of Building Materials".

2.5 FIRE RATED INSULATION

A. Wrap shall be fully tested against external fires (ASTM E 119/UL263), through penetration insulated piping fires (ASTM 814/UL1479), wall fires (ASTM E 119), and surface burning (ASTM E 84/UL723). Wrap for engine exhaust applications shall use two layers of 1-1/2 in. wrap. The interior layer shall be applied with a butt joint. The second layer shall be offset a minimum of six inches from the initial layer, with an overlap of three inches and the insulated pipe is banded with stainless steel straps.

B. Acceptable Manufacturers: John Mansville Firetemp Wrap, Certainteed FlameChek or approved equal.

2.6 FIELD-APPLIED JACKETS

A. Piping:

1. PVC Pipe Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming. Adhesive: As recommended by insulation material manufacturer. PVC Jacket Color: White.

2.7 COATINGS, MASTICS, ADHESIVES AND SEALANTS

A. Vapor Barrier Coatings: Used in conjunction with reinforcing mesh to coat insulation on below ambient services temperatures. Permeance shall be no greater than 0.08 perms at 45 mils dry as tested by ASTM F1249. Foster 30-65 Vapor Fas; Childers CP-34, or approved equal.

B. Lagging Adhesives: Used in conjunction with canvas or glass lagging cloth to protect equipment/piping indoors. Foster 30-36 Sealfas; Childers CP-50AMV1 Chil Seal, or approved equal.

C. Fiberglass Adhesive: Used bond low density fibrous insulation to metal surfaces. Shall meet ASTM C916 Type II. Foster 85-60; Childers CP-127, or approved equal.

D. Elastomeric Insulation Adhesive: Used to bond elastomeric insulation. Foster 85-75; Childers CP-82, or approved equal.

E. Elastomeric Insulation Coating: Water based coating used to protect outside of elastomeric insulation. Foster 30-65, Childers CP-34 or approved equal.

F. Insulation Joint Sealant: Used as a vapor sealant on below ambient piping with polyisocyanurate and cellular glass insulation. Foster 95-50; Childers CP-76, or approved equal.

2.8 PIPE SUPPORT INSULATION INSERTS

A. 20 lbs./cu. ft. molded fiberglass, for -120°F to +450°F service temperature, non-combustible, 0.30 thermal conductivity (k), same thickness as pipe insulation.

B. Acceptable Manufacturers: Hamfab "H" Block, or approved equal.

2.9 MATERIALS AND SCHEDULES

A. See Exhibits at the end of this section.

## PART 3 - EXECUTION

### 3.1 GENERAL REQUIREMENTS

A. All materials shall be installed by skilled labor regularly engaged in this type of work. All materials shall be installed in strict accordance with manufacturer's recommendations, building codes, and industry standards.

B. Locate insulation and cover seams in the least visible location. All surface finishes shall be extended in such a manner as to protect all raw edges, ends and surfaces of insulation. No glass fibers shall be exposed to the air.

C. All pipe insulation shall be continuous through hangers, sleeves, walls, ceiling, floor, or roof openings, unless not allowed by fire stop system. Refer to Sections 220500, "Basic Plumbing Requirements" and 221010, "Piping Systems and Accessories" for firestop systems.

D. Provide thermal insulation on clean, dry surfaces and after piping and equipment (as applicable) have been tested. Do not cover pipe joints with insulation until required tests are completed.

E. All cold surfaces that may "sweat" must be insulated. Vapor barrier must be maintained; insulation shall be applied with a continuous, unbroken moisture and vapor seal. All hangers, supports, anchors, or other projections that are secured to cold surfaces shall be insulated and vapor sealed to prevent condensation. Cover valves, fittings and similar items in each piping system with insulation as applied to adjoining pipe run. Extra care must be taken on piping appurtenances to insure a tight fit to the piping system. For piping systems with fluid temperatures below ambient, all vapor retarder jacket (ASJ) seams must be coated with vapor barrier coating. All associated elbows, fittings, valves, etc. must be coated with vapor barrier coating and reinforcing mesh to prevent moisture ingress. Valve extension stems require Elastomeric insulation that is tight fitting to the adjoining fiberglass system insulation. Pumps, strainers, drain valves, etc. must be totally encapsulated with Elastomeric insulation.

F. Items such as manholes, handholds, clean-outs, plugged connections, pet cocks, air vents, ASME stamp, and manufacturers' nameplates, may be left un-insulated unless omitting insulation would cause a condensation problem. When such is the case, appropriate tagging shall be provided to identify the presence of these items. Provide neatly beveled edges at interruptions of insulation.

G. Provide protective insulation as required to prevent personal injury.

H. All pipes shall be individually insulated.

I. If any insulation material becomes wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site.

J. All exposed surfaces shall be white, unless noted otherwise.

3.2 PIPE INSULATION

A. Insulate piping systems including fittings, valves, flanges, unions, strainers, and other attachments installed in piping system, whether exposed or concealed including all piping, valves, etc. within meter/backflow preventer enclosure.

B. Insulation installed on piping operating below ambient temperatures must have a continuous vapor retarder. All joints, seams and fittings must be sealed. Insulation shall be continuous through hangers on all water piping and storm water piping.

C. Hanger Shields: Refer to Section 221010 "Piping Systems and Accessories".

D. Hanger shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed as required between the pipe and the insulation shields. Inserts shall be of equal thickness to the adjacent insulation and shall be vapor sealed as required.

1. Pre-Insulated Type: Butt insulation to hanger shields and apply a wet coat of vapor barrier cement to the joints and seal with 3 in. wide vapor barrier tape.

2. Field Insulated Type: Provide Hamfab Co. "H" blocks per manufacturers recommended spacing between pipe and shield.

3. Tape shields to insulation.

E. Joints in section pipe covering made as follows:

1. All ends must be firmly butted and secured with appropriate butt-strip material. On high-temperature piping, double layering with staggered joints may be appropriate. When double layering, the inner layer should not be jacketed.

2. Standard: Longitudinal laps and butt joint sealing strips cemented with white vapor barrier coating, or factory supplied pressure sensitive adhesive lap seal.

3. Vapor Barrier: For cold services, Longitudinal laps and 4 in. vapor barrier strip at butt joints shall be sealed with white vapor barrier coating. Seal ends of pipe insulation at valves, flanges, and fittings with white vapor barrier coating.

F. Fittings, Valves and Flanges:

1. Domestic Hot and Cold Water: Premolded fitting insulation of the same material and thickness as the adjacent pipe insulation.

2. White PVC jacketing, with continuous solvent weld of all seams. Tape all fittings.

G. Flexible Pipe Insulation:

1. Split longitudinal joint and seal with adhesive.

2. Fittings made from miter-cut pieces properly sealed with adhesive, or elbows may be continuous.

H. Apply PVC jacket where indicated, with 1 in. overlap at longitudinal seams and end joints. Seal with manufacturers recommended adhesive.

I. Piping in exterior walls, spaces, overhangs, attics, or where subject to freezing: Insulate pipe with double the thickness called for. Piping in wall chases: In addition to the above, pack chase with loose glass fiber insulation.

J. Provide insulation on exposed hot and cold plumbing piping to within 18 in. of fixture or equipment connection.

K. Insulate exposed domestic water and waste piping for plumbing fixtures designated for use by the handicapped.

## EXHIBIT "I" - PIPE INSULATION MATERIALS
**(Notes at end of Exhibit "I")**

| SERVICE | INSULATION MATERIAL | THICKNESS | REMARKS |
|---|---|---|---|
| Domestic cold water | Glass fiber | 1-1/2 in. and larger: 1 in.<br>1-1/4 in. and smaller: 1/2 in. | SEE NOTES 1, 2 |
| Domestic cold water (buried) | Flexible | 1-1/2 in. and larger: 1 in.<br>1-1/4 in. and smaller: 1/2 in. | |
| Non potable cold water | Glass fiber | 1-1/2 in. and larger: 1 in.<br>1-1/4 in. and smaller: 1/2 in. | SEE NOTE 2 |
| Domestic hot, tempered and circulation water (105°F - 140°F) | Glass fiber | 1-1/2 in. and larger: 1-1/2 in.<br>1-1/4 in. and smaller: 1 in. | SEE NOTES 1, 2 |
| Domestic hot, tempered and circulation water (105°F - 140°F) (buried) | Flexible | 1-1/2 in. and larger: 1-1/2 in.<br>1-1/4 in. and smaller: 1 in. | |
| Domestic hot, tempered and circulation water (141°F - 200°F) | Glass fiber | 1-1/2 in. and larger: 2 in.<br>1-1/4 in. and smaller: 1-1/2 in. | SEE NOTES 1 |
| AC unit drains, overflows and indirect waste piping associated with any HVAC equipment | Glass fiber Flexible | All sizes: 1/2 in. | Not required for exposed PVC drains<br>SEE NOTE 2 |
| Storm and secondary storm water | Glass fiber | All sizes: 1 in. | Insulate body of drain and storm water piping, horizontal and vertical, down to connection below ground floor slab or in crawl space<br>SEE NOTE 4 |
| Sanitary and waste | Glass fiber | All sizes: 1/2 in. | SEE NOTE 3, 4 |

NOTES FOR EXHIBIT I:

NOTE 1: Exposed insulation at kitchen, laundry, and sterilizer equipment shall be covered with PVC jacket.

NOTE 2: Flexible allowed in 1/2 in. thickness only.

NOTE 3: Insulation on sanitary and waste piping located within plumbing chases and crawl spaces are not required.

NOTE 4: When PVC piping is installed for storm, sanitary and vent piping within return air plenums, the piping shall be insulated and enclosed in materials listed and labeled for installation within a plenum.

END OF SECTION

SECTION 221010 - PIPING SYSTEMS AND ACCESSORIES

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

### 1.2 SUBMITTALS

A. Provide a schedule of pipe materials, fittings and connections.

B. Provide a detailed matrix listing the specific UL approved firestop system assembly to be used for each type of piping provided and each type of construction to be penetrated along with all associated UL assembly details.

## PART 2 - PRODUCTS

### 2.1 GENERAL

A. Pipe and fittings shall be new, marked with manufacturer's name and comply with applicable ASTM and ANSI Standards.

B. All items here-in used to convey water for potable use shall be lead free in accordance with NSF, Standard 61, Section 9 - Standard for Drinking Water and Lavatory Faucets and NSF Standard 372 - Maximum Lead Requirements. Compliance shall be via third party testing and certification.

### 2.2 STEEL PIPING AND FITTINGS

A. Pipe: ASTM A53, or ASTM A106 seamless, Schedule 40 or Schedule 80 weight; black or galvanized finish as called for; ends chamfered for welding or grooved for grooved mechanical connections.

B. Fittings: Same material and pressure class as adjoining pipe.

1. Welded fittings: Factory forged, seamless construction, butt weld type chamfered ends. Where branch connections are two or more sizes smaller than main size, use of "Weldolets", "Thredolets" or "Sockolets" acceptable. Mitered elbows, "shaped" nipples, and job fabricated reductions not acceptable unless specifically called for. Socket weld type, 2000 psi wp, where called for.

2. Threaded fittings: Cast or malleable iron, black or galvanized, as called for; drainage type where called for; UL listed and FM approved for fire protection systems. Street type 45° and 90° elbows are not acceptable.

C. Flanges, Unions, and Couplings:

1. Threaded Connections:

a. Flanges: Cast iron companion type; for sizes 2-1/2 in. and larger.

b. Unions: Malleable iron, bronze to iron seat, 300 lb. wwp; for sizes 2 in. and smaller.

c. Couplings: Malleable iron. Steel thread protectors are not acceptable as couplings.

2. Welded Connections:

a. Flanges: Welding neck type. Slip-on type not allowed unless noted and shall not be installed in conjunction with butterfly valves.

3. Grooved Mechanical Connections:

a. Couplings: Ductile iron, ASTM A536, with painted coating, designed for rolled grooved piping, hot dipped galvanized finish were called for.

b. Gaskets: Grade "E" EPDM synthetic rubber, -30°F to 230°F temperature range, suitable for water service.

c. Bolts and Nuts: Heat treated, hex head carbon steel, ASTM A183, cadmium plated or zinc electroplated.

d. Fittings: Elbows, tees, laterals, reducers, adapters as required. Same construction as couplings.

e. Design Equipment: Victaulic, flexible system, Style 77 couplings.

f. Acceptable Manufacturers: Grinnell, Gruvlok, Victaulic.

D. Gauge and Instrument Connections: Nipples and plugs for adapting gauges and instruments to piping system shall be IPS brass.

E. Base Elbows:

1. Cast iron or steel type, flange connections; Crane 500 or equivalent made from welding elbows, with welded pipe support and steel base. Reducing elbows where necessary.

| Elbow Size | Support Size | Base Plate |
|---|---|---|
| Up to 3 in. | 1-1/4 in. | 6 in. x 6 in. x 1/4 in. |
| 4 in. to 6 in. | 2-1/2 in. | 8 in. x 8 in. x 1/4 in. |
| 8 in. and larger | 6 in. | 14 in. x 14 in. x 5/16 in. |

2. Anchor bolt holes in each corner of base for securely bolting to floor or concrete base; minimum 3/4 in. bolts.

2.3 STEEL PIPING AND FITTINGS - PRESS CONNECT FITTINGS

A. Piping Standard: Black steel piping shall conform to ASTM A53 or ASTM A106 seamless, Schedule 40 weight pipe.

B. Fittings: Listed in accordance with ANSI LC4/CSA 6.32.

1. For natural gas service, -40 deg. F to 180 deg F at 125 PSI.

2. Sizes 1/2 inch through 4 inch, Schedule 40.

3. Schedule 40 steel fittings with zinc/nickel coating for use with IPS schedule 40 carbon steel, pipe conforming to ASTM A53 or ASTM A106. Fittings shall have an HNBR sealing element, 420 stainless steel grip ring, separator ring and "Smart Connect" (SC) feature.

C. Design Make: Viega Mega Press G System.

D. Acceptable Manufacturer: Viega.

2.4 COPPER TUBE AND FITTINGS

A. Pipe: ASTM B88; Type K or L, hard temper. Soft temper only as called for. Plans show copper tube sizes.

B. Fittings: Wrought copper and copper alloy, ASME B16.22 or cast copper alloy, ASME B16.18; solder end connections.

C. Joints: Comply with the requirements of ASTM B828.

D. Unions and Flanges: 2 in. and smaller use unions, solder type, cast bronze, ground joint, 150 lb. swp: 2-1/2 in. and over use flanges, cast bronze, companion type, ASME drilled, solder connection, 150 lb. swp.

E. Flux Materials: Flux shall comply with ASTM B813 and the provisions of the New York State Plumbing Code.

F. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel. Harris, Inc., "Stay-Safe 50" and "Bright", Engelhard "Silvabright 100", Canfield "Watersafe" or approved equal.

G. Brazing Materials: Class BcuP-5 for brazing copper to brass, bronze to copper. Harris, Inc. "Stay-Silv 15" or approved equal.

2.5 COPPER TUBE AND FITTINGS - PRESS FITTINGS

A. Tubing Standard: Copper tubing shall conform to ASTM B75 or ASTM B88.

B. Fitting Standard: Copper fittings shall conform to ASME B16.18, ASME B16.22, or ASME B16.26.

C. Press Fittings: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM.

D. Acceptable Manufacturers: Apollo, Mueller, Nibco, Viega.

2.6 CPVC DOMESTIC WATER PIPING

A. All pipe and fittings shall be manufactured from CPVC compound with a cell class of 24448 for pipe and 23447 for fittings as per ASTM D-1784; shall conform to National Sanitation Foundation (NSF) Standards 6 and 14; and shall be intended for use in hot and cold domestic water distribution systems.

B. 1/2 in. through 2 in. Sizes: CPVC Copper Tube Size, standard dimension ratio (SDR) 11 conforming to ASTM D-2846. Transition fittings shall have brass male or female connections with integral CPVC socket connections; Charlotte Pipe and Foundry Co. FlowGuard Gold or approved equal.

C. 3 in. through 6 in. Sizes: CPVC Schedule 80 iron pipe size (IPS) conforming to ASTM F-441. Socket type fittings shall conform to ASTM F-439. Transition to metal piping shall be made using 150# flanged connections.

D. All pipe and fittings shall be produced by a single manufacturer and installed in accordance with manufacturer's recommendations and local Code requirements. Piping shall be installed using approved solvent cement conforming to ASTM F-493 and primer conforming to ASTM F-656 and in accordance with manufacturer's recommendations.

2.7 PEX DOMESTIC WATER PIPING

A. Pipe: Cross-linked, high density, polyethylene tubing for potable water. ASTM F-876/F-877; ANSI/NSF 61. Plans show nominal tube sizes.

B. Manifolds: Copper manifold with sweat ends and 24-3/4 in. outlets on 3 in. centers. Provide reducing couplings as required for individual outlets.

C. Valves: Brass body ball valves with sweat X PEX compression ends rated for 250 psi and 250°F. Provide crimp ring for PEX compression connections.

D. Acceptable Manufacturers: Wirsbo, Viega, Zurn or approved equal.

2.8 COPPER TUBE AND FITTINGS - GROOVED MECHANICAL CONNECTIONS

A. Pipe: ASTM B88, Type K or L, hard temper.

B. Fittings: Wrought copper, roll grooved mechanical connections, ASTM B-75, ANSI B16.22 for 4 in. size. Cast bronze, rolled grooved mechanical connections, ASTM B-584, ANSI B16.18 for sizes 5 in. - 8 in.

C. Couplings: Ductile iron, ASTM A-536, with copper colored alkyd enamel finish, designed for rolled grooved piping.

D. Gaskets: Grade "E" EPDM synthetic rubber, copper color coded, -30°F to 230°F temperature range, suitable for water service.

E. Bolts and Nuts: Heat treated, hex head carbon steel, ASTM A183, cadmium plated or zinc electroplated finish.

F. Design Equipment: Victaulic Style 606 couplings.

G. Acceptable Manufacturers: Grinnell, Gruvlok, Victaulic.

2.9 COPPER DRAINAGE TUBE AND FITTINGS

A. Pipe: ASTM B306, Type DWV, hard temper.

1. Copper not allowed for urinal waste.

B. Fittings: Wrought copper, ANSI B16.29 or cast bronze, ANSI B16.23; solder end connections.

C. Flux Materials: Flux shall comply with ASTM B813 and the provisions of the New York State Plumbing Code.

D. Solder Materials: No lead solder, using alloys made from tin, copper, silver and nickel.

E. Acceptable Manufacturers: Harris, Inc., "Stay-Safe 50" and "Bright", Engelhard "Silvabright 100", Canfield "Watersafe", or approved equal.

2.10 BRASS PIPE AND FITTINGS

A. Piping: ASTM B43, semi-annealed, red brass containing not less than 85% copper; chrome plated where called for.

B. Fittings: Cast brass, sps, malleable iron pattern, reinforced corresponding to weight of pipe; chrome plated with high polished finish where called for.

2.11 HUB AND SPIGOT CAST IRON SOIL PIPE AND FITTINGS

A. Pipe: ASTM A74 service weight cast iron, bitumen coated.

B. Fittings: Cast iron, service weight, hub and spigot, drainage pattern, bitumen coated.

C. Connections: ASTM C564 neoprene gaskets and lubricant.

D. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

2.12 NO-HUB CAST IRON SOIL PIPE AND FITTINGS

A. Pipe: ASTM A888, CISPI Standard 301, no-hub cast iron, bitumen coated.

1. For above grade only.

B. Fittings: Cast iron, no-hub drainage pattern, bitumen coated.

C. Couplings:

1. 1-1/2 in. to 2 in.: CISPI standard 310 with 300 series stainless steel corrugated shield and clamp assembly with ASTM C564 neoprene sealing sleeve (or) same as specified for 3 in. and larger.

2. 3 in. and Larger: 24 gauge, Type 304 stainless steel housing clamp assembly with ASTM C564 neoprene sealing sleeve, 60 in. lbs. minimum torque rating, shall meet requirements of pipe manufacturer and shall be compatible with specified pipe. Acceptable Manufacturers: Clamp-All Coupling System, Tyler "Wide Body", Husky "Series 2000", Mission "Heavy Weight", Ideal Tridon "HD" heavy duty or approved equal.

D. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

2.13 PVC SOLID WALL PIPE AND FITTINGS - DWV SYSTEM

A. Pipe: PVC Schedule 40 solid wall pipe, iron pipe size conforming to ASTM D1785 and ASTM D2665. Pipe shall be manufactured from PVC compounds as identified in ASTM D1784. Both pipe and fittings shall conform to National Sanitation Foundation Standard 14.

B. Fittings: Type DWV, socket type conforming to ASTM D2665. Fittings shall be manufactured from PVC compounds as identified in ASTM D1784. Solvent cement joints shall be made utilizing a two-step process with primer manufactured for thermoplastic piping and solvent cement conforming to ASTM D2564.

2.14 SPECIAL FITTINGS

A. Cast Iron to Lead Pipe: Red brass ferrules and wiped joints. Caulk ferrule into cast iron hub.

B. Copper to Cast Iron: Cast bronze, cast iron to sweat adapter.

C. Copper to Steel Piping:

1. Cast bronze copper to iron male or female adapter with shoulder for drainage piping only.

2. Dielectric pipefittings.

D. Steel to Cast Iron: Cast iron soil pipe connector with spigot and IPS male thread end (Manhoff fittings).

E. No-Hub, Cast Iron, Glass, Polypropylene or High Silicon Cast Iron: Proper adapter to piping being connected.

F. Cast Iron and PVC Sovent: Aerators and deaerators as manufactured by Conine Manufacturing Co., Inc.

2.15 DIELECTRIC PIPE FITTINGS

A. Description: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.

B. Unions: Factory fabricated, for 250 psi minimum working pressure at 180°F, threaded or solder ends, insulating material suitable for system fluid, pressure and temperature.

C. Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum pressure to suit system fluid pressures and temperatures with flange insulation kits and bolt sleeves.

D. Acceptable Manufacturers: EPCO, Capitol Manufacturing, Watts or approved equal.

2.16 HANGERS, INSERTS AND SUPPORTS

A. Hangers, Inserts, Clamps: B-Line, Grinnell, Michigan Hanger, PHD Manufacturing.

B. Hangers:

1. Adjustable, wrought malleable iron or steel with electroplated zinc or cadmium finish. PVC coated where in contact with copper piping.

2. Adjustable ring type where piping is installed directly on hanger for piping 3 in. and smaller.

3. Adjustable steel clevis type for piping 4 in. and larger.

4. Nuts, washers and rods with electroplated zinc or cadmium finish.

5. Provide hot dipped galvanized finish for hangers and accessories installed in exterior locations and interior areas with moist environment conditions such as pools, pool filter rooms, areaways, garages and similar areas.

C. Spacing Schedule:

| Pipe Size | Steel | Copper | Plastic | Cast Iron | Rod Size |
|---|---|---|---|---|---|
| 3/4 in. to 1 in. | 8 ft. | 6 ft. | 3 ft. | Each | 3/8 in. |
| 1-1/4 in. to 2 in. | 10 ft. | 6 ft. | 3 ft. | Horizontal | 3/8 in. |
| 2-1/2 in. to 4 in. | 12 ft. | 10 ft. | 4 ft. | Joint 5 ft. | 1/2 in. |
| 5 in. and over | 12 ft. | 10 ft. | 4 ft. | Maximum | 5/8 in. |
| 8 in. | 12 ft. | 10 ft. | 4 ft. | O.C. | 3/4 in. |
| Over 8 in. | To suit loading conditions. | | | | |

D. Cast Iron No-Hub Supports:

1. In accordance with manufacturer's recommendations.

2. Vertical piping supported at each stack base, at each floor and 15 ft. on center, maximum. Freestanding vertical pipe should be adequately staked or braced during construction to maintain alignment. Bases of stacks shall be supported on

concrete, brick laid in cement mortar, metal brackets attached to the building construction or by other methods approved by the Owner's Representative.

3. Horizontal piping supported within 24 in. each side of the coupling joint at 10 ft. intervals for 10 ft. pipe lengths and at 5 ft. intervals for 5 ft. pipe lengths. Supports or hangers placed to maintain alignment and grade with provision made to prevent shear. Greater than 3 in. diameter pipe braced at changes of direction to prevent horizontal movement.

E. Beam Attachments:

1. C-Clamp style, locknut, restraining strap, electroplated finish, UL listed, FM approved for pipe sizes 2 in. and smaller.

2. Center loaded style with clamp attachments that engage both edges of beam, electroplated finish, UL listed, FM approved, for pipe sizes larger than 2 in., refer to "Supports" for additional requirements.

F. Inserts: Carbon steel body and square insert nut, galvanized finish, maximum loading 1300 lbs., for 3/8 in. to 3/4 in. rod sizes, reinforcing rods on both sides, MSS-SP-69 Type 19 or approved equal.

G. Supports:

1. Provide intermediate structural steel members where required for hanger attachment. Members shall span across the bar joists at panel points of joists. Secure member to structure. Select size of members based on a minimum factor of safety of four.

2. For Weights Under 1000 lbs.: "Drill-In" inserts, "U" shaped Channel, beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.

3. For Weights Above 1000 lbs.: Drill through floor slabs and provide flat flush plate welded to top of rod or provide additional "Drill-In" inserts and hangers to reduce load per hanger below 1000 lbs.

4. For Metal Decks: Drill hole through for hanger rods and imbed a welded plate in concrete or use devices designed for this application, with a safety factor of four.

5. For Wood Construction: Provide hangers and supports designed for attachment to wood construction.

6. Acceptable Manufacturers: Hilti, ITW Ramset, Phillips "Red Head" or approved equal.

H. Trapeze Hangers:

1. For plumbing systems only.

2. Hangers shall be supported with rod sized with a safety factor of four.

3. May be manufactured type "U" shaped channel, or suitable angle iron or channel. Round off all sharp edges.

4. Securely fasten piping to trapeze with "U" bolt or pipe clamps, dissimilar metals shall not touch, use isolation gaskets, similar to HoldRite strut-mounted cushion clamps. Fasten piping to trapeze at every third support, except uninsulated piping which shall be fastened at every support using strut-mounted cushion clamps.

5. Acceptable Manufacturers: B-Line, HoldRite, Kindorf, Unistrut or approved equal.

I. Roof Pipe Supports - Deck Mounted Rail:

1. Raised cant for insulated roof, heavy-gauge galvanized steel with integral base, 2 x 4 pressure treated wood nailer, removable galvanized steel counter flashing.

2. Steel channel track, roller assembly and accessories, adjustable, locking devices in roller assembly, all parts galvanized except painted cast iron roller.

3. Length as required for quantity of pipes to be supported. Anchor to roof deck per manufacturer.

4. Acceptable Manufacturers: Pate #PRS-5A or approved equal.

J. Roof Pipe Supports - Fixed and Adjustable Pillow Block Style:

1. Pipe support for placement on roof surface with base perforated for drainage. Provide pipe anchor strap option and manufacturer's support pad or roofing manufacturer's recommended slip sheet below support. Support models shall be selected based on total pipe O.D. and pipe weight operating full. All polycarbonate materials shall be UV stabilized.

2. Fixed Height Pipe Stand: For bare piping up to 5 in. nominal or insulated piping up to 6 in. outside diameter. Polycarbonate resin base plate with fixed height self-lubricating polycarbonate roller supported by glass-filled nylon or stainless steel rod. Miro Industries Model R Series.

3. Adjustable Height Pipe Stand with Polycarbonate Base: For bare piping up to 5 in. nominal or insulated piping up to 6 in. outside diameter. Polycarbonate base plate with adjustable stainless steel all thread rod vertical supports, polycarbonate roller on stainless steel rod. Miro Industries Model RAH Series.

4. Adjustable Height Pipe Stand with Metal Base: For bare piping 4 in. to 6 in. nominal or insulated piping up to 7 in. outside diameter. 12 in. by 16 in. wide hot dipped galvanized steel base plate with adjustable stainless steel all thread rod vertical supports, polycarbonate roller on stainless steel rod. Miro Industries Model RAH Series.

5. Pipe Hanger Stand with Polycarbonate Base: For bare piping up to 2-1/2 in. nominal or insulated piping up to 3-1/2 in. outside diameter. 9 in. by 15 in. wide

polycarbonate resin base plate with adjustable stainless steel all thread rod vertical supports, galvanized top strut with clevis hanger suspended on stainless steel all thread rod. Miro Industries Model 2.5-SB-H Series.

6. Adjustable Height Pipe Stand with Metal Base: For bare piping up to 6 in. nominal or insulated piping up to 7-1/2 in. outside diameter. Two (2) 8 in. by 14 in. wide hot dipped galvanized steel base plates, with adjustable height galvanized braced strut assembly with clevis hanger suspended on a stainless steel all thread rod. Miro Industries Model 6-H Series.

K. Cabinet Pipe Space Supports:

1. Piping below casework countertops within space behind cabinet shall be supported using continuous slot metal channels with pipe clamps.

2. Acceptable Manufacturers: B-Line, Kindorf, Unistrut or approved equal.

L. Hanger Insulation Shields:

1. Hanger insulation shields shall be provided for all water and storm water piping. Hangers shall attach directly to pipe for all remaining services.

2. Piping 2 in. and Smaller: Pipe insulated with glass fiber insulation shall be protected at point of support by a sheet metal shield. Shield shall be #18 gauge, galvanized steel, minimum 120 degree arc, formed to fit insulation thickness and 12 in. long. Tape shields to pipe insulation.

3. Piping 3 in. and Larger: Pipe insulated with glass fiber insulation shall be protected at point of support by a sheet metal shield and pipe support insulation insert(s) between pipe and hanger. Shield shall be #18 gauge, galvanized steel, minimum 120 degree arc, formed to fit insulation thickness and 12 in. long. Tape shields to pipe insulation. Provide temporary blocking to maintain proper spacing for insulation.

M. Provide continuous support for unpigmented polypropylene piping.

N. PEX tubing supports shall comply with manufacturer's recommendations, but shall be no more than 2 ft. - 0 in. on center.

O. Piping systems with material not listed above shall be supported and protected in accordance with manufacturer's recommendations.

2.17 PIPING ACCESSORIES

A. Escutcheon Plates: Steel or cast brass, split hinge type with setscrew, high plates where required for extended sleeves. Chrome plated in finished areas and at plumbing fixtures.

B. All cleanout plugs, bushings and nipples, required for instruments and gauges shall be brass.

C. Hubless cast iron fitting restraints shall be Holdrite Series #117 or approved equal.

2.18 SLEEVES

A. Standard Type:

1. Schedule 40 black steel pipe sleeves for structural surfaces, two pipe sizes larger than the pipe, and as recommended by the sealing element manufacturer. Provide full circle water stop collar for sleeves located within below grade walls, wet wells and waterproofed surfaces. The collar shall be fabricated from steel plate and welded to the sleeve around its entire circumference.

2. Schedule 40 PVC sleeves or sheet metal sleeves for nonstructural surfaces and existing construction. Sheet metal sleeves shall be 18 gauge minimum and braced to prevent collapsing.

2.19 SEALING ELEMENTS

A. Expanding neoprene link type, watertight seal consisting of interlocking links with zinc plated bolts.

1. Acceptable Manufacturers: Thunderline "Link-Seal" Series 200, 300 or 400, Pyropac, Calipco.

2.20 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL AND FLOOR ASSEMBLIES

A. Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Through-Penetration Firestop Systems". The system shall meet the standard fire test for Through-Penetration Firestop Systems designated ASTM E814. Firestop system seals shall be provided at locations where piping pass through fire rated wall, floor/ceiling, or ceiling/roof assembly. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform with the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.21 STACK SLEEVE

A. Cast iron body with caulking recess, flashing clamp and under deck clamp.

B. Acceptable Manufacturers: Jay R. Smith Series 1720, Zurn, Wade.

2.22 STRAINERS

A. Description: Y-Pattern, self-cleaning, except where otherwise indicated, full size of connecting piping, Type 304 stainless steel screens, 125 lb. SWP, unless otherwise indicated.

B. Copper Piping 2-1/2 in. and Smaller: Lead free, cast bronze body, threaded ends, tapped retainer cap with closure plug, 20 mesh screen, Watts #LF777S.

C. Steel Piping 2-1/2 in. and Smaller: Iron body, threaded ends, tapped retainer cap with closure plug, 20 mesh screen, Watts #77S

D. Piping 3 in. and Larger, Cold Water Applications: Lead free, cast iron body, flanged ends, standard screen openings, FDA approved epoxy coating, tapped retainer cap and gasket with closure plug; Watts #77F-DI-FDA-125.

E. Fuel Oil Strainers 2 in. and Smaller: Line strainer, top cleanout, cast iron body and cap, malleable iron yoke, 50 psi operating pressure, 24 mesh stainless steel cage and basket for #2 fuel oil, female threaded ends, UL listed; Morrison Figure #286-U.

2.23 STAINLESS STEEL FLUE PIPE

A. Double wall stainless steel flue pipe shall consist of 430 stainless steel outer jacket, 1/2 in. air space, AL-29-4C inner jacket. Flue piping shall be tested and listed to UL1738, for Categories III and IV. All joints shall be equipped with a factory-applied seal.

B. Acceptable Manufacturers: Heatfab, Precision Vent, Selkirk.

2.24 PIPING MATERIALS AND SCHEDULE

A. See Exhibit "A", "Schedule of Piping Materials" at end of this Section for (Plumbing) piping.

B. See Exhibit "B", "Testing" at end of this Section.

## PART 3 - EXECUTION

3.1 EQUIPMENT AND SYSTEMS

A. Install equipment and systems in accordance with provisions of each applicable Section of these Specifications, and Local/State Codes/Regulations having jurisdiction. Accurately establish grade and elevation of piping before setting sleeves. Install piping without springing or forcing, except where specifically called for, making proper allowance for expansion and anchoring. Changes in sizes shall be made with reducing fittings. Reducing couplings are not acceptable. Arrange piping at equipment with necessary offsets, unions, flanges, and valves, to allow for easy part removal and maintenance. Offset piping and change elevation as required to coordinate with other work. Avoid contact with other mechanical or electrical systems. Provide adequate means of draining and venting units, risers, circuits and systems. Conceal piping unless otherwise called for. Copper tubing shall be cut with a wheeled tubing cutter or other approved copper tubing cutter tool. The tubing must be cut square to permit proper joining with the fittings. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction. Install piping parallel with lines of building, properly spaced to provide clearance for insulation. Make changes in direction and branch connections with fittings. Do not install valves, unions and flanges in inaccessible locations. Materials within a system and between systems shall be consistent. If this is not possible, install dielectric fittings.

3.2 PIPING OVER ELECTRICAL EQUIPMENT

A. Contractor shall route piping to avoid installation directly over electric equipment, including, but not limited to panels, transformers, disconnects, starters, motor control center, adjustable speed drives and fused switches.

B. Piping shall not be installed in the dedicated electric and working space as defined by NEC 110. Dedicated electrical space is generally equal to the depth and width of electrical equipment, and extends 6 ft. above the electrical equipment, or to a structural ceiling. Dedicated working space is a minimum of 30 in. wide or the width of equipment (whichever is larger) a minimum of 6 ft.-6 in. tall, with a depth of 3ft. to 9 ft. depending on the voltage.

## 3.3 HANGERS, INSERTS AND SUPPORTS

A. Piping shall not be supported by wires, band iron, chains, from other piping, or by vertical expansion bolts. Support piping with individual hangers from concrete inserts, wood construction, welded supports, or beams clamps of proper configuration and loading design requirements for each location; replace if not suitable. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing and of size called for, using four (4) nuts per rod. Provide additional structural steel members, having one coat rustproof paint, where required for proper support. Provide oversized hangers where insulation/supports must pass between pipe and hanger. Provide continuous support or extra supports for plastic piping per manufacturer's requirements. Hangers, when attached to joists, shall only be placed at the top or bottom chord panel point. Only concentric type hangers are permissible on piping larger that 2-1/2 in.; "C" types are permitted for piping 2 in. and smaller on joists. Provide riser clamps for each riser at each floor. Use trapeze hangers where a group of piping can be installed.

B. Provide a pipe hanger within 12 inches of pipe unions and piping connections to equipment, in order to facilitate disconnections of piping without pipe sagging.

## 3.4 PIPE CONNECTIONS

A. No-Lead Solder Connections: Nonacid flux and clean off excess flux and solder.

B. Copper Press Connections: Copper press fittings shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

C. Steel Press Connections:

1. Natural Gas Systems: Sealing elements shall be verified for the intended use. Pipe ends shall be cut on a right angle (square) to the pipe. Pipe ends shall be reamed and all paint, lacquer, grease, oil, and dirt shall be removed from the pipe end with an abrasive cloth, or with a Ridgid MegaPress pipe end prep tool. Visually examine each fitting sealing element to ensure there is no damage. Insert the pipe fully into the fitting and mark the pipe wall at the face of the fitting. Always examine the pipe to ensure it is fully inserted into the fitting prior to pressing the joint. Steel Press fittings shall be installed using Ridgid, MegaPress Tools. Steel Press fittings shall be installed according to the most current edition of the manufacturer's installation guidelines. Installers shall be trained by a manufacturer representative on proper installation procedures.

2. Testing: After Steel Press fittings have been installed a "two step test" shall be followed. Utilizing air or, dry nitrogen, pressurize the system between 5 psi and 45 psi. Check the pressure gauge for pressure loss. If the system does not hold pressure, inspect entire system and check for un-pressed fittings. Should un-pressed fittings be identified, ensure the pipe is fully inserted into the fitting and properly marked prior to pressing the joint. After appropriate repairs have been made, test the system per local code, or specification requirements, not to exceed 200 psig.

D. Brazed Connections: Make joints with silver brazing alloy in accordance with manufacturer's instructions. Remove working parts of valves before applying heat.

E. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specifically selected for each application.

F. Flanged Joints: Select appropriate gasket material, size, type and thickness for service applications. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Dielectric Pipe Fittings: Provide dielectric unions at ALL equipment connections where dissimilar metals meet. In addition, provide dielectric unions in all open type piping systems (condensing water, domestic water, etc.) where dissimilar metals are to be joined.

H. Grooved Mechanical Joints: Pipe to be prepared in accordance with the latest manufacturer's grooving specification. Use manufacturer's recommended grooving tools. Pipe shall be checked to be sure it is free of indentations, projections; weld seams or roll marks on the exterior of the pipe over the entire gasket seating area. Pipe ends are to be square cut. Lubricant shall be applied to gasket and/or pipe ends and housing interiors to eliminate pinching the gasket.

I. Solvent-Cement Plastic Piping Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.

2. CPVC Piping: Join according to ASTM D 2846.

3. PVC Piping: Join according to ASTM D 2855.

3.5 WELDING

A. Welding shall be performed in compliance with the welding procedure specifications prepared by the National Certified Pipe Welding Bureau. Welded pipe fabricated by certified welder. Contractor shall submit proof of current certification of each welder if requested by Owner. Use full-length pipe where possible; minimum distance between welds, 18 in. on straight runs. Welds must be at least full thickness of pipe inside smooth and remove cutting beads, slag and excess material at joints; chamfer ends. Minimum gap 1/8 in., maximum 1/4 in., for butt welds. Overlaps on position and bench welds to be not less than 3/4 in. One internal pass and one external pass minimum required on slip-

on flanges. Do not apply heat to rectify distorted pipe due to concentrated welding; replace distorted pipe.

B. When welding galvanized pipe, apply cold galvanizing on joint following welding.

3.6 SLEEVES

A. Provide for pipes passing through floors, walls or ceilings. Not required for floors that are core-drilled, except where floor is waterproofed.

B. Extend 1/8 in. above finished floor in finished areas. In above grade Mechanical Rooms and other areas with floor drains, use steel pipe sleeves 2 in. above floor.

C. Use steel pipe sleeves in bearing wall, structural slabs, beams and other structural surfaces, and where called for.

D. Sleeves shall be as small as practical, consistent with insulation, so as to preserve fire rating.

E. Fill abandoned sleeves with concrete.

F. Provide rubber grommet seals for pipes passing through ducts or air chambers or built-up housings.

3.7 SLEEVE PACKING

A. Seal void space at sleeves as follows:

1. Interior Locations: Firmly pack with fiberglass and caulk.

2. Exterior Walls and Below Grade Cored Holes: Use sealing element.

3. Cored Holes: Use sealing element.

4. Fire Rated, Partitions and Floor Slabs: Use fire rated sealing elements, materials and methods. Provide per manufacturer's instructions to maintain firestop.

5. Waterproofed Walls/Floors: Use waterproof sealing element, device or compound.

3.8 ESCUTCHEON PLATES

A. Provide polished chrome setscrew type escutcheon plates for all exposed piping passing through floors, walls or ceilings, in all rooms except in Boiler, Fan and Mechanical Rooms.

3.9 TESTS

A. Refer to Exhibit "B" at the end of this section for testing of Plumbing Systems.

B. Provide all necessary items to complete proper testing of work. Perform all testing in accordance with governing Codes, local utilities and other agencies having jurisdiction

and as specified. Pay all costs to perform tests. Perform all testing in a safe manner. Isolate existing systems.

C. Domestic Water:

1. Do not cover joints with insulation until required tests are completed and the Owner's Representative accepts the system.

2. Make leaks tight; no caulking permitted. Replace defective fittings, pipe or connections. Piping shall be tight and show no loss of pressure.

3. Air test not acceptable as final test.

4. Confirm in writing that tests and flushing have been conducted and successfully completed. Submit copy of the test report to Owner's Representative.

D. Sanitary and Storm:

1. There shall be no loss of water when testing interior piping.

2. Air test not acceptable as final test.

3. Should any leaks, defective joints or defective construction be detected in sewers and/or floors or walls of appurtenant structures, they shall be permanently stopped. Should any defective pipes, fitting or accessories be discovered they shall be removed and replaced at the Contractor's expense.

4. Confirm in writing that tests have been conducted and successfully completed. Submit copy of the test report to Owner's Representative.

## 3.10 DOMESTIC WATER PIPING CLEANING AND DISINFECTION

A. Cleaning and disinfecting shall be in accordance with requirements of New York State Department of Health and authority having jurisdiction. Prior to disinfecting, flush piping to remove any sediment and debris.

B. Clean and disinfect water distribution piping systems and parts of existing potable water systems that have been altered, extended or repaired.

C. After disinfection procedures, submit water samples in sterile bottles to an approved Department of Health Laboratory. Samples shall be proven equal to the water quality served to the public from the existing water supply system and acceptable to the Department of Health. Flush and disinfect all sections of pipe that fail the laboratory tests. Submit test results indicating water is potable.

## 3.11 PEX DOMESTIC WATER PIPING

A. Leave three (3) extra outlets on each manifold and cut manifolds to remove remaining outlets. Cap extra outlets for future use.

B. Accessories: Provide all required accessories including, but not limited to, bond supports, finished sleeves, strike plates, etc. as recommended by manufacturer.

3.12 CONNECTIONS TO SPECIAL EQUIPMENT

A. Kitchen Equipment:

1. Kitchen Equipment shall be furnished by others and set in place by others.

2. Provide all piping, stops, valves, traps and fittings.

3. Where exposed, provide chrome plated brass piping, valves, hangers, brackets and accessories.

4. Pipe relief valves to floor. Size and arrangement of pipe, traps, valves and fittings, as recommended by manufacturer of equipment.

3.13 PIPE LINE SIZING

A. Pipe sizes called for are to be maintained. Pipe size changes made only as reviewed by Owner's Representative. Where discrepancy in size occurs, the larger size shall be provided.

**EXHIBIT "A" - PIPING MATERIALS (PLUMBING)**
**(Notes at end of Exhibit "A")**

| SERVICE | PIPE MATERIALS | FITTINGS | CONNECTIONS |
|---|---|---|---|
| Water service (2 in. and smaller) | SEE "UNDERGROUND PIPING AND ACCESSORIES" SECTION 221020 | | |
| Domestic water interior/hot, cold and circulating 3 in. and smaller | Type L copper | Wrought or cast copper | No-lead solder |
| | Type L copper | Wrought or cast copper | Press fit |
| | CPVC, SDR 11 | Socket type | Solvent cement (SEE NOTE 6) |
| | PEX tubing | N/A | Compression |
| Domestic water interior/hot, cold and circulating 4 in. and larger | | | |
| | Type L copper | Wrought copper | Brazed |
| | Type L copper | Wrought or cast copper | Roll grooved mechanical type couplings |
| | CPVC, Schedule 80 | Socket type | Solvent cement (SEE NOTE 6) |
| Sanitary, sanitary vent, grease waste and storm (buried) | SEE "UNDERGROUND PIPING AND ACCESSORIES" SECTION 221020 | | |
| Sanitary, sanitary vent and grease waste | Service weight cast iron soil pipe | Cast iron hub and spigot | Neoprene compression type gasket |
| | Service weight cast iron soil pipe | No hub | No hub neoprene gasket and stainless steel clamp assembly |
| | Type DWV copper | Wrought copper | No-lead solder (SEE NOTE 5) |

| SERVICE | PIPE MATERIALS | FITTINGS | CONNECTIONS |
|---|---|---|---|
| | Schedule 40 PVC, solid wall | PVC, socket type | Solvent cement (SEE NOTE 4) |
| Storm | Service weight cast iron soil pipe | Cast iron hub and spigot | Neoprene compression type gasket |
| | Service weight cast iron soil pipe | No hub | No hub neoprene gasket and stainless steel clamp assembly |
| | Schedule 40 PVC, solid wall | PVC, socket type | Solvent cement (SEE NOTE 4) |
| | Type DWV copper | Wrought copper | No-lead solder |
| Water heater intake piping | Schedule 40 PVC, solid wall | PVC, socket type | Solvent cement (SEE NOTE 4) |
| Water heater exhaust piping | AL-29-4C stainless steel (exhaust) | Stainless steel | Sealed closure system |
| Indirect waste | Type DWV copper | Wrought copper | No-lead solder |
| | Schedule 40 PVC, solid wall | PVC, socket type | Solvent cement (SEE NOTE 4) |
| | Schedule 40 PVC, foam core | PVC, socket type | Solvent cement (SEE NOTE 4) |
| Pump discharge | Schedule 40 galvanized steel | Galvanized cast iron drainage | Threaded |
| | Type L Copper | Wrought copper | No-lead solder |
| Natural gas (buried) | SEE "UNDERGROUND PIPING AND ACCESSORIES" SECTION 221020 | | |
| Natural gas (exterior above grade) | Schedule 40, black steel | Butt welded steel | Welded (SEE NOTE 2) |
| | Schedule 40, black steel | Malleable iron, 2 in. and smaller | Threaded (SEE NOTE 2) |
| | Schedule 40, black steel | Steel with zinc/nickel coating | Press fit |
| Natural gas (interior) | Schedule 40, black steel | Malleable iron, 2 in. and smaller | Threaded (SEE NOTE 2) |

| SERVICE | PIPE MATERIALS | FITTINGS | CONNECTIONS |
|---|---|---|---|
| | Schedule 40, black steel | Butt welded steel, 2-1/2 in. and larger | Welded (SEE NOTE 2) |

NOTES FOR EXHIBIT A:

NOTE 1: Provide ductile iron, double thickness cement - lined pipe and fittings up to the water meter inlet valve in accordance with the New York State Plumbing Code and Water Bureau Requirements. Pipe and fittings shall be flanged.

NOTE 2: Provide one coat of alkyd primer and two coats of exterior acrylic latex gloss enamel on exposed exterior and interior piping. Color as selected.

NOTE 3: For gas piping systems having operating pressure other than the standard 50 to 55 psig (or 160 psig for nitrogen), provide Type K copper for medical gas.

NOTE 4: PVC piping shall not be installed within return air plenums.

NOTE 5: Copper piping shall not be used for urinal waste piping.

NOTE 6: CPVC piping, copper tube size (SDR11) permitted for piping 2 in. and smaller. CPVC piping, Schedule 80 permitted for piping 3 in. and larger.

NOTE 8: All uninsulated piping supported by trapeze hangers shall be securely fastened to each hanger using strut-mounted cushion clamps.

## EXHIBIT "B" - TESTING

| SERVICE | TEST REQUIREMENTS |
|---|---|
| Domestic water | Test hydrostatically at 150 PSI for two (2) hours or at 1.5 times the working pressure when working pressure exceeds 100 PSI |
| Sanitary, sanitary vent, storm | Maintain 10 ft. head of water for two (2) hours. |
| Indirect waste | Maintain 10 ft. head of water for two (2) hours. |
| Pump discharge | Hydrostatically test at 5 PSI greater than the pump rating for two (2) hours. |
| Natural gas | Refer to Section 227010 - "Natural Gas Systems". |

END OF SECTION

SECTION 221020 - UNDERGROUND PIPING AND ACCESSORIES

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents

### 1.2 SUBMITTALS

A. Provide a schedule of pipe materials, fittings and connections.

## PART 2 - PRODUCTS

### 2.1 GENERAL

A. Pipe and fittings new and marked with manufacturer's name, complying with applicable ASTM and ANSI Standards.

### 2.2 CAST IRON SOIL PIPE AND FITTINGS

A. Pipe: ASTM A74 service weight cast iron, bitumen coated, hub and spigot.

B. Fittings: Service weight cast iron, bitumen coated, hub and spigot, ASTM C564 service weight neoprene gasket of same manufacturer as piping.

C. All cast iron pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

### 2.3 COPPER PIPE AND FITTINGS

A. Pipe: ASTM B88, Type K, Soft Temper

B. Fittings: ANSI B16.22 wrought copper; ANSI B16.26 and ASTM B62 cast bronze; flared end connections.

### 2.4 DUCTILE IRON PIPE AND FITTINGS

A. Pipe: AWWA C151/ANSI A21.51, Class 52, ductile iron, mechanical type joints for short runs, otherwise use push-on type joints.

B. Fittings: AWWA C110/ANSI A21.51, ductile iron, 250-psi pressure rating (or) AWWA C153/ANSI A21.53 ductile iron compact fitting, 350 psi pressure rating. Joints shall be restrained, mechanical type for short runs, otherwise use push-on type.

C. Lining: Pipe and fittings shall have double thickness cement mortar lining with seal per AWWA C104/ANSI A21.4 on interior and asphaltic coating on outside.

D. Glands and Gaskets: AWWA C111/ANSI A21.11, ductile iron gland, rubber gasket joints, provide two bronze wedges for each joint of pipe.

2.5 PVC SOLID WALL PIPE AND FITTINGS - DWV SYSTEM

A. Pipe: PVC Schedule 40 solid wall pipe, iron pipe size conforming to ASTM D1785 and ASTM D2665. Pipe shall be manufactured from PVC compounds as identified in ASTM D1784. Both pipe and fittings shall conform to National Sanitation Foundation Standard 14.

B. Fittings: Type DWV, socket type conforming to ASTM D2665. Fittings shall be manufactured from PVC compounds as identified in ASTM D1784. Solvent cement joints shall be made utilizing a two-step process with primer manufactured for thermoplastic piping and solvent cement conforming to ASTM D2564.

2.6 POLYETHYLENE PIPE AND FITTINGS - NATURAL GAS

A. Pipe: ASTM D2513, SDR 11, Fittings: Same material as pipe. Heat fusion joints, socket-type ASTM D2683.

B. Acceptable Manufacturers: Adrisco, Chevron Phillips, or approved equal.

2.7 HIGH-DENSITY POLYETHYLENE (HDPE) SEWER PIPE AND FITTINGS

A. Pipe: Smooth interior and corrugated exterior wall HDPE pipe conforming to AASHTO M252 Type C (3 in. through 10 in.) or AASHTO M 294 Type C (12 in. through 24 in.). Pipe shall be manufactured from HDPE compounds as identified in ASTM D3350 with cell classification of 424420C (3 in. through I 0 in.) and 435400C (12 in. through 24 in.).

B. Fittings: Fittings shall conform to AASHTO M252 or AASHTO M294. Fittings shall be manufactured from compounds as identified in ASTM F810.

C. Joints: Pipe connections shall be made with coupling bands covering at least two full corrugations on each end of pipe meeting soil-tight requirements of AASHTO M252 and M294. Gasketed connections shall incorporate closed-cell synthetic expanded rubber gaskets meeting ASTM D1056 Grade 2A2.

2.8 DETECTABLE TAPE

A. Detectable underground warning tape, 5 mil. polyethylene, 6 in. wide, aluminum backing, APWA approved background colors within permanent black lettering identifying service below.

B. Schedule:

1. Sanitary: Green color, "Caution Buried Sewer Line Below".

2. Storm: Green color, "Caution Buried Sewer Line Below".

3. Water: Blue color, "Caution Buried Water Line Below".

4. Gas: Yellow color, "Caution Buried Gas Line Below".

5. Electric: Red color, "Caution Buried Electric Line Below".

C. Acceptable Manufacturers: Seton, Terra Tape, Pro-Line Safety Products, Inc.

2.9 SCHEDULE OF PIPING MATERIALS

A. See Exhibit "A", Schedule of Piping Materials at end of this section for piping.

PART 3 - EXECUTION

3.1 TESTING

A. Sanitary and Storm:

1. Do not backfill over piping until required tests are completed and the Owner's Representative accepts the system.

2. There shall be no loss of water when testing interior piping inside the building foundation.

3. Air test not acceptable as final test.

4. Should any leaks, defective joints or defective construction be detected in sewers, floors or walls of appurtenant structures, they shall be permanently stopped. Should any defective pipes, fitting or accessories be discovered they shall be removed and replaced at the Contractor's expense.

5. Test exterior piping outside the building foundation in 100 ft. sections. The allowable rate of leakage per 24 hours per in. of diameter per 1,000 ft. of sewer tested shall not exceed 25 gallons. Piping shall be inspected and tested prior to backfill.

6. Confirm in writing that tests have been conducted and successfully completed. Submit copy of the test reports to Owner's Representative.

B. Domestic Water:

1. Do not backfill over piping until required tests are completed and the Owner's Representative accepts the system.

2. Make leaks tight; no caulking permitted. Replace defective fittings, pipe or connections. Piping shall be tight and show no loss of pressure.

3. Air test not acceptable as final test.

4. Confirm in writing that tests and flushing have been conducted and successfully completed. Submit copy of the test report to Owner's Representative.

C. Test exterior water and fire service piping outside the building foundation hydrostatically at 200 psi for two (2) hours. The amount of leakage shall not exceed two (2) quarts per hour per 100 gaskets or joints. Conform to NFPA 24.

3.2 HIGH-DENSITY POLYETHYLENE (HDPE) SEWER PIPE AND FITTINGS

A. Pipe installation shall comply with ASTM D2321 and the manufacturer's recommendations.

3.3 DETECTABLE TAPE

A. Provide detectable tape directly over the buried pipe lines at a depth of 1 ft. - 0 in. below finished grade. Install tape over the continuous length of the pipe.

3.4 GAS PIPING

A. Refer to Section 227010, "Natural Gas Systems".

**EXHIBIT "A" - PIPING MATERIALS (PLUMBING)**
**(Notes are at end of Exhibit "A")**

| SERVICE | PIPE MATERIALS | FITTINGS | CONNECTIONS |
|---|---|---|---|
| Water and Fire service | Ductile iron water main with cement lining | Ductile iron | Mechanical or push-on type |
| Water service (2 in. and smaller service) | Type K copper | Cast bronze | Flared |
| Sanitary and grease waste | Service weight cast iron soil pipe | Cast iron, hub and spigot | Neoprene gasket compression type |
| | Schedule 40 PVC, solid wall | PVC, socket type | Solvent cement (SEE NOTE 2) |
| | Schedule 40 PVC, foam core | PVC, socket type | Solvent cement (SEE NOTE 2) |
| Sanitary and grease waste vent | Service weight cast iron soil pipe | Cast iron, hub and spigot | Neoprene gasket compression type |
| Storm | Service weight cast iron soil pipe | Cast iron, hub and spigot | Neoprene gasket compression type |
| | Schedule 40 PVC, solid wall | PVC, socket type | Solvent cement |
| Natural gas | Schedule 40 steel, factory applied corrosion protective coating | Butt welded steel | Welded (SEE NOTE 1) |
| | SDR 11 Polyethylene | Polyethylene | Heat fusion |

NOTES FOR EXHIBIT A:

NOTE 1: On buried coated steel pipe, tape all joints with Scotchwrap #50, 2 in. wide, 50% overlap. Provide cathodic protection system.

NOTE 2: Schedule 40 PVC pipe may not be used when the temperature of the waste can exceed 140°F.

## EXHIBIT "B" - TESTING

| SERVICE | TEST REQUIREMENTS |
|---|---|
| Water service | Test hydrostatically at 150 PSI for two (2) hours or at 1.5 times the working pressure when working pressure exceeds 100 PSI. |
| Sanitary, sanitary vent, storm | Maintain 10 ft. head of water for two (2) hours. |
| Acid waste and vent | Maintain 10 ft. head of water for two (2) hours. |
| Natural gas | Refer to Section 227010 - "Natural Gas Systems". |
| LG gas (propane) | Refer to Section 227011 - "LP Gas System". |
| Fire service | Test hydrostatically at 200 PSI or 50 PSI in excess of the system working pressure, whichever is greater for two (2) hours. |

END OF SECTION

SECTION 221030 - PUMPS

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

### 1.2 QUALITY ASSURANCE

A. Follow all requirements, recommendations and appendices to comply with the following publications, codes, standards and listings/approvals:

1. All items here-in used to convey water for potable use shall be lead free in accordance with NSF 61, Standard 61, Section 9 - Standard for Drinking Water and Lavatory Faucets and NSF Standard 372 - Maximum Lead Requirements. Compliance shall be via third party testing and certification.

### 1.3 SUBMITTALS

A. Submit manufacturer's data in accordance with the Basic Mechanical and Electrical Requirements. Obtain approval prior to ordering material.

B. Provide submittals for all items specified under Part 2 of this Section.

## PART 2 - PRODUCTS

### 2.1 HOT WATER CIRCULATING PUMP

A. Pump: Inline centrifugal, all stainless steel, system fluid lubricated, 145 psi working pressure, 230°F water temperature, ceramic shaft and radial rings, flange mount.

B. Motor: Impedance protected, stainless steel can and static o-ring seals to isolate stator from system fluid, non-overloading throughout the pump curve.

C. Electric Control: Time clock and aquastat for each pump and wiring to motor starter. Starter and time clock by Electrical Contractor.

D. Refer to schedule on drawings for capacity and electrical characteristics.

E. Acceptable Manufacturers: Armstrong, Bell and Gossett, Grundfos.

### 2.2 SUMP PUMP - SUBMERSIBLE

A. Pump: Simplex, submersible type, 2 in. discharge, bronze construction, non-clog impeller, stainless steel shaft, capable of handling 5/8 in. solids, mechanical seal, minimum 50 gpm capacity.

B. Motor: Oil filled, permanent lubrication, automatic reset thermal overload, oil and water resistant power cord with plug, non-overloading throughout the pump curve.

C. Electric Control: Built-in automatic diaphragm-type pressure switch, completely prewired, requiring only receptacle for plug in power connection.

D. Basin: Basin and cover shall be provided by the General Contractor.

E. Refer to schedule on drawings for capacity and electrical characteristics.

F. Acceptable Manufacturers: Hydromatic, Goulds, Weil, Zoeller.

2.3 SUMP PUMP - SUBMERSIBLE

A. General: Provide pump and control system capable of pumping water and automatically shutting down the pumping system upon the detection of oil in the sump.

B. Pump: Simplex, submersible effluent type, 2 in. discharge, stainless steel construction, capable of handling 5/8 in. solids, mechanical seal, meets UL 778 standard, minimum 50 gpm capacity.

C. Motor: Capable of operating continuously or intermittently, housing constructed of #304 stainless steel, oil filled, permanent lubrication, automatic reset thermal overload, oil and water resistant power cord with plug, non-overloading throughout the pump curve.

D. Basin: Basin and cover shall be provided by the General Contractor.

E. The system shall function automatically and provide audible and visual alarms in the event of the presence of oil in the sump, high liquid in the sump, high amps or a locked rotor condition. LED lights shall be provided to indicate power on and pump running.

F. Electric Control Panel: The control panel shall meet UL 508 standards and be housed in a gasketed NEMA 4X enclosure. The control shall be equipped with a twist lock receptacle, dual solid state relays with variable sensitivity settings, an over current relay, self-cleaning stainless steel sensor probe, high decibel warning horn with alarm silencing switch, dual floats, terminal board, remote monitoring contact, NEMA 4X junction box with twist-lock electrical receptacle and mating conductor cables. Provide all cables between the pump and junction box and the cable and plug from the control unit. The control panel, junction box, pump, floats and sensor shall be factory assembled and tested by a nationally recognized testing laboratory. The system shall allow for the main control panel to be located outside of the elevator shaft and be monitored for all functions. The system shall function automatically and provide audible and visual alarms in the event of the presence of oil in the sump, high liquid in the sump, high amps or a locked rotor condition. LED Lights shall be provided to indicate power on and pump running.

G. Refer to Schedule on Drawings for capacity and electrical characteristics.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Pumps shall be installed, aligned and started in accordance with manufacturers written installation instruction.

B. Install pumps in locations to provide access for maintenance and replacement of parts.

C. Support pumps and piping separately so that piping does not support pumps.

D. Provide the services of a factory trained mechanic to start up the system based on factory recommendations. Provide Owner instruction at time of startup. Submit three (3) copies of startup report to the Owner's Representative.

E. All wiring for sump] pump(s) between control panel and junction box shall be continuous. No junction boxes allowed within pump basin.

3.2 HOT WATER CIRCULATING PUMP

A. Install shutoff valve and strainer on pump suction; check valve, balancing valve and shutoff valve in pump discharge. Install pressure gauge on suction and discharge piping. Adjust gpm of each circulating pump to capacity as noted.

3.3 SUMP PUMP

A. Install gate valve and check valve in discharge piping for each pump.

B. Simplex pump operation shall be completely automatic. Pressure style switch shall start and stop the pump at the factory set levels. Float style switches shall be adjusted to start and stop the pump at the specified levels.

C. Install liquid level control devices at proper elevation to produce specified sump drawdown. Secure control devices to discharge piping with corrosion resistant brackets and fasteners.

D. Install high water alarm and make electrical connections. Install liquid level control device at proper liquid depth. Secure control device to discharge piping with corrosion resistant brackets and fasteners.

3.4 TESTING

A. Test hot water recirculating pumps for operation.

B. Test sanitary and storm pumping systems for operation at specified liquid depths.

C. Test high water alarm for operation at specified liquid depth.

D. Test domestic water pressure booster pump system for operation.

E. Certify in writing that tests have been performed and the systems are properly operating. Submit three (3) copies of all test reports to the Owner's Representative.

END OF SECTION

SECTION 223010 - EQUIPMENT

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Document.

### 1.2 SUBMITTALS

A. Provide submittals for all items specified under Part 2 of this section.

## PART 2 - PRODUCTS

### 2.1 FLOOR DRAINS

A. Drain Description: All Floor Drains Type A unless otherwise noted.

1. Type A: Cast iron body, flashing collar with weepholes, nickel bronze, 7 in. diameter adjustable strainer; Jay R. Smith Figure #2010-A.

2. Type B: Cast iron body, flashing collar with weepholes, nickel bronze 7 in. diameter adjustable strainer with separate oval funnel; Jay R. Smith Figure #2010-A with #3590 funnel Type C: Cast iron body, flashing collar with weepholes, 8 in. diameter cast iron grate medium duty, removable sediment bucket; Jay R. Smith Figure #2110.

B. Where floor drains are not installed in slabs on grade, provide flashing collar and flash with 24 in. square four (4) pound lead flashing or equal.

C. Make: Josam, Jay R. Smith, Wade, Watts or Zurn.

### 2.2 FLOOR SINKS

A. Sink Description:

1. Type A: Acid resistant coated body with 12-1/2 in. square nickel bronze top, 8 in. deep with sediment bucket; Jay R. Smith Figure #3150.

B. Make: Josam, Jay R. Smith, Wade, Watts or Zurn.

### 2.3 ROOF DRAINS

A. Drain Description: All Roof Drains Type A unless otherwise noted.

1. Type A: Combination main drain and overflow drain mounted in single deck plate. Each drain to have coated cast iron body with round sump and flange, 15 inch diameter, bottom threaded outlet, aluminum removable locking type dome, deck clamp, receiver, cast iron bolted flashing clamp ring and integral V-notched gravel stop on standard drain and solid weir on secondary drain, both with adjustable extension; Zurn #Z163.

B. Expansion Joints:

1. Coated cast iron, bronze sleeve, packing gland, bolted pressure ring; Jay R. Smith Figure #1710.

C. Downspout Nozzles

1. Cast bronze nozzle and flange, machined nozzle that slips over cast iron pipe, nickel bronze finish and bird screen. J.R. Smith Figure 1771

D. Make: Josam, Jay R. Smith, Wade, Watts or Zurn.

2.4 CLEANOUTS

A. Floors: Cast iron body, nickel-bronze top with adjustable feature, bronze plug and flashing clamp where required, carpet marker and tile cover where applicable; Jay R. Smith Series #4028.

B. Walls: Cast iron ferrule, with bronze plug and stainless steel smooth access cover.

1. Horizontal: Jay R. Smith Figure #4402.

2. Vertical: Jay R. Smith Figure #4531.

C. Yard Cleanout:

1. Cast iron body, adjustable round heavy duty top, with tractor cover, vandal proof screws and bronze plug; Jay R. Smith Figure #4246.

D. Make: Josam, Jay R. Smith, Wade, Watts or Zurn.

2.5 GREASE INTERCEPTOR **[STEEL]**

A. Welded 1/4 in. steel body, **[3/8 in. nonskid tread plate cover,] [reinforced cover for heavy traffic,]** secured with stainless steel bolts, extra heavy leakproof gasket, **[recessed] [semi-recessed] [above floor]** installation, integral extension to floor/grade. Acid-resistant coating inside and outside.

B. **[ ]** gpm full flow, **[ ]** gallon liquid holding capacity, **[ ]** in. tapped inlet and outlet with outlet vent connection, **[ ]** lb. greasy sludge capacity, removable separator screen, filter screen and anchor flange.

C. Make: Rockford **[ ]**, MiFab.

2.6 GREASE INTERCEPTOR **[FIBERGLASS]**

A. Glass fiber construction impervious to retained wastes. For below floor installation. Nonskid frame shall be set flush with floor/grade.

B. **[ ]** gpm full flow, **[ ]** gallon capacity, **[ ]** gallon grease storage capacity, **[ ]** gallon solids storage capacity, **[ ]** in.

inlet and outlet with **[ ]** in. vent connection, integral baffle, cleanout and sample connections, extension to grade, removable gasketed cover.

C. Make: Proceptor Model **[ ]**.

## 2.7 LINT INTERCEPTOR

A. Epoxy coated, fabricated steel, coated with primary and secondary stainless steel screens, 3/16 in. plate cover, secured and gasketed, **[modified for] [ ]** in. inlet and outlet; non-skid-heavy-duty cover.

B. Acceptable Manufacturer: MiFab #MI-LINT **[ ]**, **[ ]** gpm flow rate with anchor flange and membrane clamp, extension up to flush with floor, flow control fitting, and sediment bucket.

## 2.8 WALL HYDRANTS

A. Exposed type hose connection, lead-free, solder connection, nickel bronze face, quarter turn valve, nonfreeze type, 3/4 in. hose connection, self draining, integral vacuum breaker with vandal resistant cap, loose key control and wall clamp; Jay R. Smith Figure #5609QT.

B. Make: Jay R. Smith, Prier, Watts, Woodford or Zurn.

## 2.9 ROOF HYDRANT

A. Non-freeze, post-type roof hydrant with ASSE 1052 dual check backflow preventer, underdeck clamp support, 1 in. water inlet, 3/4 in. hose connection and 1/8 inch drain port: Wood #RYH2-MS.

B. Make: Jay R. Smith, Watts, Woodford or Zurn.

## 2.10 SHOCK ABSORBERS

A. Hydropneumatically controlled with permanently sealed expansion chamber pre-charged with non-combustible gas; lead-free, threaded connection, meets or exceeds Plumbing and Drainage Institute Standard PDI WH-201 and ASSE Standard 1010.

1. Bellows Type: Stainless steel construction with stainless steel bellows.

2. Piston Type: Hard drawn copper body with brass piston, cap and adapter, and elastomer seals.

B. Elastomer or rubber compound type bellows not allowed.

C. Make: Watts #LF15M2, Precision Plumbing Products, Jay R. Smith, or Zurn.

## 2.11 TRAP GUARDS

A. Elastomeric, normally closed seal to prevent evaporation of P-traps. Inserts into throat of floor drain. Provide for each new floor drain.

B. Make: ProVent Systems, Inc. "ProSet Trap Guard".

2.12 WATER PRESSURE GAUGES

A. Construction to be Bourdon tube type; 4-1/2 in. diameter, minimum dial face, stamped stainless steel, replaceable glass lens, with snap-on rings. Phosphor bronze tube, bronze bushed rotary movement, silver brazed or soldered to brass socket and brass tip, 1/4 in. bottom connection. Accuracy, on (1.0) percent of included scale range. White dial face with black numerals, graduated in pounds; equipped with bronze pulsation dampener or snubber and needle valve.

B. Make: Trerice, Weiss, Weksler, Winters.

2.13 PIPING SYSTEM THERMOMETERS

A. Industrial type, plastic, aluminum or steel case, glass or plastic front, non-toxic organic liquid filled, red reading column, white or silver V-shaped scale, black numerals. Union flange mounted, separable socket with thermowell, extension necks were required; range as called for service. Universal adjustable type, 9 in. scale. For installation in water systems where the maximum temperature is less than 120°F, graduations of 1°F, accurate to within 1/2°F. For installation greater than 120°F, graduations of 2°F, accurate to

B. Make: Trerice, Weiss, Weksler, Winters.

2.14 TEMPERATURE MIXING VALVE - HIGH/LOW TYPE

A. Valve shall mix 140°F hot water with 40°F cold water to obtain a water outlet temperature of 120°F. The valve shall consist of the following:

1. High/low style, single thermostatic mixing valve with **[ ]** in. inlet and **[ ]** in. outlet. Flow capacity of **[ ]** gpm at 5 psi pressure drop, and **[ ]** gpm at 20 psi pressure drop.

2. Combination strainer check stops with union at each inlet, union on outlet, tamper resistant temperature adjustment control.

3. Provide valves on hot, cold and tempered water piping with fittings, nipples, trim piping and escutcheon plates. Horizontal stem dial thermometers on hot, cold and tempered water piping.

4. Rough bronze lead free mixing valve and trim within cabinet.

5. Surface mounted Epoxy coated steel cabinet with No. 4 finish, 16 gauge body, and 14 gauge door with cylinder lock. Turn keys over to Owner.

B. Make: Powers Series LFSH 1430, Leonard, or Symmons.

2.15 LAUNDRY UTILITY BOX

A. Guy Gray, Model [ ] washing machine supply and drain fitting with hot and cold water 1/2 in. sweat shutoff valves, 2 in. drain connection and in 20 gauge, white powder coated steel cabinet with faceplate.

B. Provide vacuum breakers on each hose connection.

PART 3 - EXECUTION

3.1 EQUIPMENT CONNECTIONS

A. Plumbing Contractor shall:

1. Provide all roughing and final water, waste, vent, gas, air, vacuum, diesel and/or oxygen connections to all equipment requiring same as called for on Contract Documents.

2. Refer to Contract Documents for roughing schedules, and equipment and lists indicating scope of connections required.

3. Provide loose key stops, "P" traps, tailpieces, adapters, gas or air cocks and all necessary piping and fittings from roughing point to equipment.

4. Provide for installation of sinks, faucets, traps and tailpieces provided by an Equipment Contractor. These items to be delivered, in easily identified cartons, to the proper room for Contractor's installation.

5. Install controls and devices furnished by others.

6. Provide cold water line with gate valve and backflow prevention device at locations called for. Continuation and connection to equipment by others.

7. Install relief valve discharge piping from equipment relief valves.

8. Provide for Owner furnished equipment:

a. Connect complete and ready for use, including all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, insulation, sheet metal work, controls, dampers, etc., as required by Owner.

b. Refer to manufacturer Drawings and Specifications for requirements of special equipment. Verify connection requirements before bidding.

3.2 ROOF DRAINS

A. Install according to manufacturer's written installation instructions.

B. Clean drains and strainers just prior to final inspection.

C. Provide expansion joints for roof drains located more than 25 ft. - 0 in. above finished floor.

3.3 CLEANOUTS

A. Install cleanouts out of traffic patterns and flush to floor. Provide offset from sanitary line served. Do not locate under doors or under lockers. Maintain distance between cleanouts on piping 4 in. and smaller, 50 ft.; over 4 in., 100 ft. At changes in direction greater than 45°. Install at base of soil, waste, vent, stacks and roof conductors and where called for.

B. Cleanouts: Same nominal size as pipe, but not larger than 4 in.

3.4 WALL HYDRANTS

A. Install minimum 24 in. above grade.

3.5 HOSE BIBBS

A. Install at low points of piping system.

3.6 SHOCK ABSORBERS

A. Install in vertical position.

3.7 THERMOMETERS

A. Provide on piping system where called for and shown, with thermometer well at each location, mounted in oversize tee or elbow to provide as little restriction as possible to fluid flow, stems or proper length to allow accurate reading. Arrange to be easily read from floor.

B. Select range such that the maximum system working temperature is in the middle one-third of the scale.

3.8 PRESSURE GAUGES

A. Provide in piping system where called for and shown, with needle valve and pulsation damper or snubber at each location. Arrange to be easily read from the floor.

B. Select range such that the maximum system working temperature is in the middle one-third of the scale.

3.9 TEMPERATURE MIXING VALVE

A. Provide where called for. Provide 2 ft. - 0 in. deep heat trap on hot water supply line ahead of connection to mixing valve.

B. Provide factory-trained technician to start up, adjust and inspect the mixing valve and piping for correct installation and temperature adjustment.

3.10 GREASE TRAP

A. Install in accordance with manufacturer's written installation instructions.

B. Provide concrete hold down pad as indicated on drawing.

C. Set trap on a 6 in. deep level bed of compacted pea gravel spread evenly over the top of the concrete pad.

D. Secure trap to pad with anchor bolts hooked under reinforcing rods of the hold down pad. Coat bolts, rods and other exposed metal surfaces with three coats of black asphaltum.

END OF SECTION

SECTION 223400 - WATER HEATERS

## PART 1 - GENERAL

### 1.1 SCOPE OF WORK

A. Work of this section shall be performed in accordance with the requirements of the Contract Documents, including but not limited to Instructions to Bidders, Agreement and General Conditions, General Requirements and Basic Mechanical/Electrical Requirements.

B. Provide labor, materials, equipment and services to perform work and related work required by Contract Documents for a complete operating system.

### 1.2 SUBMITTALS

A. Submit manufacturer's data for approval in accordance with Basic Mechanical/Electrical Requirements. Obtain approval prior to ordering material.

B. Provide submittals for all products to be installed including, but not limited to:

1. Water Heater.
2. Tank Protective Valves.
3. Expansion Tank.
4. All Heater and Tank Accessories.
5. All System Wiring Diagrams.
6. Tank Lining.
7. Condensate Neutralizer Kit.

### 1.3 SPECIAL COORDINATION

A. Coordinate all work of other trades in Water Room.

B. Furnish Division 26 "Electric" with dimensional drawings showing location of electrical connections, location of equipment mounted on walls, and of other equipment requiring electrical connections, removals or replacements.

## PART 2 - PRODUCTS

### 2.1 WATER HEATER SEMI-INSTANTANEOUS, GAS-FIRED CONDENSING TYPE

A. Provide gas-fired, condensing fire tube heater with a modulating power burner.

B. Units to fire on Natural gas.

C. Heater shall be UL/FM approved with an input of 250 mbh and an output of 225 mbh with a minimum efficiency of 96%.

D. Heater shall have a recovery rate of 291 GPH at 100°F rise.

E. The tank shall be lined with Vitraglas® vitreous enamel and shall have a bolted hand hole cleanout.

F. The tank shall have four extruded magnesium anode rods installed in separate head couplings.

G. This water heater shall be equipped with stainless steel cold water inlet, Hydrojet® Sediment Reduction System.

H. This water heater shall be equipped with an electronic ignition system, an ASME rated T&P relief valve and a premix closed combustion system for direct venting using either 2", 3", 4" or 6" PVC, CPVC, Polypropylene, Stainless Steel, or ABS vent pipe.

I. The water heater shall be factory assembled and tested. The water heater shall be approved for zero inch clearance to combustibles.

J. A digital LCD display shall be integrated into the front and be an adjustable electronic thermostat to any temperature up to 180°F. A recycling Energy Cut Off (E.C.O.) shuts off all gas in the event of an overheat condition.

K. The entire installation shall be made in compliance with state and local codes and ordinances.

L. Basis-of-Design: Bradford White Model EF-100T-250E-3N or approved equal.

2.2 THERMAL EXPANSION TANK

A. Vertical steel expansion tank constructed and designed per ASME Code Section VIII, 150 PSI working pressure, steel outer shell, rigid polypropylene liner, heavy duty butyl rubber diaphragm and non-ferrous system connection tapping, suitable for potable hot water, factory pre-charged at 15 PSI. Tank will have a 12 in. diameter and a height of 18 in. with a 6.4 gallon total volume and 0.80 maximum acceptance factors. The manufacturer will be similar to Model ST-12C by Amtrol, Wessel or approved equal.

B. Design Equipment: Watts.

C. Acceptable Manufacturers: Amtrol, Watts, Wessel or approved equal.

2.3 TANK PROTECTIVE VALVES

A. Pressure Relief Valves:

1. ASME stamped and rated.

2. Open at 125 lbs. pressure sized for full heating capacity.

3. Make: Bell & Gossett, Kunkle, Watts or approved equal.

B. Temperature and Pressure Relief Valve:

1. ASME stamped and rated (for steam or hot water).

2. Size for full heat input.

3. Complying with Federal Spec. MIL-V-13612C.

4. Valve shall be sized and selected by manufacturer for tank and heater installed.

5. Make: Camco, Cash-Acme, Watts, or approved equal.

## PART 3 - EXECUTION

### 3.1 WATER HEATERS

A. Install each heater on a 6 in. high concrete pad.

B. Pipe pressure and temperature relief valve drain to discharge to nearest floor drain.

C. Provide all electric wiring and equipment in accordance with manufacturer's wiring diagrams and instructions. Make all final connections.

D. Provide all piping, valves and fittings in accordance with manufacturer's piping instructions. Make all final connections.

E. Provide equipment in accordance with contract drawings and all local codes.

F. Provide gas pressure regulator when inlet gas pressure exceeds 14 in. w.c.

G. Provide start-up services of a factory trained technician to inspect the installation based on factory recommendations. Items include but are not limited to:

1. Verification of proper piping arrangement.

2. Fuel supply piping and connection(s).

3. Combustion efficiency.

4. Verification of proper temperature rise across heater(s).

5. Verification of proper venting with draft reading.

6. Operating and safety controls.

7. Proper operation of equipment.

8. Verification of piping arrangement and aquastat location.

9. Verification of proper gas pressure to unit and to burners.

10. Relief valve settings and AGA BTU capacities.

11. All control settings.

H. Submit three (3) copies of startup reports in writing with all factory checkout data signed by the factory authorized service agent to the Owner's Representative.

I. Place equipment in operation.

J. The installation of water heaters shall be based on the details shown on the drawings and specified in this Section. Approved water heaters provided other than type shown or specified shall be installed in accordance with manufacturer's recommended installation instructions and piping diagrams.

## 3.2 INSTANTANEOUS WATER HEATERS

A. Install instantaneous type water heaters as recommended by the manufacturer. Place and secure anchorage devices to building structure. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible.

## 3.3 STORAGE TANKS AND HEATERS

A. Provide 2 in. drain with valve off bottom.

B. Install tank on a 6 in. high concrete pad.

C. Temperature and Pressure Relief Valves:

1. Extend drain piping to terminate at 6 in. above floor or floor drain. Support all discharge piping independent of valves to eliminate strain on valve bodies.

2. Install all valves per ANSI Z21.22.

3. The temperature sensing elements shall be immersed in the water within the top 6 in. of the top of the tank.

4. Install pressure relief valve in the cold water line.

D. Unused Tank Openings:

1. Provide solid brass or bronze plugs in all unused tank openings.

## 3.4 CONDENSATE NEUTRALIZERS

A. Verify if condensate neutralizer is available from factory to be provided with water heater to site.

B. Install unit with 1/2 in. polyethylene tubing or piping in accordance with the water heater manufacturer's recommendations.

END OF SECTION

SECTION 224000 - PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. Submit manufacturer's data in accordance with Basic Mechanical/Electrical Requirements. Obtain approval prior to ordering material.

B. Provide submittals for all items specified under Part 2 - Products of this section.

1.3 DESCRIPTION OF FIXTURES

A. Fixtures and trim shall be of those manufacturers listed, unless otherwise indicated. Fixtures for this project shall be of same manufacturer.

1. Fixtures: American Standard, Kohler, Mansfield, Sloan, Toto, Watts or Zurn.

2. Faucets: Chicago Faucets, Delta, Moen, Symmons, T&S Brass or Zurn. All faucets shall be lead-free in accordance with NSF 61 and NSF 372.

3. Closet Seats: Bemis, Beneke, Church or Olsonite.

4. Fixture Carriers: Jay R. Smith, Watts, Wade, Josam or Zurn.

5. Sinks: Elkay, Just or Kohler.

6. Water Coolers: Elkay, Halsey Taylor or Haws.

7. Supplies, Stops and Traps: Brasscraft, EBC, McGuire or Sanitary Dash.

B. Exposed parts of trim shall have polished chrome plated finish.

C. Tubular drainage products ("P" traps, nipples, etc.) shall be 17 gauge brass.

1.4 QUALITY ASSURANCE

A. Comply with requirements of the Plumbing Fixture Law of the New York State Department of Environmental Conservation.

B. Comply with the American Disabilities Act Guidelines and ANSI A117.1 "Accessible and Usable Buildings and Facilities".

C. All items here-in used to convey water for potable use shall be lead free in accordance with NSF Standard 61, Section 9 Standard for Drinking Water and Lavatory Faucets and

NSF Standard 372 - Maximum Lead Requirements. Compliance shall be via third-party testing and certification.

D. All fixture trim used to convey water for potable use shall be lead free.

PART 2 - PRODUCTS

2.1 WATER CLOSETS

A. WC-A (HDCP):

1. American Standard #2386.012 Cadet 3 Right Height, floor mounted, vitreous china, siphon action jetted, tank type, elongated bowl, close coupled, 16-1/2 in. high rim, fully glazed 2 in. ball pass trapway, 1.28 GPF fitted with the following:

a. Church #380TC extra heavy weight, white elongated solid plastic, open front seat with cover.

b. McGuire #166 chrome plated angle supply with 3/8 in. x 12 in. flexible riser, wheel handle stop and wall escutcheon with set screw.

c. Cast iron closet flange with stainless steel bolts and wax setting ring.

d. Color matching bolt caps.

2.2 LAVATORIES

A. LAV-A (HDCP):

1. American Standard #0355.012 Lucerne, 20 in. x 18 in., wall hung, vitreous china lavatory with 4 in. centers, front overflow, self-draining deck and punching for concealed arm carrier, fitted with following:

a. F-C faucet as specified herein.

b. McGuire #155WC offset chrome plated P.O. plug with open grid strainer and 1-1/4 in., 17 gauge offset tailpiece.

c. McGuire #8902 chrome plated, 17 gauge, 1-1/4 in. x 1-1/2 in. "P" trap with cleanout plug and cast brass escutcheon with set screw.

d. McGuire # LF165LKF, lead-free, 3/8 in. chrome plated wall supplies with loose key angle stops, 12 in. long flexible risers, cast brass escutcheon with set screws.

e. Jay R. Smith Series 700 concealed arm floor mounted carrier with rectangular uprights.

f. Cover exposed waste, stops and supply piping with ADA conforming pipe covers, Truebro, Inc. "Lav-Guard".

g. Mount at ADA required height and location or as shown on Architectural drawings.

B. LAV-B:

1. American Standard #0497.221, 21-1/2 in. x 17 in. oval, undermount, vitreous china lavatory with front overflow fitted with the following:

a. F-L faucet as specified herein.

b. McGuire #155-A chrome plated PO plug with open grid strainer and 1-1/4 in., 17 gauge tailpiece.

c. McGuire #8902 chrome plated, 17 gauge, 1-1/4 in. x 1-1/2 in. "P" trap with cleanout plug and cast brass escutcheon with set screw.

d. McGuire # LF165LKF, lead-free, 3/8 in. chrome plated wall supplies with loose key angle stops. 12 in. long flexible risers, and cast brass escutcheon with set screws.

2.3 SINKS

A. SK-A (HDCP):

1. Elkay Lustertone LRAD2219, 22 in. x 19 in. x 6 in. deep, nickel type 302 stainless steel single bowl sink, ADA compliant, three (3) faucet holes, 18 gauge, self rimming for countertop installation, fitted with the following:

a. F-O faucet as specified herein.

b. Elkay #LKAD18 stamped brass drain outlet with 3 in. perforated grid strainer and LKADOS 1-1/2 in. O.D. offset tailpiece.

c. McGuire #8912 semi-cast brass adjustable "P" trap, 1-1/2 in. x 1-1/2 in., with cleanout plug and cast brass escutcheon with set screw.

d. McGuire #LF2167LKF, lead-free, 1/2 in. copper sweat supplies with 1/2 in. OD flexible risers, loose key stops and cast brass escutcheons with set screws.

2.4 FAUCETS

A. F-C:

1. Chicago Faucets Hytronic #116.221.AB.1, dual supply, with user adjustable temperature mixing valve and integral checks, CP solid cast brass electronic sensor faucet, battery operated, deck mounted, 4 in. centers, lead-free, cover plate, vandalproof non-aerating spray outlet, stainless steel braided hose supply, ADA compliant and fitted with the following:

a. 0.50 GPM aerator.

b. Chicago #131-ABNF, lead-free, thermostatic mixing valve, 3/8 in. connections

c. 6 volt lithium CRP2 battery.

d. ADA compliant, chrome plated.

B. F-L: Chicago Faucets #420-POABCP lift-on/push off single lever lead-free faucet with pop-up waste, 4 in. centers, 4-5/8 in. spout, 1.5 laminar flow outlet, ceramic volume and temperature control cartridge, ADA compliant.

1. Chicago #131-ABNF, lead-free, thermostatic mixing valve, 3/8 in. connections.

C. F-O:

1. Chicago #431ABCP, single lever washerless sink faucet, integral 9-1/2 in. cast brass swing spout, temperature limiter , deck mounted, 8 in. centers, lead-free, ADA compliant and fitted with the following:

a. 1.5 GPM aerator.

b. Chicago #131-ABNF, lead-free thermostatic mixing valve, 3/8 in. connections.

c. #369 standard lever handles.

d. ADA compliant.

2.5 MOP BASINS

A. MB-A:

1. Fiat Model MSB, molded stone, 24 in. x 24 in. x 10 in. deep, stainless steel flat strainer, 2 in. outlet with the following:

a. T&S Brass #B-0665-BSTP, lead-free, exposed wall mounted faucet with integral stops, rough chrome finish, lever handles, top brace spout with bucket hook, hose end and vacuum breaker.

b. Fiat # 832AA Hose and Hose Bracket.

c. Fiat #889CC Mop Hanger.

d. Fiat # E77AA Vinyl Bumper guard on exposed sides.

e. Fiat #MSG 2424 Stainless Steel Wall Guard.

f. Provide silicone sealant between wall, floor and mop basin.

## PART 3 - EXECUTION

### 3.1 FIXTURES, EQUIPMENT AND SYSTEMS

A. Install fixtures, equipment and systems as shown on Drawings or specified herein in accordance with provisions of each applicable Specification Section and all local and state codes having jurisdiction.

### 3.2 INSTALLATION OF PLUMBING FIXTURES

A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers written installation instructions.

B. Carefully drill holes for through bolts to avoid chipping blocks or plaster.

C. Except where carriers are specified, attach hangers or brackets to walls as follows:

1. Masonry Construction: Secure fixture hangers to partition by thru-bolts extending through a steel plate on opposite side of partition. Obtain Owner's Representative's approval prior to work.

2. Metal Stud Construction: Anchor backing for fixtures or equipment to 1/8 in. x 12 in. steel plate bolted or riveted to at least three studs. Obtain Owner's Representative's approval prior to work.

D. Anchor carriers to concrete floor with 1/2 in. x 3 in. anchor or thru-bolts and washers. Provide for drilling of floor and installation of expansion shields. Quantity of anchors:

1. Water Closets - Four (4).

2. Lavatories - Eight (8).

3. Urinals - Eight (8).

E. Seal fixtures in contact with walls, floors and counters using a sanitary-type, one-part, mildew-resistant, silicone caulk. Match color to fixture color.

F. Set self-rimming lavatories and sinks in a bed of silicone caulk.

G. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.

H. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gage.

I. Install wall-hanging, back-outlet urinals with gasket seals.

J. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified and to building wall construction where no support is indicated.

K. Fasten counter-mounting-type plumbing fixtures to casework.

L. Metering faucets shall be adjusted for minimum ten (10) second run time, but not more than 0.25 gallons per cycle.

M. Immediately after installation, provide protective covering over fixtures and trim.

3.3 MOUNTING HEIGHT AND LOCATION

A. Mount fixtures at height and location as indicated on Architectural plans and elevations.

B. Mount accessible fixtures in conformance with the requirements of ANSI A117.1.

3.4 CONNECTIONS

A. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other sections of Division 22.

3.5 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings and controls.

B. Adjust water pressure at electric water coolers, faucets and flush valves to provide proper flow and stream.

C. Replace washers of leaking and dripping faucets and stops.

D. Clean fixtures, fittings, spout and drain strainers with manufacturers' recommended cleaning methods and materials.

E. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components and retest. Repeat procedure until all units operate properly.

END OF SECTION

SECTION 224000.10 - SUPPLEMENTAL TO FIXTURE SCHEDULE

PART 1 - GENERAL

1.1 BATHTUBS

A. Type A: (cast iron)

1. American Standard #2265.379

a. As required. 5 ft. - 0 in. long x 30 in. wide x 14 in. high, white enameled cast iron, recessed bathtub with slip resistant bottom and the following trim.

b. Concealed pop-up waste with overflow, level handle, brass elbows, tee and 1-1/2 in., 17 gauge brass tubing.

2. Accessories:

a. Mixing Valve: Equal to Powers Hydroguard Type #410 pressure balancing valve with check stops, level handle, color insert, stainless steel trim and adjustable temperature limit stop.

1) Make: Powers: #802, Symmons, or approved equal.

b. Shower Head: Powers Type "K" standard shower head with 2.0 gpm flow control (built-in) Type 1 standard arm and flange.

c. Tub Spout: Powers Type "U" slip-on lift latch (diverter) spout.

d. Curtain and rod; 1 in. diameter stainless steel curtain rod; white 10 oz. Curtain with hooks.

1.2 SHOWERS

A. All showers Type "A" unless otherwise noted.

B. Type "A":

1. AKER Model NF6034 60 in. x 34 in. x 74 in. one piece shower cabinet, white acrylic with fiberglass and polyester resin backing, 2 in., chrome plated cast brass drain and arranged for right or left hand valves as indicated on drawings and fitted with the following:

a. Textured one piece floor integral threshold and recessed soap dish.

b. Provide 1 in. diameter stainless steel curtain rod with 10 oz. white shower curtain with curtain hooks.

c. Power #413 Hydroguard mixing valve pressure type with check stops maximum temperature stop and lever handle and escutcheon plate.

d. Powers #141-376 deluxe self-cleaning shower head all brass construction, ball joint, spray adjustment, 2.5 gpm flow control, #141-198 heavy duty arm and die cast flange with locking set screw.

1.3 WASHING MACHINE FITTING

A. Guy Gray, Model DLWB1 space saver washing machine supply and drain fitting.

END OF SECTION

SECTION 227010 - NATURAL GAS SYSTEMS

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

### 1.2 SUBMITTALS

A. Provide manufacturer's data sheets and installation instructions for all equipment and accessories in this section in accordance with Basic Mechanical/Electrical Requirements and Division 01.

### 1.3 QUALITY ASSURANCE

A. Follow all requirements, recommendations, and appendices to comply with the following publications, codes, standards, and listings:

1. 2020 Fuel Gas Code of New York State.
2. American Gas Association.
3. Local Utility Company.

B. Provide equipment and accessories that are listed and labeled by a nationally recognized testing laboratory.

### 1.4 GAS SERVICE

A. All new underground gas service piping from the street main to, and including, the gas meter will be installed by.

B. The cost of this work shall be included in this Contractor's bid.

C. This Contractor shall provide the meter pad, pipe bollards and meter enclosure.

### 1.5 GAS PRESSURE

A. The maximum allowable gas pressure inside the building is 1/2 psi.

### 1.6 UNDERGROUND GAS PIPING

A. All underground gas piping located downstream of the gas meter shall be installed by a **[Rochester Gas and Electric Corporation] [National Fuel Gas] [National Grid]** approved utility contractor in accordance with the gas company's requirements.

B. The cost of this work shall be included in this Contractor's bid.

## PART 2 - PRODUCTS

### 2.1 GAS PIPING

A. Piping Materials: Refer to Specification Section 221010, "Piping Systems and Accessories" and Section 221020, "Underground Piping And Accessories".

B. All exposed exterior and interior piping shall be primed and painted with one coat of alkyd primer and two coats of exterior acrylic latex gloss enamel. Color shall be as selected.

### 2.2 VALVES

A. Refer to Specification Section 220523, "Valves".

### 2.3 GAS PRESSURE REGULATORS

A. By Utility Company.

### 2.4 FLEXIBLE CONNECTORS

A. Stainless steel construction and in accordance with ANSI Z21.24.

### 2.5 LOCATOR TAPE

A. Yellow plastic tape, intended for direct-burial service, not less than 6 in. wide x 4 mils thick with #10 AWG coated stranded copper wire tracer. Lettering on the tape shall state, "CAUTION: BURIED GAS LINE BELOW".

B. Manufacturers: Calpico, Griffolyn, Terra Tape or approved equivalent.

## PART 3 - EXECUTION

### 3.1 ARRANGEMENTS

A. Make arrangements with Local Utility company to provide the gas service and meter at the indicated location.

B. Contact the utility company for the cost of the service, its fees and required permits. Pay all costs and include within the base bid.

C. The service load is **[ ]** Btuh. The pressure at the meter outlet shall be set at **[ ]** in. wc.

D. Coordinate all service requirements with the utility company.

E. The contractor shall arrange for the plumbing inspector to inspect the gas piping and vent installations upon completion including underground and rough-ins, as well as installation of gas-fired appliances.

### 3.2 GAS DISTRIBUTION SYSTEM

A. Provide distribution system from gas meter outlet, including meter pad, fence enclosure, mains, risers, branches, drips, shut-offs and other required parts. Connect to equipment or appliances indicated or specified as requiring gas for their operation.

B. Provide shutoff valve at the meter outlet. Provide all parts and accessories needed to connect to meter.

C. Furnish sleeve and sealing element for above ground gas piping entry through outside wall. Make entry gas and watertight.

3.3 PIPING INSTALLATION

A. Install gas piping at a uniform slope of 1/4 in. in 15 ft. to prevent traps. Horizontal lines shall slope upward to risers to the equipment.

B. Drips and Sediment Traps: Install drips at points where condensate may collect. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.

C. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down. Connect branch piping from top or side of horizontal piping.

D. Install unions in pipes 2 in. and smaller, adjacent to each valve, regulator and at final connection to each piece of equipment. Unions are not required on flanged devices.

E. Provide pressure regulator in supply to each gas fired appliance as required.

F. Install valve and strainer on the supply side of each gas pressure regulator.

G. Install vent piping for gas pressure regulators and gas trains, extend outside building and vent to atmosphere. Terminate vents with turned-down reducing elbow fittings with corrosion-resistant insect screens in large end.

H. Install containment conduits for buried gas piping within building in gas-tight conduits extending 12 in. minimum outside building and vented to atmosphere. Terminate vents with turned-down, reducing elbow fittings with corrosion-resistant insect screens in large end. Prepare and paint outside of conduits with coal tar epoxy.

I. Install pressure-relief or pressure-limiting devices so they can be readily operated to determine if valve is free; test to determine pressure at which they will operate; and examine for leakage when in closed position.

3.4 WELDING

A. Welding shall be performed in compliance with the welding procedure specifications prepared by the National Certified Pipe Welding Bureau. Welded pipe fabricated by certified welder. Contractor shall submit proof of current certification of each welder if requested by the Owner. Use full-length pipe where possible; minimum distance between welds, 18 in. on straight runs. Welds must be at least full thickness of pipe with inside smooth; remove cutting beads, slag and excess material at joints; chamfer ends. Minimum gap 1/8 in., maximum 1/4 in. for butt welds. Overlaps on position and bench

welds to be not less than 3/4 in. One internal pass and one external pass minimum required on slip-on flanges. Do not apply heat to rectify distorted pipe due to concentrated welding; replace distorted pipe. Exercise caution to prevent heat related damage to plastic parts within the gas meter or regulators.

B. Welder qualifications: Welded piping fabricated by certified welder. Welder shall be certified under ASME or API Code III.

3.5 CONNECTIONS

A. Install gas piping next to gas-utilizing equipment and appliances for servicing and maintenance. Connect gas piping to gas-utilizing equipment and appliances with shutoff valves and unions. Make connections to equipment downstream of valves and unions with flexible connectors. Valves, unions and flexible connectors shall be same size as the gas supply piping to the equipment.

B. Install a gas valve upstream within 6 ft. of each gas-utilizing appliance. Install a union connection downstream from the valve to permit removal of controls.

C. Sediment Traps: Install full size tee fittings forming drips, as close as practical to gas appliance inlets. Cap or plug bottom outlet.

3.6 UNDERGROUND PIPING INSTALLATION

A. All underground piping shall be installed by a utility approved contractor in accordance with the gas company's requirements.

B. Qualification by the utility company is required for the individual making heat-fusion joints.

C. The service main shall be installed with a minimum 36 in. cover and shall in all cases conform to be requirements of the pipe manufacturer instructions.

D. Install piping a minimum 5 ft. - 0 in. from buildings.

3.7 LOCATOR TAPE

A. Install the locator tape with the gas main, which can be used to help determine the location of the gas piping at a future time. Locate directly over the buried gas line at a depth of 6 in. below finished grade.

B. Terminate tracer wire in cast iron boxes. Maximum spacing between boxes shall be 500 ft.

3.8 GAS PIPING TESTS

A. Test natural gas systems according to 2020 Fuel Gas Code of New York State and the local utility requirements unless otherwise noted:

1. Test pressure shall be 1-1/2 times working pressure, but not less than 3 psi for two (2) hours for steel piping.

2. Pressure testing of plastic piping shall be per utility's requirements.

B. Tests shall be witnessed by utility company. Make arrangements, provide all necessary items to complete testing and pay all costs.

C. All tests shall be performed prior to the connection of equipment. Regulator shall be isolated from test pressures. Soap test shall be conducted on all joints. Repair leaks and defects with new materials. Retest system until satisfactory results are obtained.

D. Verify correct pressure settings for pressure regulators.

E. Provide written certification that tests have been conducted and satisfactorily completed. Submit to Owner's Representative.

3.9 GAS LINE PURGING

A. At completion of pressure test, purge all natural gas systems according to 2020 Fuel Gas Code of New York State and the utility company requirements.

B. Provide three (3) days notice to utility company to have the meter unlocked for service and equipment start up. Make all arrangements and pay all fees as required by the Utility Company.

END OF SECTION