SECTION 22 01 00 – GENERAL PROVISIONS - PLUMBING

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. The work to be done under Division 22 sub-contracts shall include the furnishing of all labor, materials, equipment, and services necessary for and reasonably incidental to the proper completion of all work as shown on the plans and herein specified, only excepting work materials specified or noted as being furnished or installed by others.

B. All work shown in the drawings and specifications shall be included under the base bid, except where there is specific reference to exclusion or incorporation in alternate quotation.

C. The Plumbing subcontractor (plumbing contractor) may hereinafter also be referred to as "This Sub-contractor," "subcontractor", "PC", Division 22 sub-contractor.

D. Drawings shall not be scaled. Refer to architectural and structural drawings for building construction and dimensions and to room finish schedule or architectural drawings for material, finish and construction method of walls, floor and ceiling in order to insure proper rough-in and installation of work.

1.2 WORK INCLUDED:

A. The plumbing subcontractor shall be responsible for including the cost of all labor, accessories, tools, equipment and materials required to completely execute installation of the entire plumbing for all systems as shown on the drawings and as specified. Work under the plumbing contract shall include, but shall not be limited to, the furnishing, unloading, handling, distribution, setting and installation of all components required for the following systems:
1. Sanitary sewers (interior and exterior to the building)
2. Vent and waste systems
3. Special drainage work as hereinafter specified
4. Piping Specialties
5. Storm sewer to designated points outside building
6. Plumbing fixtures
7. Rough-in and final connections
8. Miscellaneous items as specified, required and/or shown on drawings

1.3 RELATED WORK WHICH IS A PART OF SECTION 22 00 50:

A. All work done under this section of the specification is subject to the Architect's instructions to bidders, general conditions and their corresponding supplements.

B. Refer to the supplementary general conditions of these specifications for temporary services and facilities that shall be provided.

1.4 DEFINITIONS:

A. "Piping": Pipe, fittings, flanges, traps, drains, vents, and items customarily required in connection with the transfer of fluids.

B. "Provide" (P): Furnish and install complete ready for use.

C. "Furnish" (F): Purchase and deliver to the project site complete with every necessary appurtenance and support.

D. "Install"(I): Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation of the proper location in the project.

E. "Concealed": Embedded in masonry or other construction, installed behind wall furring, within double partitions of hung ceilings, in crawl spaces, in shafts.

F. "By Other Trades": Shall mean by persons or parties who are not anticipated to be the Contractor whose work is specified in this section but shall mean other contractors or subcontractors who along with this trade shall be working together with the general contractor. In this context the words "by other trades" shall not be interpreted to mean not included in the overall contract.

1.5 ABBREVIATIONS:

AFF	Above Finish Floor
AMP	Amperes
BO	By Others
CI	Cast Iron
CL	Ceiling
CO	Clean Out (F-Floor)(W-Wall) (Y-Yard)
CONTR	Contractor
DB	Decibels
DIS.SW	Disconnect Switch
DN	Down
ELEC	Electrical
F	Furnish or Filter
FD	Floor Drain
FL	Floor
FS	Floor Sink
HB	Hose Bibb
IE	Invert Elevation
NC	Noise Criteria
ORD	Overflow Roof Drain
P	Provided (Furnished & Installed)
PH	Current Phase
PLBG	Plumbing
RD	Roof Drain
UF	Underfloor
UG	Underground
Ø or PH	Current Phase

1.6 INTERPRETATION OF CONTRACT DOCUMENTS:

A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

B. It shall be understood that the specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Exceptions are that notes on the drawings, which refer to an individual element of work, take precedence over the specifications where they conflict with same.

C. No exclusions from, or limitations in, the language used in the drawings or specifications shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted.

D. The drawings of necessity utilize symbols as schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed in accordance with the diagrammatic intent expressed on the drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings.

E. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.

F. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the intended work.

G. Information as to the general construction shall be derived from structural and architectural drawings and specification only.

H. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

1.7 DELINEATION OF WORK:

A. The sub-contractor is required to supply all necessary supervision and coordination of information to any others who are performing work to accommodate plumbing installations. Where the plumbing subcontractor is required to install items which he does not purchase, he shall include for such items:
1. The coordination of their delivery.
2. Their unloading from delivery trucks driven in to any designated point on the property line.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected.
5. Their field assembly and internal connections as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

B. Items which are to be installed but not purchased as part of the work of the mechanical or plumbing contractors shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation shall require procedures beyond the reasonable scope of the work shall be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The work under this contract shall include all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

C. The specifications for the overall construction delineate various items of work under separate section headings. The list below sets forth this delineation to the extent that it affects the mechanical work category. In the absence of more detailed information, this list shall be taken as a specific instruction to the mechanical subcontractor to include the work assigned to him. Indications that each subcontractor is to perform the work means that it is to perform the work for its own accommodation only, except as specifically noted otherwise.
1. "P" indicates Provide
2. "F" indicates Furnish
3. "I" indicates Install

ITEM	"OTHER"	"PLBG"	"MECH"	"ELECT"
Hoisting		P		
Rigging		P		
Cutting and Patching		P		
EXCEPTION: Cost where due to late installation or improper coordination of work is the responsibility of the delinquent sub-contractor. Locations shall be approved by structural engineer.				
Framed slots and openings in walls, decks and slabs	P			
EXCEPTION: Coordination drawings are required from the plumbing subcontractor.				
Sleeves through non- membraned slabs, decks and walls		P		
EXCEPTION: Refer to Division 3 for coordination of installation.				
Excavation and backfill inside building		P		
EXCEPTION: Specifications and drawings delineate exceptions.				
Blasting	P			
EXCEPTION: Only with permission of Architect.				
Keeping Site and Excavations free from Surface Water During Construction	P			
EXCEPTION: To accommodate the overall project general contractor.				
Rubbish Removal	P			
EXCEPTION: Where one trade furnishes and another installs, the installing trade removes the shipping and packing material which accumulate.				
Special tools for equipment maintenance		P		
Piping and Associated Work Outside of the Building Line	P			
Kitchen Related Equipment	P			
EXCEPTION: Rough-in and final connection shall be provided by the plumbing subcontractor providing specified services.				

D. This contractor is required to supply all necessary supervision and coordination of information to any others who are supplying work to accommodate Plumbing Contractor installation.

1.8 STANDARDS AND CODES:

A. Nothing in this specification shall be interpreted to conflict with any City or State law, regulation, code, ordinance, ruling or Fire Underwriters requirement applicable to this class of work.

B. All installations for construction purposes shall conform with the Department of Labor "Safety and Health Regulations for Construction."

C. All equipment with electrical components shall bear the UL label.

D. The following minimum standards apply wherever applicable:

ANS	American National Standards
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Act
SMACNA	Sheet Metal and Air Conditioning Contractors National Assoc., Inc.
AGA	American Gas Association
ASA	American Standards Association
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
NBFU	National Board of Fire Underwriters
PDI	Plumbing and Drainage Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning, Engineers, Inc.

1.9 INSPECTION AND COOPERATION:

A. All work shall be done under the periodic observation of and to the complete satisfaction of the Architect. No deviations from the Drawings and Specifications shall be allowed without prior written approval of the Architect. The Plumbing subcontractor shall cooperate with the other contractors to allow for the installation of their work as well as his own.

B. The Plumbing subcontractor shall be responsible for his work fitting in place without conflict with the other trades, where proper planning could avoid interference. Any work installed by this subcontractor without regard for other work, or if a conflict results, shall be changed if directed by the Architect or Engineer without additional cost to Owner or his agents.

C. Relocation of equipment, system connections or rough-in locations up to ten feet (10'), if necessary, shall be done at no additional cost to the Owner or his agents if done before roughing-in.

D. All concealed work shall be inspected by the Architect/Engineer or his appointed representative before being concealed. The Plumbing subcontractor shall call for inspection at least two (2) work days before concealment.

E. The Architect shall have the right to inspect the work whenever advisable in his judgment. The plumbing subcontractor shall have a representative present at each inspection and shall give such assistance as may be required.

F. Recommendations made by the Architect shall be promptly carried out and all unsatisfactory material and workmanship replaced at once to the Architect's satisfaction at the appropriate subcontractor expense.

G. The plumbing sub-contractor shall be responsible for hoisting of all materials and equipment furnished under as part of his portion of the work in accordance with all City, State, and Federal rules and regulations.

1.10 TEMPORARY SERVICES AND FACILITIES:

A. Refer to general requirements for temporary services and facilities that shall be provided.

1.11 UNIT PRICES:

A. Refer to general requirements relative to "Add" or "Deduct" prices relative to this contract.

1.12 ROCK DEFINITION:

A. Refer to Division 02 for definitions and requirements relative to rock encountered during excavation.

1.13 SUBMITTALS:

A. LIST OF MANUFACTURERS: Within twenty days following award of contract, the plumbing subcontractor shall submit the required information pertaining to the equipment and materials he shall be furnishing, commencing with the list of manufacturers for approval by the Engineer. Following up in short order shall be the shop drawings and other documents. The Owner and his representatives reserve the right to reject as unacceptable any items for which, in their judgment, they have not been allowed adequate lead time in which to investigate suitability, or their experience has proved the service or equipment unsatisfactory.

1.14 SHOP DRAWINGS:

A. Prior to purchasing any equipment or materials, the approved list of the manufacturers shall be returned by the Engineer to the Contractor.

B. Shop drawings shall be submitted conforming to the requirements stated in supplementary conditions and Division 01 for the items indicated throughout the following specifications:
   1. Documents shall not be accepted for approval unless:
      a. They comply with the requirements of the supplement to the General Conditions.
      b. They include complete information pertaining to appurtenances and accessories.
      c. They are submitted as a package where they pertain to related items.
      d. They are properly marked with service or function identification as related to the project, where they consist of catalog sheets displaying other items which are not applicable, and are marked with pertinent specification paragraph number.
      e. They are properly marked with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.

2. Approval of shop drawings does not invalidate the plans and specifications if in conflict, unless a letter requesting such change is submitted and approved on the Engineer's letterhead.

PART 2 - PRODUCTS

2.1 MATERIALS AND MANUFACTURERS:

A. All equipment and materials required for installation under these specifications shall be new manufactured and without blemish or defect. All equipment shall bear labels attesting to Underwriter Laboratories approval where subject to Underwriters Laboratory label service. Where no specific indication as to the type of material or equipment is indicated a first class standard article shall be furnished.

B. Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent shall not be acceptable. ASME Code ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible. It is the intent of the specifications that wherever manufacturers of a product are specified any substituted item must conform in all respects to the specified item. Consideration shall not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.

C. Substituted equipment where permitted or approved, must conform to space requirements, whether approved or not or shall be replaced at the contractor's expense. Any modification of related systems as a result of substitutions shall be made at the subcontractor's expense.

D. Note the approval of shop drawings, or other information submitted in accordance with the requirements hereinbefore specified, does not assure that the Engineer, Architect, or any other Owner's Representative, attests to the dimensional accuracy or the ability of the material or equipment involved or the mechanical performance of the equipment. Approval of shop drawings does not invalidate the plans and specifications if in conflict, unless a letter requesting such change is submitted and approved on the Engineer's letterhead.

2.2 SUBSTITUTION OF SPECIFIED MATERIALS:

A. It is the purpose of this specification not to exclude competition between manufacturers of similar equipment.

B. Where items are specified as "or approved equivalent" prior approval must be obtained from the Engineer. Said approval does not intend to obligate the Engineer in the event shop drawings submitted do not indicate equality of materials, workmanship or function and the right to reject substitutes shall remain the prerogative of the Engineer.

C. In all cases regardless of method of submission, the contractor shall be completely responsible for changes in dimension of other than first named manufacturer equipment, electrical changes, etc. required for proper function and final performance. Item shall comply with all requirements herein set forth and as required to perform as designed. Minor modifications to suit standard manufactured items are acceptable if approved by Engineer.

D. Should contract documents fail to describe particular materials or goods to be used, then it shall be the duty of subcontractor to inquire of Engineer as to what is to be used and to supply it at contractor's expense or else thereafter or to require corrections.

E. Plumbing subcontractor shall promptly remove, at own expense, rejected materials from site of work.

F. When material has been approved, no change in brand or make shall be permitted without approval of Engineer.

PART 3 - EXECUTION

3.1 WORKMANSHIP:

A. Workmanship shall be of best quality. Good appearance of finished work shall be of equal importance with its mechanical efficiency. No make-shifts shall be permitted anywhere in work and all portions work shall be so laid out and installed that work as a whole is of uniform quality and appearance.

3.2 PROTECTION OF EQUIPMENT:

A. Protect all materials and equipment from damage during storage at the site and throughout the construction period.

B. Protection from damage from rain, dirt, sun and ground water shall be accomplished by storing the equipment on elevated supports and covering them on all sides with protective rigid or flexible water proof coverings securely fastened.

C. Piping shall be protected by storing it on elevated supports and capping the ends with suitable material to prevent dirt accumulation in the piping.

D. These subcontractors shall be responsible for the work damaged by him in executing this contract. Any work damaged by the Plumbing Contractor shall be replaced by him and placed in perfect condition without extra cost.

3.3 CONTIGUOUS WORK:

A. If any part of the Plumbing subcontractor work is dependent for its proper execution or for its subsequent efficiency or appearance on the character or conditions of contiguous work not executed by him, this subcontractor shall examine and measure such contiguous work and report to the Architect in writing any imperfection therein, or conditions that render it unsuitable for the reception of his work. Should this subcontractor proceed without making such written report, he shall be held to have accepted such work and the existing conditions and he shall be responsible.

3.4 CERTIFICATES OF INSPECTION AND APPROVAL:

A. Upon completion of work, plumbing subcontractor shall each furnish to the Owner certificates of inspection or approval from the authorities having jurisdiction if certificates of inspection or approval are required by law or regulation.

3.5 SLEEVES AND OPENINGS:

A. All sleeves and openings required shall be located and provided by the subcontractor for his portion of the work. Core drilling for missed sleeves shall be provided by the delinquent subcontractor.

3.6 COORDINATION:

A. The plumbing contractor is cautioned that the building has an unusually high quantity of piping, conduits, and other mechanical equipment, and space may be limited. This subcontractor shall offset pipes as required to avoid interference at no additional cost to the Owner. Generally pipes in which grade must be maintained, such as waste and storm drain piping, shall have first priority. Other pipes shall be offset as required to avoid those items.

B. Minor changes required by Owner, and any incidental changes required to meet structural conditions or to match trim etc. shall be made by this subcontractor without extra cost to the Owner.

C. The HVAC contractor will make the basic duct drawings and send sepias to the plumbing contractor. Within 30 days after receiving the sepias and “CADD disk”, the plumbing contractor shall return them to the mechanical subcontractor, marked to show how plumbing pipes cross the ducts, and with suggested pipe elevation for each pipe. The HVAC contractor will use this information plus similar information received from other contractors to prepare the finished coordination drawings.

D. The HVAC contractor shall provide manufacturers installation drawings as shipped with equipment, field working and location drawings, coordination drawings, wiring diagrams as required to show information required for information and coordination of the work for other trades. This includes locations of equipment, sleeves, foundations, curbs, pipe connections, wiring connections, etc. These drawings shall be provided in advance of work in the area so that the necessary coordination can be done at the proper time. The drawings shall be submitted to the A/E for record only and other subcontractors involved in the work.

E. The HVAC contractor shall coordinate the work of his trade and other trades in order that interference between plumbing, mechanical, electrical, architectural and structural work will be avoided. Piping, ducts, conduits, etc. shall be kept as close as possible to ceiling, walls, columns, etc. in order to take up the minimum amount of space; and all offsets, fittings, etc. required shall be furnished without additional cost to the Owner. In case interferences develop, the Engineer will decide which equipment shall be relocated regardless of which was first installed.

F. The plumbing subcontractor shall cooperate closely with the General Contractor and all other contractors on the job in order that the job will progress smoothly to its completion. He shall lay out his pipe in advance of pouring floors, or installing walls, shall provide to the General Contractor the location and size of any openings he may require, and shall furnish for the installation by the General Contractor any sleeves, forms, or inserts required for his work. In the event of failure to do these things at the proper time, or improper location of the required items, the cutting and patching required to rectify the errors shall be done by the subcontractor who installed the original material being cut but shall be paid by the subcontractor at fault, as determined by the Engineer, and at no additional cost to the Owner.

G. All equipment shall be installed with sufficient access and clearance for maintenance, repairs, and replacement. In the event that it appears necessary to install equipment without proper access or clearance, the work shall be stopped until written permission is received from the Engineer to install the equipment.

H. The following general rules shall apply to the preceding items:
1. Storm drain piping and sanitary waste piping, in which the grade must be maintained, shall have first priority.

3.7 AS-BUILT DRAWINGS:

A. These subcontractors shall provide one set of marked plans to the Engineer for his preparation of as-built drawings. The marked plans shall indicate correct location of all equipment, piping, etc. as installed on the project.

B. The drawings shall provide an accurate and complete record of the work as installed.

3.8 PHASING OF WORK:

A. All work connected to systems in use, utilities or services presently in use by Owner or Utility Company shall be cleared for shutdown with Owner 72 hours before disruption of services is desired. The Owner reserves the right to postpone any work of this nature to coincide with his operational procedure. The maximum shutdown period for any services is 8 hours unless previous approval for a longer period is obtained from the Owner. Any damage incurred in facilities by extended shutdown beyond period allowed shall be repaired by this subcontractor at no expense to the Owner. Request for a shutdown shall be in writing stating utility to be taken out of service, required length of shutdown period, and desired date and hour of shutdown.

END OF SECTION 22 01 00

SECTION 22 01 04 - DIVISION OF WORK (DIVISION 22 AND 26)

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. This section delineates the DIVISION OF WORK between Division 22 and Division 26.

B. Refer to typical diagram on Sheet E4.02 covering the items specified here. Specific work to be done under Division 26 is here in after listed or described. All other work necessary for the operation of Division 22 equipment shall be performed under Division 22.

1.2 DIVISION OF WORK:

A. All individual motor starters for mechanical equipment (fans, pumps, etc.), shall be furnished and installed under Division 22. Motor starters for mechanical equipment which are scheduled as part of motor control centers, if any, shall be provided under Division 26 - Electrical.

B. Under Division 22, generally, power wiring, including line power wiring to some Division 22 control panels, shall be provided up to a termination point consisting of junction box, trough, starter, VFD, or disconnect switch. Under Division 26, line side terminations shall also be provided. Wiring from the termination point to the mechanical equipment, including final connections, shall be provided under Division 26, as shown on the electrical drawings. Whenever a direct connection to Division 22 equipment is shown, electrical contractor shall provide final connection.

C. Power and control wiring for equipment rated at less than 115 volts, and for all relays, actuators, including motorized dampers, timers, seven-day clocks, alternators, pressure, vacuum, float, flow, pneumatic-electric, and electric-pneumatic switches, aquastats, freezestats, line and low voltage thermostats, thermals, remote selector switches, remote push-button stations, emergency break-glass stations, and interlocking devices, shall be provided by the contractor or subcontractor furnishing the equipment or control item. Power wiring of disconnect switches beyond termination point, and other appurtenances associated with equipment under Division 22 shall be furnished, installed and wired under Division 26.

D. All wiring required for power, controls and instrumentation for Division 26 systems, not indicated on the electrical drawings, shall be furnished and installed by Division 22.

E. Additional power wiring required for Plumbing equipment over and above what the electrical drawings show shall be provided by the Plumbing contractor.

F. 120 Volts, 60 Hz power supply for Division 22 control functions, if not shown on electrical drawings being directly provided, or provided in adjacent junction box by Division 26, shall be provided under Division 22 utilizing spare circuit breakers in branch circuit panelboard with type of power compatible with the control function. Use standby emergency power panelboards for control of plumbing equipment on standby emergency power; use legal emergency power for HVAC smoke control functions; use normal power panelboards for control of plumbing equipment on normal power system.

END OF SECTION 22 01 04

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SECTION 22 02 06 - ROUGH-IN AND CONNECTIONS TO EQUIPMENT FURNISHED BY OTHERS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. Rough in for all items of equipment that require waste, vent or water connections, regardless of which contractor furnished the equipment.

B. Make final connections to those items for equipment furnished by others except where specifically designated on the drawings or in these specifications otherwise.

C. Generally, final connections to equipment shall be by the plumbing contractor.

D. Generally, final connections to water heaters, and other equipment of this type will be by the plumbing contractor.

E. The plumbing contractor shall be responsible for verifying that any shut-off, pressure regulator and backflow prevention devices is included with equipment or furnishing the same if is not, when connecting services to any specialized equipment.

1.2 ROUGH-IN DRAWINGS:

A. The plumbing contractor shall secure from each contractor furnishing items of equipment (requiring plumbing connections) roughing-in prints and complete detail shop drawings of all equipment, and review at the job each area with the respective contractor before roughing-in. Make all adjustments as required. In the event that the plumbing contractor fails to obtain the roughing-in prints for whatever reason, and roughs in the pipes at the wrong location, the pipes shall be relocated as required at the expense of the plumbing contractor. In the event that the plumbing contractor roughs in the pipes in accordance with prints furnished by the respective contractor, and it turns out that the pipes are in the wrong locations, any costs of relocating the roughed-in pipes will be paid by the contractor furnishing that item of equipment.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials shall be the same as are described in the specifications for the various piping systems.

END OF SECTION 22 02 06

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SECTION 22 02 08 - PLUMBING IDENTIFICATION AND PAINTING

PART 1 - GENERAL

1.1 SCOPE:

A. All exposed pipe, hangers, and equipment in the equipment platform level installed by this subcontractor shall be painted unless it has a factory finish or is noted otherwise. Exposed chromeplated brass, stainless steel, or plastic piping will not be painted.

B. Type of identification devices specified in this section include the following:
1. Plastic Pipe Markers
2. Plastic Tape
3. Valve Tags
4. Valve Schedule Frames
5. Engraved Plastic-Laminate Signs

1.2 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. ANSI Standards: Comply with ANSI A13.1 for lettering size, colors, and viewing angles of identification devices.

1.3 SUBMITTALS:

A. Product Data: Submit product specifications and installation instructions for each identification material and device required.

B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

C. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags," in margin of schedule. In addition to mounted copies, furnish extra copies for Maintenance Manuals as specified in Division 22.

PART 2 - PRODUCTS

2.1 PLASTIC PIPE MARKERS:

A. Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, color-coded, plastic-sheet pipe markers, complying with ANSI A13.1.

B. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
   1. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
   2. Adhesive lap joint in pipe marker overlap.
   3. Laminated or bonded application of pipe marker to pipe (or insulation).
   4. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".

C. Large Pipes: For external diameters of 6" and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:
   1. Laminated or bonded application of pipe marker to pipe (or insulation).
   2. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1-1/2" wide; full circle at both ends of pipe marker, tape lapped 3".
   3. Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless steel bands.

D. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with names as shown or specified.

E. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

2.2 PLASTIC TAPE:

A. Manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.

B. Width: Provide 1-1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6", 2-1/2" wide tape for larger pipes.

C. Color: Comply with ANSI A13.1, except where another color selection is indicated.

2.3 VALVE TAGS:

A. Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener. Provide 1-1/2" diameter tags, except as otherwise indicated.

B. Valve Tag Fasteners: Manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

C. Provide ceiling mounted valve tag buttons to identify valve locations above lay-in ceilings.

2.4 VALVE SCHEDULE FRAMES:

A. For each page of the valve schedule, provide a glazed display frame, with screws for removable mounting on walls. Provide frames of rigid plastic or metal, with plastic glazing.

2.5 ENGRAVED PLASTIC-LAMINATE SIGNS:

A. Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

B. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.

C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.6 LETTERING AND GRAPHICS:

A. Coordinate names, abbreviations and other designations used in mechanical identification work with corresponding designations shown pre-existing, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer's or as required for proper identification and operation/maintenance of mechanical systems and equipment.

B. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples; Boiler No. 3, Air Supply No. 1H).

2.7 PAINT:

A. All products shall be in accordance with the specifications for painting in the general contract.

PART 3 - EXECUTION

3.1 GENERAL:

A. Any equipment shipped with a factory applied finish shall be touched up to repair any damage to the finish so that it is the same as new.

B. In the mechanical equipment rooms the plumbing contractor shall be responsible for painting all piping, equipment, and accessories installed under their respective contract.

C. In other parts of the buildings items which are in place in finished areas when general building painting is done will be painted by the General Contractor. Items installed after painting is completed shall be painted by the plumbing contractor, as directed by the architect.

D. All exposed nongalvanized ferrous metal hangers and miscellaneous metal used in connection with the plumbing systems shall be painted with two coats of enamel.

E. All exposed piping including insulated piping, insulated by this contractor shall be painted two coats of lead and oil paint. Elastomeric pipe insulation shall have two coats of enamel of the type recommended by the insulation manufacturer.

F. Do not field paint exposed copper pipe, brass valves, or brass trim on iron body valves, or machinery or equipment that has a factory applied finish unless otherwise specified. Do not paint plastic pipe.

G. Painted pipes which are buried in earth, shall be allowed to dry before backfilling.

H. All paint shall be delivered to the project in unbroken containers. Containers shall be labeled to indicate color, directions for use, manufacture, and date of manufacturer. Directions for use of the paint shall be carefully followed in the mixing and general application. All paint shall be applied under dry and dust free conditions. Sufficient time shall elapse between paint coats to permit satisfactory recoating. Once started all painting shall be completed without delay.

3.2 PIPING SYSTEM IDENTIFICATION:

A. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums), exterior non-concealed locations and above removable acoustical ceilings.
1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
3. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
4. At access doors, manholes and similar access points which permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
7. On piping above removable acoustical ceilings.

3.3 PAINT SCHEDULE:

A. All exposed equipment, pipes, conduits, or other appurtenances shall be painted by this sub-contractor with materials and application as specified in the general contract specifications and as directed by the architect.

B. All concealed pipe covering shall be identified by colored bands and legends. The direction of flow shall be indicated by flow arrows.

C. All exposed pipe covering shall be totally painted the color of the band color listed below. All exposed pipe hangers, rods, supports, channels, etc. shall be painted flat black.

D. Color coding strips shall be painted no less than every 15 linear feet plus wherever entering or leaving a space and near valves. (Tape is acceptable). Width of strip shall be approximately 1/5 of the diameter of pipe plus covering if any, but in no case less than 1/2 inch. Color coding shall conform OSHA requirement.

E. Directions arrow and fluid name shall be applied by sticker at same spacing as above. The stickers shall be secured by color coded tape wrapped two times around the pipe at each end of the label or spring cords.

F. Standard colors and legends are as follows: (Plumbing)

3.4 PIPE IDENTIFICATION

A. Piping systems in mechanical rooms shall be completely painted with the applicable colors listed below and have appropriate self-sticking or strap-on identifications and arrows indicating direction of flow. Piping and ducts in chases above ceiling, etc. shall be color banded and have stencil markings at appropriate intervals. On straight runs of piping, markings should be no further than 30 feet apart; and stencil identifications, color bands, and direction arrows shall be near each valve, pressure reducing valve, heat exchanger, etc. Where pipe passes through walls or floors, marking shall be near the penetration on both sides. Markings shall be at each directional change of all piping systems. Mechanical room pipe color and the color of bands are to be as follows:

PIPING SYSTEMS AND CONTENTS	STENCIL COLOR	IDENTIFICATION
Condensate Drain	Medium Blue	COND
Water, Chilled Supply	Safety Blue	CHWS
Water, Chilled Return	Safety Blue	CHWR
Water, Cold Domestic	Med. Green	DOM CW
Hot Water Heating Supply	Oxide Yellow	HWS
Hot Water Heating Return	Oxide Yellow	HWR
Natural Gas	Med. Yellow	2-PSI G, 5-PSI G
Ductwork	White	
Supports, Hangers	Flat Black	

B. Pipe identification should contrast in color to the pipe colors and be easily readable. The width of color bands should be equal to the size of the stencil indicated below.

C. For insulated pipe systems, stencil sizes should be as follows:
1. For pipes up to 1 inch, use 1 inch letters.
2. For pipes 1 inch to 2 inches, use 2 inch letters.
3. For pipes 2 inches to 6 inches, use 3 inch letters.
4. For pipes above 6 inches, use 4 inch letters.

D. For un-insulated systems, stencil sizes should be as follows:
1. For pipe diameters up to 1 inch, use 1/2 inch letters.
2. For pipe diameters from 1 inch to 2 inches, use 1 inch letters.
3. For pipe diameters from 2 inches to 6 inches, use 2 inch letters.

E. Valve handle shall be painted the same color as the stripes on the pipe.

3.5 VALVE IDENTIFICATION:

A. General: Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibs, and shut-off valves at plumbing fixtures, and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.

B. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.

3.6 PLUMBING EQUIPMENT IDENTIFICATION:

A. Install engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:
   1. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
   2. Pumps and similar motor-driven units.

B. Lettering Size: Minimum 3/8" high lettering for name of unit where viewing distance is less than 2'-0", 3/4" high for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 the size of principal lettering.

C. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, and warn of hazards and improper operations.

D. Operational valves and similar minor equipment items located in non-occupied spaces (including machine rooms) may, at installer's option, be identified by installation of plasticized tags in lieu of engraved plastic signs.

END OF SECTION 22 02 08

SECTION 22 02 10 - CONCRETE & MASONRY WORK

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. Provide all concrete and masonry work as indicated on the plumbing contract drawings, unless it is indicated that it will be by the general contractor. This includes bases for equipment.

PART 2 - PRODUCTS

2.1 GENERAL

A. All cement, gravel, sand, reinforcing rod, brick, block and other materials comply with the requirements for those materials in the specifications for the general contract as part of Section 03 30 00.

PART 3 - EXECUTION

3.1 GENERAL

A. The workmanship and manner of placing the materials shall comply with the requirements for those items in the specifications for the general contract.

B. Bases shall have smooth tops and cambered edges.

END OF SECTION 22 02 10

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SECTION 22 05 00 – BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DEFINITION:

A. Work under this section of the specifications shall include but not necessarily be limited to items common to sections:
   1. 220600 Underground Pipe and Pipe Fittings
   2. 220610 Above Ground Pipe and Pipe Fittings
   3. 220800 Piping Specialties and Accessories

B. In all cases, work specified in this section of the specifications shall be compatible with all other specification sections.

1.2 SUBMITTALS:

A. Shop drawings shall be submitted on all items in accordance with the provisions of specification Section.

B. Submit shop drawings on the following:
   1. Piping
   2. Floor Drains

1.3 COORDINATION:

A. The plumbing sub-contractor shall coordinate with each and the other sub-contractors as required to produce workable, controllable systems.

END OF SECTION 22 05 00

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SECTION 22 05 50 - NOISE AND VIBRATION CONTROL FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this section.

1.2 WORK INCLUDED

A. Provide complete noise control systems as shown or specified and in accordance with the requirements of the Contract Documents. System shall be complete with:

1. Foundations and supports for rigidly supported equipment.
2. Vibration Isolation Equipment
3. Sealing Around Services Penetrations Through Walls and Slabs

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Consult all other Sections to determine the extent of work specified elsewhere but related to this Section. This work shall be properly coordinated to produce an installation satisfactory to the Owner. This work includes, but is not limited to the following:

1. Pumps
2. Piping
3. Plumbing Fixtures
4. Concrete Housekeeping Pads
5. Noise and Vibration Control for Plumbing Systems
6. Sealant
7. Plumbing Equipment

1.4 CONTRACTOR'S RESPONSIBILITY

A. The Contractor shall be responsible for verifying the completeness of the isolation installation and the overall suitability of the equipment to meet the intent of this specification. The Contractor, even if not specifically mentioned herein or in the Contract Documents, shall supply any additional equipment needed to meet the intent of this specification, without claim for additional payment.

B. Performance or waiving of inspection, testing or surveillance for any portion of the Work shall not relieve the Contractor of the responsibility to conform strictly to the Contract Documents. The Contractor shall not construe performance or waiving of inspection, testing or surveillance by the Owner or Architects to relieve the Contractor from total responsibility to perform in strict accordance with the Contract Documents.

C. The intent of the designers is that there are no conflicts between this and other sections of the specification. If conflicts are discovered between this section and any other section or subsection of Division 22, it shall be the contractor’s responsibility to immediately bring this fact to the architect’s attention and request instruction. Absent that instruction, the contractor shall assume that this current section shall overrule in any conflicts.

1.5 MANUFACTURER'S RESPONSIBILITIES

A. Manufacturer of vibration isolation equipment shall have the following responsibilities:

1. Provide piping and equipment isolation systems as scheduled or specified.
2. Guarantee specified isolation system deflection.
3. Provide installation instructions, drawings and field supervision to assure proper installation and performance.
4. The vibration isolation systems shall be guaranteed to have deflection indicated on the schedule on the drawings. The mounting manufacturer shall determine mounting sizes and the sizes shall be installed in accordance with the manufacturer's instructions.
5. The vibration isolator vendor shall ensure that all equipment to be isolated has sufficient support structure to distribute equipment loads onto isolators. Where additional support structure is required, vibration isolator vendor shall provide this.

1.6 BID PROPOSALS

A. The Contractor shall submit at the time of bidding the names and qualifications of the noise and vibration control supplier(s). If a supplier is not one of the pre-approved vendors, then the submittal shall be accompanied by a complete catalog of that supplier's products and samples of each proposed vibration isolator.

1.7 SUBMITTALS

A. Contractor shall submit fully coordinated shop drawings for all vibration and noise control equipment. These submittals shall state the acoustical performance of the products as described below.

1. Isolators: Submittal to the Architect shall include drawings prepared by the isol*ation materials* manufacturer showing the construction of the isolation devices to be used, including specific selection of isolators for the equipment to be furnished for this project.

B. Submittal of vibration isolation system schedule indicating the following:

1. Manufacturer, type, model number, size
2. Height when uncompressed and static deflection of each isolation element
3. Spring constant of each isolation element
4. Estimated imposed load on each isolation element
5. Spring o. d., free operating and solid heights
6. Design of supplementary bases, if any
7. Layout of isolator hangers, mounts and other elements shown on an outline of the isolated equipment, including complete details of attachment to load-bearing structure or supplementary framing
8. Piping isolators shown and identified on piping layout drawing

C. All concrete foundations and supports (and required reinforcing and forms) will be furnished and installed by another trade. However, this trade shall furnish shop drawings showing adequate concrete reinforcing steel details and templates for all concrete foundations and supports and all required hanger bolts and other accessories necessary for the proper installation of his equipment. Although another trade will complete all concrete work, all such work shall be shown in detail on the shop drawings, prepared by this trade which drawings shall be submitted showing the complete details of all foundations including necessary concrete and steel work, vibration isolation devices, etc.

1.8 NOISE CRITICAL SPACES

A. Many areas of the building, referred to as "noise-critical spaces", require special attention (special acoustical provisions and restrictions). The table below designates the noise-critical spaces; noise levels due to equipment, etc., shall permit attaining sound pressure levels in all 8 octave bands in occupied spaces conforming to NC levels per ASHRAE handbook as indicated.

B. Noise Critical Spaces

SPACE	NC LEVEL
Multipurpose Room	NC 25
Offices	NC 35
Classrooms	NC 35
Lobby	NC 30

C. Penetrations by pipes into or between noise critical spaces should be avoided. Where they are necessary, they shall be sleeved, packed and sealed airtight with non-hardening sealant as described herein.

1.9 DESCRIPTION OF SYSTEMS

A. VIBRATION ISOLATION

1. Building structure can provide a direct path for mechanically induced vibration to travel from mechanical equipment to noise critical spaces. Rotating or vibrating equipment such as pumps and pipes shall be mounted on or suspended from vibration isolators to attenuate the vibration transfer from equipment into the building structure.

B. SEALING OF PENETRATIONS

1. Building structures meant to isolate air-borne noise surround noise critical spaces and spaces that contain noise, i.e. mechanical equipment rooms. These building structures must be massive, airtight constructions. The effectiveness of sound isolating structures can be severely compromised by penetrations for piping. Proper sealing and/or lagging (enclosure) around mechanical services penetrating these structures will maintain the integrity of the isolating structure.

1.10 QUALITY ASSURANCE

A. It is the objective of this Specification to provide for the control of noise and vibration due to the operation of machinery or equipment, and/or due to interconnected piping.

B. The installation of all noise and vibration control systems shall be under the supervision of the manufacturer's representative.

C. A single manufacturer shall provide all vibration isolation equipment and materials. The following manufacturers are approved provided systems are in compliance with the specified design and performance requirements. The project acoustics consultant must approve any others.

1. Mason Industries, Inc., Hauppauge, New York
2. Vibration Mountings and Controls, New Hyde Park, NY
3. Kinetics Noise Control, Dublin, Ohio

PART 2 - PRODUCTS

2.1 GENERAL

A. All equipment provided for vibration isolation or noise control shall be new and manufactured specifically for the purpose intended.

2.2 FOAM ROD

A. Foam backer rod shall be closed cell polyethylene suitable for use as a backing for non-hardening sealant.

2.3 NON-HARDENING SEALANT

A. Sealant for penetrations shall be non-hardening polysulphide type.

B. Permanently flexible, approved firestop putty may be used in lieu of the sealant on foam rod in noise critical walls that are also fire rated.

2.4 PACKING MATERIAL FOR PENETRATIONS

A. Mineral fiber; non-combustible; resistant to water, mildew and vermin. Expanding resilient foams manufactured for this purpose are an acceptable alternative only if the material density is at least 15 pcf (40 kg/m3).

2.5 VIBRATION ISOLATION SYSTEMS

A. The static deflection of isolators shall be as given in the equipment schedule and specified below. The isolator schedule shall take precedence.

B. The vibration isolator supplier shall determine vibration isolator sizes and layout.

C. All vibration isolators shall have either known undeflected heights or calibration markings so that, after adjustment, verified, thus determining that the load is within the proper range of the device and that the correct degree of vibration isolation is being provided according to the design.

D. All isolators shall operate in the linear portion of their load versus deflection curve. Load versus deflection curves shall be furnished by the manufacturer and must be linear over a deflection range of not less than 50% above the design deflection.

E. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than ±10%.

F. All neoprene mountings shall have a Shore hardness of 30 to 60 ±5, or as specified herein, after minimum aging of 20 days or corresponding over-aging.

G. Housed or caged spring isolators are not acceptable.

H. Where steel spring isolation systems are described in the specifications, the mounting assemblies shall utilize bare springs with the spring diameter not less than 0.8 of the loaded operating height of the spring. Each spring isolator shall be designed and installed so that the ends of the spring remain parallel during and after the spring installation. All isolators shall operate in the linear portion of their load versus deflection curve and have 50% excess capacity without becoming coil bound.

I. All mounting systems exposed to weather and other corrosive environments shall be protected with factory corrosion resistance. All metal parts of mountings (except springs and hardware) shall be hot dip galvanized. Springs shall be cadmium plated and neoprene coated. Nuts and bolts shall be cadmium plated.

J. ISOLATOR TYPE WP

1. Type WP (Waffle Pads) shall be 5/16 inch thick neoprene pads ribbed or waffled on both sides. The pads shall be manufactured with bridge bearing quality neoprene and selected for a maximum durometer of 50 and designed for 15% strain. Where required, steel load-spreading plates shall be incorporated between the equipment and the neoprene pad.

2. If the isolator is bolted to the structure, a neoprene vibration isolation washer and sleeve (Uniroyal Type 620/660 or as approved) shall be installed under the bolt head between the steel washer and the base plate.

3. (Type WP: Mason Industries Type W or as approved.)

K. ISOLATOR TYPE MWP

1. Type MWP (Metal and Waffle Sandwich Pads) shall consist of two 5/16 inch thick ribbed or waffle neoprene pads sandwiching a 16 gauge stainless steel shim plate. The pad shall be manufactured with bridge bearing quality neoprene and selected for a maximum durometer of 50 and designed for 15% strain.

2. If the isolator is bolted to the structure, a neoprene vibration isolation washer and sleeve (Uniroyal Type 620/660, or as approved) shall be installed under the bolt head between the steel washer and the base plate.

3. (Type MWP: Mason Industries Type WSW or as approved.)

L. ISOLATOR TYPE DDNM

1. Type DDNM (Double Deflection Neoprene Mounts) shall be laterally stable, double deflecting, molded neoprene isolators. All metal surfaces shall be covered with neoprene. The top and bottom surfaces shall be ribbed and bolt holes shall be provided in the base. The mounts shall have leveling bolts rigidly secured to the equipment.

2. The isolator shall be manufactured with bridge bearing quality neoprene and selected for a maximum durometer of 50 and designed for 15% strain. DDNM mounts shall be selected for a static deflection of 3/8 inch unless otherwise specified.

3. (Type DDNM: Mason Industries Type ND or as approved.)

M. ISOLATOR TYPE DDNH

1. Type DDNH (Double Deflection Neoprene Hangers) shall consist of a molded neoprene isolating element in a steel hanger box. A neoprene sleeve shall be provided where the lower hanger rod passes through the steel hanger box, such that the hanger rod cannot contact the steel hanger. The diameter of the clear hole in the hanger box shall be at least 3/4 inch larger than the diameter of the hanger rod and permit the hanger rod to swing through a 30 degree arc. When installed, the hanger box shall be allowed to rotate through a full 360 degrees without encountering any obstructions.
2. The isolator shall be manufactured with bridge bearing quality neoprene and selected for a maximum durometer of 50 and designed for 15% strain. Unless otherwise specified, the static deflection of DDNH hangers shall be 0.3 inches.
3. (Type DDNH: Mason Industries Type HD or as approved.)

N. ISOLATOR TYPE RBA

1. Type RBA isolators shall be designed with a neoprene element to provide isolation in tension, shear or compression. Neoprene to bridge bearing quality with a maximum durometer of 50.
2. (Type RBA: Mason Industries Type RBA or as approved)

O. ISOLATOR TYPE SPNM

1. Type SPNM (Spring and Neoprene Mounts) shall have a free-standing and laterally stable steel spring without any housing. Springs shall be designed so that the ratio of the horizontal to vertical spring constant is between one and two. The spring diameter shall be not less than 80% of the compressed height of the spring at rated load. Loaded springs shall have a minimum additional travel to solid equal to 50% of the specified static deflection.
2. Unless otherwise specified, the minimum static deflection of SPNM isolators for equipment mounted on grade slabs shall be 1 inch and the minimum static deflection for equipment mounted above grade level shall be 2 inches.
3. Two Type WP isolation pads sandwiching a 16 gauge stainless or galvanized steel separator plate shall be bonded to the isolator baseplate.
4. Unless otherwise specified, isolators need not be bolted to the floor for indoor installations. If the base plates are bolted to the structure, a neoprene vibration isolation washer and sleeve (Uniroyal Type 620/660 or as approved) shall be installed under the bolt head between the steel washer and the base plate.
5. (Type SPNM: Mason Industries Type SLFSW or as approved.)

P. ISOLATOR TYPE SPNH

1. Type SPNH (Spring and Neoprene Hangers) shall consist of a steel spring in series with a neoprene isolating element. The spring shall have a minimum additional travel to solid equal to 50% of the specified deflection. The neoprene element shall have a static deflection of not less than 0.3 inches with a strain not exceeding 15%.

2. Unless otherwise specified, the static deflection of SPNH hangers shall be 2 inches.

3. Spring diameter and hanger box hole size shall be large enough to permit the hanger rod to swing through a 30 degree arc. A neoprene sleeve shall be provided where the lower hanger rod passes through the steel hanger box, such that the hanger rod cannot contact the steel hanger. The diameter of the clear hole in the hanger box shall be at least 3/4 inch larger than the diameter of the hanger rod. When installed, the spring element shall not be cocked and the hanger box shall be allowed to rotate through a full 360 degree arc without encountering any obstructions. When installed and loaded, if the threaded rod touches the neoprene at the bottom of the hanger box, instructions shall be given to make an adjustment.

4. (Type SPNH: Mason Industries Type 30N or as approved.)

Q. ISOLATOR TYPE CSNM

1. Type CSNM (Constrained Spring and Neoprene Mounts) shall be a spring and neoprene mount that incorporates a housing which incorporates unrestrained stable springs with built-in leveling device and resilient vertical limit stops to prevent spring elongation when partial load is removed and limits the movement of equipment when it is subjected to wind loading.

2. A minimum clearance of 1 inch shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring operation. Limit stops shall provide minimum 1/4” clearance under normal operation and a neoprene washer shall be installed beneath the bolt head/ washer used to restrain the isolator.

3. In installations subject to wind load, provide tapped hole in top and bottom plates for bolting to equipment and the roof or supporting structure with a neoprene mounting sleeve.

4. Provide minimum 1/4” inch thick neoprene acoustical base pad on underside of mount unless designated otherwise.

5. Mount shall be capable of supporting equipment at a fixed elevation during equipment erection. Installed and operating heights shall be identical.

6. Unless otherwise specified, the minimum static deflection for Type CSNM mounts shall be 2 inches.

7. Spring diameter and hanger box hole size shall be large enough to permit the hanger rod to swing through a 30 degree arc. A neoprene sleeve shall be provided where the lower hanger rod passes through the steel hanger box, such that the hanger rod cannot contact

the steel hanger. The diameter of the clear hole in the hanger box shall be at least 3/4 inch larger than the diameter of the hanger rod. When installed, the spring element shall not be cocked and the hanger box shall be allowed to rotate through a full 360 degree arc without encountering any obstructions. When installed and loaded, if the threaded rod touches the neoprene at the bottom of the hanger box, instructions shall be given to make an adjustment.

8. (Type CSNM: Mason Industries Type SLR or as approved)

R. BASE TYPE CB

1. Inertia base Type CB (Concrete Base) shall have an integral rectangular structural steel form into which concrete is poured.

2. Perimeter members shall be beams of depth equal to 10% of the longest span of the base, but not more than 12 inches nor less than 6 inches deep. Forms shall include motor slide base and all reinforcing steel. Where anchor bolt locations fall in concrete, the reinforcing steel shall include drilled members with sleeves welded below the steel to accept the anchor bolts. Height saving steel brackets shall be used in all mounting locations.

3. When the concrete base is "T" shaped, isolators shall be located under the projections as well as under the main body in order to prevent cantilever distortion.

4. The structural perimeter frame, mounting templates, height saving brackets and spring system shall be provided as an assembly by the vibration control vendor.

5. (Base Type CB: Mason Industries Type KSLFSW or as approved)

2.6 NEOPRENE MOUNTING SLEEVES

A. Neoprene mounting sleeves for hold-down applications of equipment with vibration isolators shall be Uniroyal Type 620/660 or as approved.

2.7 PIPE FLEXIBLE CONNECTORS

A. Flexible connectors for pipes shall be neoprene Mason Type MFNEC, MFTNC or as approved. Do not use control rods.

PART 3 - EXECUTION

3.1 GENERAL

A. All equipment, piping, etc. shall be mounted on or suspended from approved foundations and supports, all as specified herein, or as shown on the drawings.

B. All floor-mounted equipment shall be erected on 4" thick concrete housekeeping pads over the complete floor area of the equipment, unless otherwise specified to the contrary herein. These pads shall be integrally keyed to structural slab. Wherever vibration eliminating devices and/or concrete inertia blocks are specified, these items shall, in all cases, be in turn mounted on concrete housekeeping pads unless otherwise specified to the contrary herein.

C. Furnish and install neoprene mounting sleeves for hold-down bolts to prevent any metal to metal contact.

D. All equipment shall be provided with lateral restraining isolators as required to limit horizontal motion to 1/4" maximum, under all operating conditions. Lateral restraining isolators shall have the same having the same static deflection as equipment being isolated,

E. Unless otherwise indicated, all equipment mounted on vibration isolators shall have a minimum operating clearance of 2 inches between the bottom of the equipment or inertia base (and height-saving bracket) and the concrete housekeeping pad (or bolt heads) beneath the equipment. The clearance shall be checked by the Contractor to ensure that no material has been left to short- circuit the vibration isolators. There shall be a minimum 4 inch clearance between isolated equipment and the walls, ceiling, floors, columns and any other equipment not installed on vibration isolators.

F. Piping plumbing equipment shall be supported from building structure, not hung from or supported on other equipment, pipes, or ductwork.

G. Equipment connected to water piping shall be erected on isolators or isolated foundations at correct operating heights prior to connection of piping and blocked-up with temporary shims to final operating height. When the system is assembled and fluid is added, the isolators shall be adjusted to allow removal of the shims.

H. All plumbing equipment not specifically identified in this specification that contains rotating or vibrating elements and any associated electrical apparatus installed by this division that

contains transformers or inductors shall be installed on Type DDNM or RBA neoprene isolators as appropriate.

I. All wiring connections to plumbing equipment on isolators shall be made with a minimum 36 inch long flexible conduit in a 180 degree “U” shaped loop.

J. Elastomeric isolators that will be exposed to temperatures below 32 degrees F shall be fabricated from natural rubber instead of neoprene.

K. Springs shall be designed and installed so that ends of springs remain parallel and all springs installed with adjustment bolts.

L. Springs shall be sized to be non-resonant with equipment forcing frequencies or support structure natural frequencies.

M. Refer to Vibration Isolation Schedule at the end of this Section.

3.2 INLINE PUMPS

A. Inline pumps shall be supported on Type SPNM spring isolators under supports. Use elbow-type neoprene flexible pipe couplings on each side of pump. The vertical load is to be carried by the supports, not by the flexible couplings.

3.3 MOUNTING OF CENTRIFUGAL PUMPS - UNDER 2 HP

A. Pumps under 1.5 hp shall be installed on a 4” minimum thickness concrete housekeeping pad and shall be supported on at least four Type DDNM isolators.

B. Expansion TANKS and water heaters without pumps or motors

C. Each floor-mounted unit shall be supported on Type MWP neoprene sandwich pads. Each suspended unit shall be supported on Type DDNH hangers. Where piping on isolators is connected to these units, the connection shall be made with a neoprene flexible connector.

D. If an associated circulation pump is to be mounted on the unit and if the pump is 0.5 HP (0.4KW) or smaller, then the pump shall be mounted to he unit through Type RBA neoprene

isolators. Such pumps larger than 0.5 HP (0.4KW) shall be supported from the building structure on Type DDNM mounts or Type DDNH hangers. Pumps larger than 1.5 HP shall be supported on Type CIB concrete inertia bases which are supported on Type SPNM isolators. All connection to these circulation pumps shall be with flexible connections.

3.4 SUPPORT OF PIPING

A. The following water piping shall be resiliently supported:

1. All piping in equipment rooms.
2. Piping outside of equipment room within 75 feet of connected rotating equipment or 100 pipe diameters whichever is greater.
3. All piping in shafts.
4. All piping where exposed on roof.

B. Resilient diagonal mountings or other approved devices shall be provided as required to limit piping motion due to equipment startup or shut down, to a maximum of 1/8".

C. Water piping hanger rod isolators shall contain a steel spring in series with a 1/4" acoustical neoprene pad within a steel box retainer. The hanger rod isolator assembly shall be rigidly supported from the spring sub assembly shall not contact the steel box retainer and clearances in the isolator design shall be capable of accepting a 15 degree misalignment in any direction from the vertical.

D. The steel spring element of the assembly shall be designed to have a minimum surge frequency of 340 HZ and a minimum deflection of 3/4".

E. Where supplementary steel is required to support piping, the supplementary steel shall be sized so that maximum deflection between supports does not exceed 0.08" and shall be resiliently supported from the building structure with mountings as described above. Supported piping from the supplementary steel shall be rigidly suspended or supported.

F. Where isolated water piping 6" and smaller is supported directly below exposed steel beams, attachment to the beam shall be made by means of welded channel beam attachments located directly under the web of the beam. Beam clamps may be used in lieu of welding subject to approval of beam clamp selection.

3.5 SUPPORTS

A. Piping supports within shafts shall be provided with suitable bearing plates and two layers 1/4" thick ribbed or waffled neoprene pad loaded for 50 psi maximum. The isolation pads shall be separated with 1/4" steel plate.

B. The isolation pads shall be Mason Industries Type W or approved equal.

C. Piping isolation supports at the base of risers shall be two layers of 1/2" thick heavy duty neoprene and canvas duct isolation pad separated by 1/4" thick steel plate. Suitable bearing plates sized to provide a pad loading of 500 psi maximum shall be provided. The stanchion between the pipe and isolation support shall be welded to the pipe and welded or bolted to the isolation support. The isolation support shall be bolted to the floor slab with resilient sleeves and washers.

D. All pipe support resilient materials shall be HL Mason Industries, Inc., or as approved.

3.6 PIPES CONNECTED TO EQUIPMENT ON SPRING ISOLATORS

A. All pipes connected to equipment installed on spring vibration isolators, except sprinkler piping, shall be suspended or, supported by Type SPNM or Type SPNH isolators. Provide vibration isolation anchors and guides as specified elsewhere in this specification.

B. The first isolator both upstream and downstream of equipment on springs shall have a static deflection equal to 1.5 times that of the equipment isolators, up to a maximum of 2 inches. The static deflection of the remaining pipe isolators shall be 1 inch.

C. If pipes are supported on noise-critical structure, the 1.5 times spring deflection rule above applies throughout the pipe run.

3.7 PIPES CONNECTED TO EQUIPMENT ON NEOPRENE ISOLATORS

A. Piping that is connected only to machinery installed on neoprene isolators shall be either supported from the floor on Type DDNM mounts or suspended from the structure on Type DDNH hangers.

3.8 PIPES WITH MULTIPLE CONNECTIONS

A. Where a pipe run connects multiple items of equipment in the mechanical room the pipe isolators for the entire run shall be chosen to suit the connected equipment of greatest static deflection.

3.9 FLEXIBLE PIPING CONNECTORS

A. Twin-sphere neoprene type flexible piping connectors shall be installed to connect piping to reciprocating or rotating equipment.

3.10 DRAIN PIPES, VENT PIPES AND SMALL DOMESTIC WATER PIPES

A. Except as noted elsewhere on this specification, outside the mechanical room all domestic hot and cold water pipes with a diameter less than or equal to 2 inches shall be isolated from the structure with sponge neoprene, felt or glass /mineral fiber sleeves between the pipe and pipe clamp or with Type WP pads between the clamp and the structure. When it is compressed, the sleeve shall be not less than 1/8 inch in thickness.

3.11 PIPE RISERS

A. Where pipes rise in a vertical chase and are supported from a structure with type SPNH or DDNH isolators and require lateral bracing, neoprene riser guides shall be mounted around the pipe to limit lateral movement and to prevent direct contact with the supporting structure.

3.12 PIPE PENETRATIONS

A. DOMESTIC WATER, SEWER, DRAIN AND VENT PIPING: Where a pipe passes through a wall, ceiling or floor slab, a steel sleeve shall be cast or grouted into the structure. The internal diameter of the sleeve shall be 2 inches larger than the external diameter of the pipe passing through it. After all of the piping is installed in that area, the Contractor shall check the clearance and correct it, if necessary, to within 1/2 inch. Then the void shall be packed full depth with glass /mineral fiber and sealed at both ends, 1 inch deep, with sealant backed by foam rod.

3.13 WIRING

A. All wiring connections to plumbing equipment on vibration isolators (either spring or neoprene type) shall be made with a minimum 36 inch (1m) long flexible conduit in a 180 degree “U” shaped loop. This Contractor shall coordinate wiring connections with the Electrical Contractor.

3.14 FIELD QUALITY

A. Contractor shall work in accord with best trade practices, shall fabricate and install all items in accordance with manufacturer's recommendations and Architect's directions and shall consult with trades doing adjoining work in order to provide an installation of first class quality.

3.15 ADJUSTMENT AND TESTING

A. SITE ACCESS: During installation of equipment, Contractor shall arrange for access as necessary for inspection of isolation and noise control equipment by Architect and his representatives.

3.16 CONTRACTOR'S REPORT

A. The vibration isolation vendor shall inspect and approve the installation of the vibration isolators and shall submit a report to the Owner, which verifies that all of the isolation equipment has been properly installed and that the installation is in full conformance with the specification. The report shall record the vibration isolator identification and model or type. For isolators containing steel springs the report shall also record the size and uncompressed height, design static deflection and measured static deflection of the isolators provided.

3.17 CONSULTANT'S INSPECTION

A. Upon completing installation and adjustment for suitable operation of all work specified under this section, the Contractor shall notify the Architect in writing. The letter shall certify that all work specified under this section is complete, operational and adjusted in every respect and that all work is ready for the completion checkout. A copy of the vibration isolation report shall accompany the notification letter.

B. Upon notification of completion, Architect will schedule an inspection by the Acoustics Consultant, who will measure the background noise level with all Plumbing Systems running.

C. For each inspection, Contractor shall perform such functions as are necessary for inspection of the equipment. Background noise level testing must be carried out during late-night hours when ambient noise from outside is at a minimum and the site is otherwise not occupied and no work is under way. Contractor shall turn on and off any and all plumbing equipment during such background noise level testing.

3.18 GUARANTEE

A. If, in the actual installation, any equipment fails to meet the noise or vibration control requirements specified herein, that equipment shall be corrected or replaced without claim for additional payment, inclusive of all labor and material costs. Such corrective measures shall be done within a time schedule specified by the Owner.

VIBRATION ISOLATION SCHEDULE FOR PLUMBING EQUIPMENT				
EQUIPMENT	BASE TYPE	ISOLATOR TYPE	STATIC DEFLECTION	REFERENCE DETAIL
Base-mounted pumps	4” housekeeping pad	DDNM	4”	
Piping	4” housekeeping pad	Isolation as per specification	2” default	

END OF SECTION 22 05 50

SECTION 22 05 93 - TESTING AND BALANCING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section describes the requirements for testing and balancing of all piping and equipment installed under this contract in the presence of the Engineer and the State Inspector and prove tight for the periods stated below or longer if required for inspection.
   1. Disconnect the apparatus for developing the required pressures during the stated periods.
   2. Completely disconnect and remake joints that leak.
   3. No plumbing system or part thereof shall be covered or concealed until after it has been tested and approved.
   4. If such work has been covered or concealed before testing, it shall be exposed for testing.
   5. If tests described in the specifications for plumbing systems differ from requirements or the local inspector, the more rigid requirements shall govern.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Testing:
   1. Rough sanitary, vent and storm water piping:
   2. Stop all openings and fill with water to the top of the highest vent.
   3. Water level shall hold constant for two hours.
   4. Soil, storm waste, and vent systems: May be tested in sections using the water pressure test. Test pressure shall be equal to at least 10 ft. water column at all points. Retest at least the upper 10 feet of the lower section.

2.2 WATER SUPPLY SYSTEM:

A. Fill and subject to 150 PSIG hydrostatic pressure at the lowest level for (2) hours. Fixtures shall not be connected, test the system for two hours at 75 PSIG or the prevailing water pressure, whichever is higher.

2.3 BALANCING:

A. Regulate the flow of water to each fixture so that the faucets and flush valves operate satisfactorily without waste of water and without objectionable noise.

B. All piping shall be free from objectionable noise or vibration and the circulation through same free and easy under normal operation and peak loads.

C. Adjust the hot water recirculation balancing valves to obtain approximately equal temperature drops through each section of the mains.

END OF SECTION 22 05 93

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SECTION 22 06 00 – UNDERGROUND PIPE AND PIPE FITTINGS

PART 1 - GENERAL

1.1 SCOPE OF DIVISION 22 WORK:

A. This work shall consist of furnishing all labor, material, equipment and services necessary for the installation of all equipment specified hereinafter.

B. Systems, piping and components principally relevant to this section include:
1. Sanitary Piping
2. Vent Piping
3. Storm Water Piping
4. Domestic Water Piping
5. Other items where shown on the drawings or as specified.

PART 2 - PRODUCTS

2.1 SANITARY PIPING:

A. Where noted on the construction drawings, waste and vent piping below grade up to a point five (5) feet from the building shall be PVC Schedule 40 solid wall pipe with DWV fittings. Pipe and fittings shall be manufactured from PVC compound with a cell class of 12454 per ASTM D1784 and conform with National Sanitation Foundation (NSF) standard 14. Pipe shall be iron pipe size (IPS) conforming to ASTM D1785 and ASTM D2665. Injection molded fittings shall conform to ASTM D 2665. Fabricated fittings shall conform to ASTM F 1866.

B. All pipe and fittings to be produced by a single manufacturer and to be installed in accordance with manufacturer’s recommendations and local code requirements. Solvent cements shall conform to ASTM D2564. Primer shall conform to ASTM F 656.

C. All cast iron piping and fittings shall meet the latest standard and specifications of the Cast Iron Soil Pipe Institute (CISPI) and of the American Society for Testing and Materials (ASTM).

D. All interior waste piping 2" and larger above grade shall be no-hub service weight cast iron pipe. Fittings shall be service weight cast iron no-hub.

E. All interior waste piping 1 1/2" and smaller, above grade shall be galvanized cast iron with galvanized cast-iron drainage fittings or type DWV copper.

F. Long turn drainage fittings shall be used in all cases except where space limitations make their use impractical.

2.2 VENT PIPING:

A. Vent piping 2 inches and larger shall be service weight cast iron soil pipe with service weight cast iron fittings.

B. Vent piping below grade shall be the same as sanitary piping listed in sections 2.1A and 2.1B. Minimum vent pipe size below grade shall be two (2) inches in diameter.

2.3 STORM WATER PIPING:

A. Where noted on the construction drawings, all storm piping below grade up to a point five (5) feet from the building shall be PVC Schedule 40 solid wall pipe with DWV fittings. Pipe and fittings shall be manufactured from PVC compound with a cell class of 12454 per ASTM D1784 and conform with National Sanitation Foundation (NSF) standard 14. Pipe shall be iron pipe size (IPS) conforming to ASTM D1785 and ASTM D2665. Injection molded fittings shall conform to ASTM D 2665. Fabricated fittings shall conform to ASTM F 1866.

B. All pipe and fittings to be produced by a single manufacturer and to be installed in accordance with manufacturer's recommendations and local code requirements. Solvent cements shall conform to ASTM D2564. Primer shall conform to ASTM F 656.

C. All interior roof drain piping above grade shall be no-hub service weight cast iron pipe with service weight no-hub cast iron fittings, or galvanized steel with galvanized malleable iron screw fittings.

D. All cast iron piping and fittings shall meet the latest standards and specifications of the Cast Iron Soil Pipe Institute (CISPI) and of the American Society for Testing and Materials (ASTM).

2.4 DOMESTIC WATER AND FORCED MAIN PIPING:

A. Pipe material for above ground installation shall be type "L" hard drawn copper tubing with 125 psi solder joint wrought copper fittings.

B. Underground service outside the building shall be ductile iron with 250 PSI joints and fittings or type "K" hard drawn copper tubing.

C. Pipe material for below ground installation, inside the building shall be Type "K" hard drawn copper tubing without fittings or joints or ductile iron.

D. Green water supply piping shall be provided per the domestic water specification.

PART 3 - EXECUTION

3.1 GENERAL:

A. For purposes of clearances and legibility, the contract documents are essentially diagrammatic and, although size and location of piping are drawn to scale wherever possible, contractor shall make use of all data in all of the contract documents and shall verify this information at building site.

B. The contract documents indicate required size and points of termination of pipes and suggest proper routes of piping to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that the contract documents indicate all necessary offsets, and it shall be the work of this section to install piping in such a manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear, without further instructions or cost to the Owner. The contractor shall fully inform himself regarding any

and all peculiarities and limitations of the spaces available for the installation of all work and materials furnished and installed under the contract. The contractor shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible. Although the locations of the equipment and piping may be shown on the contract documents in certain positions, the contractor shall be guided by the architectural details and conditions existing at the job, correlating this work with that of others. Provide all offsets as required to produce a neat, workmanlike arrangement.

C. The contractor shall study all drawings and specifications to determine any conflict with ordinances and statutes. Any errors or omissions shall be reported, and any changes shall be shown in drawings made by this section, and any additional work performed at no additional cost to the Owner.

D. Submittal of bid shall indicate the contractor has examined the site and contract documents and has included all required allowances in his bid. No allowance shall be made for any error resulting from contractor's failure to visit job sites and to review contract documents and bid shall include costs for all required drawings and changes as outlined above, all at no additional cost to the Owner.

E. Springing, bending or forcing of pipe shall not be allowed. Use fittings for all offsets or changes in alignment of piping. Center hubs so cast iron pipe shall lay straight without pinched joints.

F. All changes in directions shall be made with approved fittings. Mitering, saddling or welding of smaller pipe and larger piping is prohibited.

G. Pipe openings shall be closed with caps or plugs during installation. Rags and tin cans are not considered suitable closures.

H. Damage by leaks - This sub-contractor shall be responsible for damage to the grounds, walks, road, buildings, pipe systems, electrical systems and their equipment and contents, caused by leaks in the piping system being installed or having been installed herein. He shall repair at his expense all damage so caused. All repair work shall be performed as directed by the Architect.

I. The use of chemicals or so-called "Stop-Leak" compounds shall not be permitted at any time.

3.2 PIPE JOINING METHODS:

A. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.

B. Solder copper tube-and-fitting joints where indicated, in accordance with ANSI B31. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.

C. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.

D. Hubless Cast-Iron Joints: Comply with CISPI 310.

E. Install gray and ductile cast-iron water mains and appurtenances in accordance with ANSI/AWWA C600.

3.3 WASTE PIPING:

A. Joints above grade shall be no-hub coupling consisting of an approved (ASTM A-48 & ASTM C-564) elastomeric sealing sleeve and stainless steel clamp, clamping screws and housing. Piping shall be supported at one side of joint at all joints made with coupling. MG coupling or Clamp-All will be acceptable.

B. All joints for bell and spigot piping shall be made with factory molded flexible neoprene compression couplings, factory formed, integral with the bell and spigot of the pipe. Piping joints at the joining of partial sections of pipe not equipped with compressions couplings shall be made with Carey Sewertite or approved equal compound. Joints shall meet all applicable codes.

C. Minimum size of soil or waste piping below grade shall be (2) inches in diameter.

D. Install horizontal and waste piping to a uniform grade of not less than 1/4 inch per foot for two (2) inch diameter and less, and not less than 1/8 inch per foot for diameters of two (2) inches or larger.

E. Piping shall be supported at one side of joint and all joints made with no-hub couplings.

F. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

G. Cleanouts: Install in waste piping as indicated, as required by the North Carolina State Plumbing Code; at each change in direction of piping greater than 45 degrees, at minimum intervals of 50' for piping 3" and smaller and 80' for larger piping; and at base of each vertical waste or waste stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.

H. Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membrane.

I. Vent Flashing Sleeves: Install on stacks passing through roof, secure over stack flashing in accordance with manufacturer's instructions. Coordinate installation with roofing contractor.

J. Installation of underground PVC sanitary and vent piping shall comply with the latest installation instructions published by the manufacturer and shall conform to all applicable plumbing, fire, and building code requirements. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668. Solvent cement joints shall be made in a two-step process with primer conforming to ASTM F 656 and solvent cement conforming to ASTM D 2564. The system shall be protected from chemical agents, fire-stopping materials, thread sealant, plasticized-vinyl products or other aggressive chemical agents not compatible with PVC compounds. The system shall be hydrostatically tested after installation.

3.4 VENT PIPING:

A. Plumbing contractor shall provide a complete venting system for the waste system as shown on the contract documents, and as described herein.

B. The vent system shall not be used for purposes other than venting of the plumbing system.

C. Piping shall be supported at one side of joints and all joints.

D. Minimum diameter of an individual vent above grade shall be at least one half-(1/2) the diameter of the drain served, except that no vent pipe shall be less than one and one quarter (1-1/4) inches in diameter.

E. All vent and branch vent pipes shall be sloped a minimum of one eight (1/8) inch per foot and so connected as to drain back to the soil or waste pipe by gravity.

3.5 STORM PIPING:

A. The storm system shall not be used for any purpose other than the removal of rainwater from the roof, sidewalks and paved areas. Storm water shall not drain into the sanitary sewer system.

B. All joints above grade shall be no-hub coupling type consisting of an approved elastomeric sealing sleeve and stainless steel clamp, clamping screens and housing. Piping shall be supported at both sides of joint at all joints made with this coupling.

C. Pitch all horizontal storm piping above grade a minimum of 1/8" per foot unless noted otherwise. All horizontal piping below grade shall be pitched to meet invert elevations shown on the contract documents.

D. Lay storm piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

E. Installation of underground PVC storm piping shall comply with the latest installation instructions published by the manufacturer and shall conform to all applicable plumbing, fire, and building code requirements. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668. Solvent cement joints shall be made in a two-step process with primer conforming to ASTM F 656 and solvent cement conforming to ASTM D 2564. The system shall be protected from chemical agents, fire-stopping materials, thread sealant, plasticized-vinyl products or other aggressive chemical agents not compatible with PVC compounds. The system shall be hydrostatically tested after installation.

3.6 DOMESTIC WATER PIPING:

A. Potable water piping shall include all domestic cold water piping.

B. All copper piping shall have sweat joints, except at valves where sweat to threaded adapters shall be used. All pipe shall be reamed to full diameter before jointing. Ends of pipe and inside of fittings shall be cleaned and flux applied to entire area of pipe end to be soldered. On pipe 1-

1/2 inches and larger, flux shall be applied to pipe and fittings. Solder for piping 4" and smaller shall be 95-5 solder.

C. Chlorination of Water System: After water system is completed, the entire system shall be chlorinated by injecting a strong solution of chlorine into the system of not less than 50 ppm. Valves shall be opened and closed to gain complete coverage of system. Let system stand for twenty-four (24) hours, then flush system to leave a minimum permissible concentration as recommended by the Health Department having jurisdiction. After flushing, satisfactory bacteriological results must be obtained or the mains must be rechlorinated until satisfactory results are obtained.

END OF SECTION 22 06 00

SECTION 22 06 10 – ABOVE GROUND PIPE AND PIPE FITTINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. This work shall consist of furnishing all labor, material, equipment and services necessary for the installation of all equipment specified hereinafter.

B. Systems, piping and components principally relevant to this section include:
1. Sanitary Piping
2. Vent Piping
3. Storm Water Piping
4. Domestic Water Piping/Forced Main Piping
5. Other items where shown on the drawings or as specified.

1.2 SUBMITTALS:

A. Shop drawings shall be submitted on all items in accordance with the provisions of specification section 22 01 00.

PART 2 - PRODUCTS

2.1 SANITARY AND STORM WASTE PIPING:

A. All interior waste and storm piping 2" and larger above grade shall be non-hub or hub & spigot service weight cast iron pipe. Fittings shall be service weight cast iron. Schedule 40 Solid Wall PVC with DWV fittings is an acceptable alternate.

B. All interior waste and storm piping 1 1/2" and smaller above grade shall be galvanized wrought iron with galvanized cast-iron drainage fittings. Copper DWV piping and fittings will be acceptable. Schedule 40 Solid Wall PVC with DWV fittings is an acceptable alternate.

C. Long turn drainage fittings shall be used in all cases except where space limitations make their use impractical.

2.2 VENT PIPING:

A. Vent piping 2 inches and larger shall be service weight cast iron soil pipe with service weight cast iron fittings. Schedule 40 Solid Wall PVC with DWV fittings is an acceptable alternate.

B. Vent piping below grade shall be Schedule 40 PVC with matched fittings. Minimum vent pipe size below grade shall be two (2) inches in diameter.

2.3 DOMESTIC WATER PIPING/FORCED MAIN PIPING:

A. Pipe material for above ground installation, larger than 2", shall be type "L" hard drawn copper tubing with 125 psi solder joint wrought copper fittings.

B. Pipe material for above ground installation, 2" and smaller, shall be PEX Type A with cold-expansion PEX Type A compression-sleeve fittings. Flow through fittings shall be maintained for full size of line.

C. Pipe material for below ground installation, inside the building shall be Type "K" hard drawn copper tubing without fittings or joints. Solder and flux shall be lead free.

D. Solder for joints 1½" and larger shall be silver soldered joints. Smaller than 1½" shall be soldered with 95-5. Joints for potable water piping shall use lead free solder and flux.

E. Fittings for copper pipe shall be wrought copper.

F. All exposed piping in finished room (including cabinets) used in connection with plumbing fixtures shall be chromium plated brass pipe with plated cast brass fittings.

2.4 COMPOUNDS, SOLDER AND LEAD:

A. Pipe Thread Compound:
1. Crane, Dixon, Rutland, or equal, or Teflon tape type.
2. Solder-joint solder: 95% tin and 5% antimony. Joints on larger pipe shall be made with a high-temperature brazing solder, Sil-phos or equal, except use 95-5 at valves.

B. Asphaltic Joint Compound:
1. G-K Jointite, Korite or equal.

PART 3 - EXECUTION

3.1 GENERAL:

A. For purposes of clearances and legibility, the contract documents are essentially diagrammatic and, although size and location of piping are drawn to scale wherever possible, contractor shall make use of all data in all of the contract documents and shall verify this information at building site.

B. The contract documents indicate required size and points of termination of pipes and suggest proper routes of piping to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that the contract documents indicate all necessary offsets, and it shall be the work of this section to install piping in such a manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear, without further instructions or cost to the Owner. The contractor shall fully inform himself regarding any and all peculiarities and limitations of the spaces available for the installation of all work and materials furnished and installed under the contract. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible. Although the locations of the equipment and piping may be shown on the contract documents in certain positions, the contractor shall be guided by the architectural details and conditions existing at the job, correlating this work with that of others. Provide all offsets as required to produce a neat, workmanlike arrangement.

C. The contractor shall study all drawings and specifications to determine any conflict with ordinances and statutes. Any errors or omissions shall be reported, and any changes shall be shown in drawings made by this section, and any additional work performed at no additional cost to the Owner.

D. Submittal of bid shall indicate the contractor has examined the site and contract documents and has included all required allowances in his bid. No allowance shall be made for any error resulting from contractor's failure to visit job sites and to review contract documents and bid shall include costs for all required drawings and changes as outlined above, all at no additional cost to the Owner.

E. All piping shall be installed to prevent unusual noise from the flow of water under normal conditions. Insert one (1) inch strip of hair felt to isolate all piping from any direct contact with any part of the building, framing, conduit, etc.

F. Springing, bending or forcing of pipe shall not be allowed. Use fittings for all offsets or changes in alignment of piping. Center hubs so cast iron or clay pipe shall lay straight without pinched joints.

G. All changes in directions shall be made with approved fittings. Mitering, saddling or welding of smaller pipe and larger piping is prohibited.

H. Pipe openings shall be closed with caps or plugs during installation. Rags and tin cans are not considered suitable closures. Pipe openings in terrazzo floors shall have semi-permanent closures during construction.

I. Damage by leaks - These contractor's shall be responsible for damage to the grounds, walks, road, buildings, pipe systems, electrical systems and their equipment and contents, caused by leaks in the piping system being installed or having been installed herein. He shall repair at his expense all damage so caused. All repair work shall be performed as directed by the Architect.

J. The use of chemicals or so-called "Stop-Leak" compounds shall not be permitted at any time.

K. Unions shall be provided at connection to all equipment.

L. Escutcheon plates shall be provided at all penetrations of walls, ceilings, floors, etc.

M. All items of equipment and plumbing fixtures shall be provided with approved vacuum breakers to prevent backflow, as required by State Health Department and local authorities having jurisdiction. All waste connections shall be installed with approved airbreak fittings to comply with the above requirements. Vacuum breakers where shown on Drawings or required shall be angle pattern with built-in lift type check valves as manufactured by Bidoro Manufacturing Company or approved equal.

N. Bypass Piping: Except as otherwise indicated, fabricate and install bypass piping using same materials and in same plane as connected piping, but one pipe size smaller. Include valve in bypass piping. Install bypass piping around control valves, PRV stations and as shown on drawings.

3.2 PIPE JOINING METHODS:

A. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.

B. Braze copper tube-and-fitting joints where indicated, in accordance with ANSI B31. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.

C. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.

D. Hubless Cast-Iron Joints: Comply with CISPI 310.

E. Install gray and ductile cast-iron water mains and appurtenances in accordance with ANSI/AWWA C600.

F. Install Schedule 40 PVC in accordance with manufacturer’s installations and current plumbing code.

3.3 SANITARY WASTE PIPING:

A. Coat all piping with tar pitch or similar bituminous material, if not applied in factory.

B. Joints above grade shall be no-hub coupling consisting of an approved (ASTM C-1540) elastomeric sealing sleeve and Type 304 stainless steel clamp, clamping screws and housing. Piping shall be supported at one side of joint at all joints made with coupling. Husky SD4000, MG coupling, Clamp-All 125 or equal will be acceptable.

C. All joints for bell and spigot piping shall be made with factory molded flexible compression couplings, factory formed, integral with the bell and spigot of the pipe. Piping joints at the joining of partial sections of pipe not equipped with compressions couplings shall be made with firmly packed hemp, oakum, jute and Carey Sewertite or approved equal compound. Joints shall meet all applicable codes.

D. Minimum size of waste piping below grade shall be (2) inches in diameter.

E. Piping shall be supported at one side of joint and all joints made with no-hub couplings.

F. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

G. Install waste piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 2 1/2" and smaller, and 1/8" per foot (1%) for piping 3" and larger.

H. Install 1" thick extruded polystyrene over underground building drain piping not under building. Provide width to extend minimum of 12" beyond each side of pipe. Install directly over pipe, centered on pipe center line.

I. Cleanouts: Install in sanitary above ground piping and sanitary building drain piping as indicated, as required by the International Plumbing Code; at each change in direction of piping greater than 45°, at minimum intervals of 50' for piping 3" and smaller and 80' for larger piping; and at base of each vertical waste or waste stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.

J. Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membrane.

K. Vent Flashing Sleeves: Install on stacks passing through roof, secure over stack flashing in accordance with manufacturer's instructions. Coordinate installation with roofing contractor.

L. Installation of underground PVC sanitary and vent piping shall comply with the latest installation instructions published by the manufacturer and shall conform to all applicable plumbing, fire, and building code requirements. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668. Solvent cement joints shall be made in a two-step process with primer conforming to ASTM F 656 and solvent cement conforming to ASTM D 2564. The system shall be protected from chemical agents, fire-stopping materials, thread sealant, plasticized-vinyl products or other aggressive chemical agents not compatible with PVC compounds. The system shall be hydrostatically tested after installation.

3.4 VENT PIPING:

A. Plumbing contractor shall provide a complete venting system for the sanitary system as shown on the contract documents, and as described herein.

B. The vent system shall not be used for purposes other than venting of the plumbing system.

C. Piping shall be supported at one side of joints and all joints.

D. Minimum diameter of an individual vent above grade shall be at least one half-(½) the diameter of the drain served, except that no vent pipe shall be less than one and one quarter (1-1/4) inches in diameter.

E. All vent and branch vent pipes shall be sloped a minimum of one eight (1/8) inch per foot and so connected as to drain back to the soil or waste pipe by gravity.

F. Extension of vent pipes through a roof shall be terminated at least twelve (12) inches above the roof.

G. Minimum size vent through the roof shall be three (3) inches in diameter. When it is found necessary to increase the size of the vent extension to meet this requirement, the change in diameter shall be made inside the building at least one foot below the roof with an approved fitting.

H. The vents must be through the roofs before the final roofing is applied. Where necessary, the vents shall be offset in the roof construction so that they come through the roof at least 18" from walls and other objects projecting above roof surface.

3.5 DOMESTIC WATER PIPING / FORCED MAIN PIPING:

A. Potable water piping shall include all domestic cold, hot, circulating and Rainwater Harvesting supply piping.

B. The water service to the building shall maintain a minimum depth of 36” below the finished grade to the top of pipe.

C. All copper piping shall have sweat joints, except at valves where sweat to threaded adapters shall be used. All pipes shall be reamed to full diameter before jointing. Ends of pipe and inside of fittings shall be cleaned and flux applied to entire area of pipe end to be soldered. On pipe 1-1/2 inches and larger, flux shall be applied to pipe and fittings. Solder shall be of the composition indicated below.
1. 1-1/2" and larger - Silver Solder
2. 1-1/4" and lower - 95-5 Solder

D. All cold-expansion PEXa compression-sleeve fittings shall be assembled using the manufacturer’s approved tools and must consist of the following process 1. Make a clean, square cut of the PEXa pipe 2. Slide the PEXa compression sleeve over the PEXa pipe 3. Expand the PEXa pipe twice with a rotation between expansions 4. Insert the cold-expansion compression-sleeve fitting into the expanded PEXa pipe 5. Compress the PEXa compression sleeve over the PEXa pipe and fitting using only tools from the manufacturer’s cataloged program.

E. All water piping shall be pitched approximately one (1) inch per sixty (60) feet upward from source to facilitate drainage. Where water piping must change elevation to avoid structural or other obstructions, drain valves and air vents shall be provided.

F. Provide three quarter (3/4) inch hose end valve at all low points in system for drainage.

G. Dielectric unions or insulated couplings shall be installed between copper or brass piping material and steel piping material. Unions or insulated couplings shall be used for pipe sizes 2" and smaller, and dielectrically gasketed flanges and sleeves for pipes 2-1/2" and larger.

H. Provide unions on inlet and outlet of all apparatus and equipment having connections 2" and smaller. Where valves are adjacent to equipment, union shall be on the downstream side of valves. For piping over 2" flanged points shall be used.

I. Chlorination of Domestic Water Supply System:

1. After water system is completed, the entire system shall be chlorinated by injecting a strong solution of chlorine into the system of not less than 50 ppm. Valves shall be opened and closed to gain complete coverage of system. Let system stand for twenty-four (24) hours, then flush system to leave a minimum permissible concentration as recommended by the Health Department having jurisdiction. After flushing, satisfactory bacteriological results must be obtained or the mains must be re-chlorinated until satisfactory results are obtained.
2. After disinfection the water supply shall not be placed into a service until bacteriological test results of representative water samples analyzed in approved laboratory are found to be satisfactory. Certification of bacteriological testing for quality of the domestic water shall be conducted, accepted by the Project Engineer and submitted to Authorities Having Jurisdiction prior of request for final inspection.

J. Tests of domestic plumbing systems shall comply with authorities having jurisdiction, and, where required, shall be witnessed by the building official.

K. Air Test:
1. Charge the completed, yet unconcealed pipes with air at a minimum of 40 psig.
2. Do not exceed amount of pressure required by the local jurisdiction. Contractor responsible for ensuring all proper and safe procedures are followed per manufacturer's instructions.

L. Water Test
1. Purge air from pipes.
2. Charge the completed, yet unconcealed pipes with water.
3. Take necessary precautions to prevent water from freezing.
4. Check the system for leakage, especially at all pipe joints.

M. Perform pressure test per manufacturer's technical guidelines.

END OF SECTION 22 06 10

SECTION 22 07 00 - INSULATION

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. Provide insulation as specified for: Piping systems including valves, couplings, fittings, flanges, strainers, and expansion joints.
   1. Equipment, including tanks, and components subject to heat loss or heat gain.
   2. Other items where shown on drawings and/or specified.

1.2 SUBMITTALS:

A. Shop drawings shall be submitted on all items in accordance with the provisions of specification Section 22 01 00.

1.3 RELATED WORK SPECIFIED ELSEWHERE:

A. In addition to this Section, this sub-contractor shall refer to other specification sections and drawings to ascertain the extent of work, including: All Division 22 Sections.

1.4 DEFINITION:

A. Work under this Division 22 of the specifications shall include but not necessarily be limited to items common to Sections:
   1. 220702 Potable Cold Water and Storm Piping Insulation

1.5 QUALITY ASSURANCE:

A. Provide piping insulation products produced by one of the following manufacturers for each type and temperature range of insulation.
   1. Certainteed Corporation
   2. Owens-Corning Fiberglass Corporation
   3. Knauff Corporation
   4. Armstrong Cork Company

1.6 SUBMITTALS:

A. Shop drawings shall be submitted on all items in accordance with the provisions of specification Section 22 01 00.

B. Submit shop drawings on the following:
   1. Insulation
   2. Fitting covers

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Protect insulation against dirt, water and chemical and mechanical damage. Do not install damaged insulation; remove from project site.

B. Delivery insulation, covering, cements, adhesives and coatings to the site in factory-fabricated containers with the manufacturer's stamp, or label, affixed showing fire hazard ratings of the products.

C. Store insulation in original wrappings and protect from weather and construction traffic.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS - PIPING INSULATION:

A. Insulation shall have composite (insulation jacket or facing, and adhesive used to adhere the facing or jacket to the insulation) fire and smoke hazard ratings as tested by procedure ASTM E84, NEPA 255 or UL 723 not exceeding:
1. Flame Spread-25
2. Smoke Developed 50

B. Accessories such as adhesives, mastics, cements, tapes and cloth for fittings shall have the same component rating as listed above. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed requirements. Treatment of jackets or facings to impart flame and smoke-safety shall be permanent. The use of water-soluble treatments is prohibited.

C. Where Benjamin-Foster adhesives are specified equal products manufactured by 3M Company, or the manufacturer of the insulation are acceptable upon approval by the Engineer. Armstrong 520 adhesive shall be used for Armstrong insulation.

D. In lieu of the insulation wrap specified for fittings, valves, mechanical couplings and flanges, unitary type insulation products similar to J-M Unifit shall be acceptable.

1. Underground piping shall be directed buried pre-insulated piping.

PART 3 - EXECUTION

3.1 GENERAL EXECUTION REQUIREMENTS - PIPING:

A. Insulation shall be applied on clean dry surfaces, after inspection and release for insulation application. Items that are factory insulated shall not receive additional insulation.

B. Insulation shall be continuous through non-rated wall and ceiling openings and sleeves.

C. Insulation on cold surfaces where vapor barrier jackets are used shall be applied with a continuous, unbroken vapor seal. Anchors, etc., that are secured directly to cold services shall be adequately insulated and vapor sealed to prevent condensation.

D. Where insulation is specified for piping, insulate similarly all connections, vents, drains, and any appurtenances and piping connected to system subject to heat loss or gain. Unions, couplings, or flanges provided at equipment for removal of heat exchanger, etc., shall be insulated with removable molded blocks.

E. Where inserts occur at pipe supports and guides, provide the following:
1. On cold pipe apply a wet coat of vapor barrier lap cement on all butt joints and seal all joints with 3" wide vapor barrier tape or band.

F. Fittings, valves, mechanical couplings and flanges shall be insulated with the same material and of the same thickness as the adjoining piping, except where otherwise specified.

G. Concealed piping insulate with glass fiber insulation types shall be banded in place with three aluminum bands per section, one over each end of the joint sealing strip, and one in the middle of the section.

H. All exposed piping within the mechanical rooms, and equipment platforms shall be finished with an 8 ounce canvas jacket posted to the insulation and if within 8'-0" of the floor shall be finished with an additional aluminum jacket (.016" preformed). Exposed fittings, etc. shall be finished with fitting cloth smoothly adhered and coated with Benjamin-Foster 30-36. Lap the cloth on itself and adjoining pipe insulation. Lap to be at least 1" on pipe insulation below 4" and 2" on sizes 4" and above.

I. On pipe sizes 4" and larger, fittings, mechanical couplings, and valves shall be insulated with molded fitting covers. Flanges shall be insulated with sectional pipe insulation extending a minimum of 1" beyond the end of the bolts. Bolt area shall be fitted with insulating and finishing cement.

J. All piping subject to freezing such as in outdoor air or discharge plenums or outdoors shall be insulated with twice the insulation thickness specified.

3.2 GENERAL EXECUTION REQUIREMENTS - EQUIPMENT:

A. Insulation shall be firmly held in place with galvanized steel wire or galvanized steel bands on 12" centers.

3.3 PROTECTION AND REPLACEMENT:

A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: Insulation installer shall advise plumbing contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 22 07 00

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SECTION 22 07 02 - POTABLE COLD WATER AND STORM WATER PIPING INSULATION

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. Provide insulation as specified for cold water piping systems, including valves, mechanical coupling, fittings, flanges and strainers.
   1. Other items where shown on drawings or as specified.

PART 2 - PRODUCTS

2.1 PIPING INSULATION TYPES:

A. Type P-1 Pipe Insulation:
   1. Insulation shall be glass fiber with a maximum K factor of .24 at 75°F mean temperature with factory applied fire resistant vapor barrier jacket.
   2. For fittings and valve bodies 3" and smaller, insulation shall be one-pound density glass fiber blanket wrapped firmly under compression with No. 20 gauge galvanized annealed steel wire and given a smoothing coat of finishing cement.

B. Insulation Thickness Schedule:

PIPING SYSTEM	THICKNESS
Potable Cold, Water Piping	1" Min.

C. Type P-2 Pipe Insulation:
   1. Insulation shall be the same as Type 1 except fittings and valves 3" and smaller shall be insulated and finished with insulation and finishing cement to a thickness equal to the adjoining pipe insulation.

INSULATION THICKNESS SCHEDULE:	THICKNESS
Piping System All horizontal storm drain above ground (primary and secondary)	1"
All roof drain bodies(primary and secondary)	1"

D. Drainage Piping Within A Ceiling Cavity From Ice Machines:
   1. Insulate the drain body, p-trap and the first 10’-0” of piping.

PART 3 - EXECUTION

3.1 PIPING INSULATION:

A. Type P-1 Insulation:
   1. Longitudinal lap and 4" wide vapor barrier joint seal strips shall be adhered neatly in place with BF 85-20 adhesive or approved equal.
   2. The ends of pipe insulation shall be sealed off with BF 30-35 coatings at all open ends, flanges, valves and fittings and at intervals of not more than 21 feet on continuous runs of pipe.

3. Fittings shall be vapor sealed by applying a layer of white open weave glass fabric (20 x 20) between two 1/16" thick coats of BF 30-35.

B. Type P-2 Insulation:
1. Type P-2 insulation shall be installed as P-1 above exception that insulation end not be vapor sealed.

END OF SECTION 22 07 02

SECTION 22 07 04 - POTABLE HOT WATER AND RECIRCULATING PIPING INSULATION

PART 1 - GENERAL:

1.1 SCOPE OF WORK:

A. Provide insulation as specified for hot water piping systems, including valves, mechanical coupling, fittings, flanges and strainers.

B. Equipment and components subject to heat transfer including:
   1. Other items where shown on drawings or as specified.

PART 2 - PRODUCTS

2.1 PIPING INSULATION TYPES:

A. Type P-3 Pipe Insulation:
   1. Insulation shall be molded glass fiber with a maximum K factor of 0.24 at 75°F mean temperature with factory applied Fire Retardant Jacket.
   2. For fittings and valves bodies 3" and smaller, insulation shall be one-pound density glass fiber blanket wrapped firmly under compression with No. 20 gauge galvanized annealed steel wire and given a smoothing coat of finishing cement.
   3. Insulation Thickness Schedule:

PIPING SYSTEM	PIPE SIZE	THICKNESS
Potable Hot Water Supply	0 - 2½”	1"
Recirculating Return (100°F to 290°F), Tempered Water and Tempered, Water Return	3" & larger	1½”

2.2 EQUIPMENT INSULATION TYPES:

A. Type E-2 Equipment Insulation:
   1. Insulation shall be 6# per cubic foot density glass fiber with fire retardant vapor barrier facing and having a maximum K factor of 0.24 at 75°F mean temperature.
   2. Sections of equipment requiring periodic servicing shall be insulated with removable ArmourCote covers as manufactured by Insulcoustic Corp. or by Sheet Metal Casing with insulation applied to the interior surface of the casing.

END OF SECTION 22 07 04

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SECTION 22 08 00 – PIPING SPECIALITES AND ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. This work shall consist of furnishing all labor, material, equipment, and services necessary for the installation of all equipment specified hereinafter.

B. Equipment and components principally relevant to this section include:
1. Sleeves
2. Other items where shown on the drawings or as specified.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Provide sleeves for each pipe passing through walls and floors.

B. Sleeve Material:

TYPE	DESIGNATION
1	Deleted
2	Standard weight galvanized steel pipe.
3	Standard weight galvanized steel pipe with a continuous welded stop of 1/4" steel plate extending outside of sleeve a minimum all around, similar to R&S Manufacturing Corp. Fig. 204.
4	Cast iron pipe sleeve with center flange, similar to James B. Clow and Sons No. F-1430 and F-1435.
5	Standard weight galvanized steel pipe with flashing clamp device welded to pipe sleeve or watertight sleeves, similar to Josam 1870-A2, 1870, 1940-C with approved caulking compound.

C. Sleeve Sizes: Sleeves for uninsulated pipe shall be two pipe sizes larger than pipe passing through a minimum of 1/2" clearance between inside of sleeve and outside of pipe.

D. Sleeve Lengths:

LOCATION	SLEEVE LENGTH
Floors	Equal to depth of floor construction including finish. In waterproof floor construction sleeves to extend minimum of 2" above finished floor level.
Walls and Partitions	Equal to thickness of construction and terminated with surfaces.

E. Sleeve and Caulking and Packing:

TYPE DESIGNATION	CAULKING AND PACKING REQUIREMENTS
A	Space between pipe and sleeve packed with oakum or hemp and caulked watertight with lead.
B	Space between pipe or pipe covering and sleeve shall be caulked with a fire resistant foam sealant.

F. Sleeve Application:

SLEEVE TYPE	LOCATION	SLEEVE CAULKING AND PACKING TYPE DESIGNATION
3 or 4	Exterior walls	A

G. Mechanical Sleeve Seals:
1. Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering mechanical sleeve seals which may be incorporated in the work include, but are not limited to, the following:
   a. Thunderline Corp.

PART 3 - EXECUTION

3.1 INSTALLATION OF MECHANICAL SLEEVE SEALS:

A. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

END OF SECTION 22 08 00

SECTION 22 11 23.21 - INLINE DOMESTIC WATER PUMPS

PART 1 - GENERAL:

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Horizontally mounted, in-line, close-coupled centrifugal pumps.

1.3 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include materials of construction, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.
1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1, without amendments, Section 7 - "Service Water Heating."

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's written rigging instructions for handling.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 HORIZONTALLY MOUNTED, IN-LINE, CLOSE-COUPLED CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bell & Gossett .
2. Grundfos
3. TACO Incorporated.
4. Watts

B. Description: Factory-assembled and -tested, in-line, single-stage, close-coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shaft mounted horizontal.

C. Pump Construction:
1. Casing: Radially split with threaded companion-flange connections for pumps with NPS 2 pipe connections and flanged connections for pumps with NPS 2-1/2 pipe connections.
2. Impeller: Statically and dynamically balanced, closed, and keyed to shaft.
3. Shaft and Shaft Sleeve: Steel shaft with deflector, with copper-alloy shaft sleeve. Include water slinger on shaft between motor and seal.
4. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket.
5. Bearings: Oil-lubricated; bronze-journal or ball type.
6. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.

D. Motor: Single speed, with grease-lubricated ball bearings; and resiliently or rigidly mounted to pump casing.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 22 05 13 "Common Motor Requirements for Plumbing Equipment."
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.3 CONTROLS

A. Thermostats: Electric; adjustable for control of hot-water circulation pump.
1. Type: Water-immersion temperature sensor, for installation in piping.
2. Range: 65 to 200 deg F
3. Enclosure: NEMA 1, Type 4X.
4. Operation of Pump: On or off.
5. Transformer: Provide if required.
6. Power Requirement: 120 V, ac.
7. Settings: Start pump temperature indicated on schedule and stop pump as indicated on schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

3.2 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install in-line, seal-less centrifugal pumps with shaft horizontal unless otherwise indicated.

C. Install horizontally mounted, in-line, close-coupled centrifugal pumps with shaft(s) horizontal.

D. Pump Mounting: Install vertically mounted, in-line, close-coupled centrifugal pumps with cast-iron base mounted to wall.
1. Minimum Deflection: 1/4 inch.

E. Install continuous-thread hanger rods and spring hangers of size required to support pump weight.
1. Comply with requirements for vibration isolation devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment." Fabricate brackets or supports as required.
2. Comply with requirements for hangers and supports specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

F. Install pressure switches in water supply piping.

G. Install thermostats in hot-water return piping.

H. Install with electrical disconnect.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 11 16 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps to allow service and maintenance.

C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.
   1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:
      a. Horizontally mounted, in-line, close-coupled centrifugal pumps.
      b. Comply with requirements for flexible connectors specified in Section 22 11 16 "Domestic Water Piping."
   2. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Section 22 05 23 "General-Duty Valves for Plumbing Piping" and comply with requirements for strainers specified in Section 22 11 19 "Domestic Water Piping Specialties."
   3. Install pressure gage at suction of each pump and pressure gage at discharge of each pump. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Comply with requirements for pressure gages and snubbers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

D. Connect thermostats to pumps that they control.

3.4 IDENTIFICATION

A. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Check piping connections for tightness.
   3. Clean strainers on suction piping.
   4. Set thermostats for automatic starting and stopping operation of pumps.
   5. Perform the following startup checks for each pump before starting:
      a. Verify bearing lubrication.
      b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
      c. Verify that pump is rotating in the correct direction.
   6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
   7. Start motor.
   8. Open discharge valve slowly.
   9. Adjust temperature settings on thermostats.
   10. Adjust timer settings.

3.6 ADJUSTING

A. Adjust domestic water pumps to function smoothly and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 22 11 23.21

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SECTION 22 15 16 – NATURAL GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR PLUMBING and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

B. Each Contractor's attention is also directed to Specification Section HANGERS, CLAMPS, ATTACHMENTS, ETC.

1.2 SCOPE:

A. Unless otherwise indicated, all materials shall be new and of the best grade and quality for the type specified. Materials shall comply with the “Buy American Act”.

B. Where piping is not indicated on the plans, but is obviously or apparently required, contact the Engineer prior to submission of the bid.

C. The piping indicated shall be installed complete and shall be of the size indicated. When a pipe size is not indicated, the Contractor shall request the pipe size from the Engineer. Where a section of piping is not indicated but is obviously required for completion of the system, the Contractor shall provide same at no additional cost to the project.

D. Pay particular attention to conflict of piping with other work. Do not install until conflict is resolved. If in doubt, consult Engineer.

PART 2 - PRODUCTS

2.1 SITE NATURAL GAS PIPING:

A. Exterior natural gas piping below grade shall be thermoplastic gas pressure pipe with fittings. All gas piping shall be per NFPA 54. Polyethylene pipe used for gas service lines must conform to specification ASTM D2513, “*Specifications for Thermoplastic Gas Pressure Pipe, Tubing and Fittings”.* The polyethylene pipe must be marked at intervals not exceeding two feet showing the manufacturer or trade name, size wall thickness or SDR number, PE type, batch identification, and ASTM D2513 compliance. The polyethylene pipe may be grade PE2406 or PE3408 with designation CD, CE, CDC, or CEC. PE2406 grade (medium density) must be yellow.

2.2 UNIONS, FLANGES AND WELDED TEES:

A. Screwed unions, soldered unions or bolted flanges shall be provided as required to permit removal of equipment, valves, and piping accessories from the piping system. Keep adequate

clearances for coil removal, rodding, tube replacement, motor lubrication, filter replacement, etc. Flanged joints shall be assembled with appropriate flanges, gaskets, and bolting. The clearance between flange faces shall be such that the connections can be gasketed and bolted tight without imposing undue strain on the piping system.

B. Dielectric insulating couplings or though ways shall be used wherever the adjoining materials being connected are of dissimilar metals such as connections between copper and steel pipe.

C. Tee connections for welded pipe shall be assembled with welding fittings. Where the size of the side outlet is such that a different connection technique than on the run is required, a weldolet, sockolet, or threadolet type fitting may be used for the branch in place of reducing tees only where the branch is 2/3 the run size or smaller. Weld-o-let and thread-o-let branch connections are acceptable.

2.3 NATURAL GAS PIPING – INTERIOR:

A. Schedule 40 black steel pipe with malleable iron threaded fittings for pipe sizes 2" and smaller.

B. Schedule 40 black steel pipe with wrought steel buttwelded fittings for pipe sizes 2½" and larger.

C. Where gas pressure is 2 psi or greater, piping shall be schedule 40 black steel pipe with wrought steel buttwelded fittings.

D. Paint all exterior piping as specified in Section IDENTIFICATIONS, TAGS, CHARTS, ETC.

PART 3 - EXECUTION

3.1 GENERAL:

A. All piping shall be capped or plugged during erection as required to keep clean and debris and moisture free.

B. All piping shall be installed straight and true, parallel, or perpendicular to the building construction. Piping shall be installed so as to allow for expansion without damage to the building finishes, structure, pipe, equipment, etc., use offsets, U-bends or expansion joints as required. No mitered joints or field fabricated pipe bends shall be accepted. Pipe shall clear all windows, doors, louvers, and other building openings.

C. All pipes shall be supported in a neat and workmanlike manner and wherever possible, parallel runs of horizontal piping shall be grouped together on hangers. Vertical risers shall be supported at each floor line with approved steel pipe riser clamps. Spacing of pipe supports shall not exceed eight (8) foot intervals for pipes 3” and smaller and ten (10) foot intervals on all other piping. Small vertical pipes (1” and less) shall be bracketed to walls, structural members, etc. at four (4) foot intervals so as to prevent vibration or damage by occupants.

D. The use of wire or perforated metal to support pipes will not be permitted. Hanging pipes from other pipes shall not be permitted.

E. Support piping with standard pipe hangers with C-clamp connection to main structural members (not perlins), use angle steel cross pieces between main structural members where required to

provide rigid support.

F. Where piping rests directly on a hanger, clip, bracket or other means of support, the support element shall be of the same material as the pipe, (e.g., copper to copper, ferrous to ferrous, etc.) or shall be electrically isolated one from the other so as to prevent pipe damage by electrolysis. Pay particular attention and do not allow copper pipe to rest on ferrous structural members, equipment, etc. without electrolytic isolation. This includes temporary support required during Construction.

G. In general, piping shall be installed concealed except in mechanical rooms, etc. unless otherwise indicated, and shall be installed underground or beneath concrete slabs only where indicated. All lines at ceilings shall be held as high as possible and shall run so as to avoid conflicts with other trades, and to facilitate the Owner's use and maintenance. Location of pipe in interior partitions shall be carefully coordinated with whoever will construct the partitions after the piping is in place. Where exposed risers occur, they shall be kept as close to walls as possible.

H. Pipe shall be cut accurately to measurements established at the building by the Contractor and worked into place without springing or forcing. All pipes shall be reamed to full pipe diameter before joining and before assembling. All lengths of pipe shall be set vertically and tapped with a hammer to remove scale and dust and inspected to ensure that no foreign matter is lodged therein.

I. Piping carrying water or other fluids subject to freezing shall not be installed in locations subject to freezing. If in doubt, consult Engineer.

J. Piping materials in each system shall, to the extent practicable, be of the same material. Frequent changes of material (for example, from copper to steel) shall be avoided and in no case shall be accomplished without use of insulating unions and permission of the Engineers.

K. Dielectric couplings or through ways shall be provided at all connections of dissimilar materials.

L. Nipples shall be of the same material, composition, and weight classification as pipe with which installed.

M. Apply approved pipe dope for service intended to all male threaded joints. The dope shall be listed for intended use.

N. Installation of pipe shall be in such a manner as to provide complete drainage of the system, whether detailed or not on plans. Drain valves shall be provided at all drainage points on pipes. Drain valves shall be ½" size ball valves with 3/4" hose thread end and vacuum breaker. Label each drain valve.

O. When running any type of pipe below a footing, parallel to the footing, the area underneath the zone of influence shall be backfilled with 4” of crushed stone, sand bedding or concrete under the pipe. Each pipe section shall be anchored into unexcavated earth on both ends with deadman anchor system. The remainder of the trench in the zone of influence shall be backfilled with cementitious flowable fill. The zone of influence is the area within a 45 degree angle projecting down from the top edge of the footing on all sides of the footing.

3.2 PIPE TESTING:

A. Piping shall be tested before being insulated or concealed in any manner. Where leaks or

defects develop, required corrections shall be made and tests repeated until systems are proven satisfactory.

B. The Contractor shall perform all additional tests that may be required by the Department of Health or other governing agency.

C. Any leaks or imperfections found shall be corrected and a new test run until satisfactory results are obtained. The cost of repair or restoration of surfaces damaged by leaks in any system shall be borne by the Contractor.

END OF SECTION 22 15 16

SECTION 22 20 00 – TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. Work Included: This section describes the requirements for excavating and backfilling pipe trenches. Obtain proper elevations from the Architect prior to the installation of underground piping, piping below slabs, and piping under foundations.

B. All excavation shall be unclassified.

1.2 QUALITY ASSURANCE:

A. Safety Codes and Standards: Perform trenching work, including shoring in compliance with the applicable requirements for governing authorities having jurisdiction.

B. Existing Utilities and Trees: Offset piping to avoid existing utilities and trees. Existing utility lines shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the responsible Contractor, or at his expense. Where roots of live trees are uncovered in excavation, they shall be carefully protected during construction.

PART 2 - PRODUCTS

2.1 MATERIALS FOR BEDDING AND BACKFILL:

A. Type 1: Clean grandular material - crushed limestone, 100% retained on 1/2" screen and 100% passing 3/4% screen. Use for subsoil foundation drainage line backfill.

B. Type 2: Crusher-run grandular material - 2" mains crusher-run crushed limestone with copious quantity of limestone dust; use for all fill and backfill except where clean granular material, earth material or sand is indicated or specified.

C. Type 3: Earth material - clay soil free of vegetable matter and foreign matter, from source approved by Architect/Engineer. Site materials free of organic and foreign materials will be acceptable. Use of fill and backfill in exterior planted areas from initial backfill to below 6" below grade.

D. Type 4: Topsoil - clean black topsoil from source approved by Architect/Engineer; use for 6" depth in planted area.

E. Type 5: Sand - clean river sand; use for 4" around all underground piping or copper and for pipe having a protective coating or jacket.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL - GENERAL:

A. All excavation and backfill required for the installation of work shall be the complete responsibility of the contractor whose work requires excavation and backfill.

B. Plumbing sub-contractors shall be responsible for the proper layout and the establishment of all lines and levels required for the execution of his work.

C. When services are to be run side-by-side, a common trench may be used providing the required vertical and horizontal separation between the various services are maintained and methods of bedding and backfill meet the approval of the Architect/Engineer. Contractors involved shall make their own agreement as to the sharing of cost for the common trenching and backfill work.

D. Excavation and trenching shall be in accordance with the North Carolina Department of Labor "Excavation & Trenching" 1926.651 and 1926.652 - latest edition.

3.2 TRENCHING:

A. Unless otherwise noted on plans, all trenching for underground work shall be open cut from the surface. The sides of the trench shall be shored if vertical, or otherwise if soil conditions required. The width of the trench shall be limited to that necessary for proper installation of the work. The distance between the trench wall and the sides of pipe below a level 1' above the top of the pipe or duct shall not exceed 12".

B. The width of trench 1' above top of pipe shall be only as wide as necessary for shoring, bracing and proper performance of the work.

C. The depth of trench shall not exceed that required to achieve depth of cover indicated, with overdig permitted only for bedding material.

D. If the width of trench exceeds that required, the space shall be filled with thoroughly compacted granular material or concrete.

3.3 SHORING AND PROTECTION:

A. Plumbing sub-contractors responsible for excavation work shall be required to provide all necessary barricades, fencing, sheet piling, warning signs, pumping, etc., for the protection of workers, general public and properties. Excavation work shall comply with ASA Standard A10.2 "Safety Code for Building Construction" and ACC Standard "Manual of Accident Prevention in Construction."

3.4 EXCESS EARTH FROM EXCAVATION:

A. All surplus earth shall be removed by the contractor from the building and disposed of at his own expense, where directed by the Architect.

B. Debris, trash or rock not usable for fill shall be removed from the site by the respective contractor.

C. Plumbing sub-contractors shall be responsible for immediate clean-up of streets, roadway and private property affected as a result of their work.

3.5 BACKFILL:

A. Backfill shall not begin until after contractor's work has been properly installed and inspected by the authority having jurisdiction and approved by the Architect/Engineer.

3.6 PLACEMENT:

A. In general, all initial backfill (to a point 6" above top of pipe) shall be of the same material as the bedding.

B. Upper fill (above initial fill) shall be as follows:
1. Within building - Type 3 material.
2. Exterior of building under paved areas - Type 2 material.
3. Exterior of building - Type 3 material. When beyond area of GC work, top with Type 4 material.

C. Bedding and backfill requirements for specialty piping and ducts shall be as specified under separate heading in Division 22 of specifications.

D. Before starting any backfill work, each contractor shall obtain Architect/Engineer approval of granular materials to be used, method of placing same and type of compacting equipment to be used. Do not place any backfill material until bottoms of excavations have been thoroughly cleaned of all water, debris and loose or soft soils.

E. Placing of granular material shall be placed in lifts of 12" maximum. Compact each lift to 95% of maximum dry density as determined by the AASHA T-180 method of compaction.

F. Place earth material in 6" maximum thickness layers and compact to dry density of at least 90% of maximum dry density as measured by AASHO T-180.

3.7 ROCK EXCAVATION:

A. The extent of excavation of rock is indicted by the test hole data indicated in these specifications. Plumbing contractors shall comply with the general conditions and shall determine a unit price for excavation of rock (if required).

3.8 RESTORATION OF EXISTING CONDITIONS:

A. When the excavation is within the area of finished site work by the General Contractor, backfill to the height of rough grade. Final surfacing shall be by the General Contractor.

B. When excavation is beyond the area of general construction work, final surface of the excavation and adjacent disturbed areas shall be restored to match the original condition by sodding, seeding asphalt paving, concrete, etc., as required. Work shall conform to applicable sections of the specifications.

C. When the excavation is on public property, restoration of surface conditions shall meet the requirements of public authorities having jurisdiction.

END OF SECTION 22 20 00

SECTION 22 40 00 - PLUMBING FIXTURES AND TRIM

PART 1 - 1

1.1 SCOPE OF WORK:

A. This work shall consist of furnishing all labor, material, equipment, and services necessary for the installation of all equipment specified hereinafter.

1.2 SHOP DRAWINGS:

A. Shop drawings shall be submitted on all equipment including the following:
   1. Cleanouts
   2. Trim
   3. Floor Drains
   4. Wall Hydrants
   5. Other items where shown on the drawings or as specified.

B. All fixtures equipment and trim shall be made by company with not less than 5 years successful service in this country and in similar installments.

1.3 FIXTURES:

A. All vitreous china fixtures shall be 2 fired, conforming in all respects to the standards adopted by the Vitreous China Fixtures Manufacturers Advisory Committee.

B. Unless otherwise specified all vitreous china fixtures shall be white.

1.4 HANGING:

A. Fixtures designed for wall mounting shall be provided with supports complete with all couplings, gaskets, anchors, etc. for compatible installation with fixtures provided.

B. Wax gaskets shall not be used on fixtures receiving hot water.

1.5 PIPING AND TRIM:

A. All exposed piping and trim, traps, valves, tail-pieces, faucets and fittings shall be chrome finished and shall be made of copper or copper alloy. P-traps shall be made of chrome-plated cast brass.

PART 2 - PRODUCTS

2.1 FIXTURES SCHEDULE:

A. The following list and description of fixtures are from various manufacturers. Similar fixtures as manufactured by other manufacturers will be acceptable for approval.

2.2 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering plumbing fixtures and trim which may be incorporated in the work include, but are not limited to, the following:

B. P7A Wall Hydrant: Nonfreeze
   Type: 3/4" inlet, 3/4" outlet, integral vacuum breaker, bronze casing and stainless steel

face, operating key and lockable cover
Mfg: Woodford model B65

C. P-7B Roof Hydrant: Nonfreeze
Type: 3/4” inlet, 3/4" outlet nonremovable vacuum breaker, loose handle, floor mounted, brass construction, chrome plated
Mfg: Woodford model RHY2-MS

D. FD-1 Floor Drain:
Type: 6" square type "S" strainer, polished nickel bronze strainer, cast iron body, diameter of outlet as shown on drawings
Mfg: Zurn No. ZN415S

E. FD-2 Floor Drain:
Type: 9" diameter, 2" deep receptor, cast iron body, furnished with deep seal trap, secondary strainer, diameter of outlet as shown on drawings
Mfg: Zurn No. ZN-554

F. FS-1 Floor Sink:
Type: 12"x12" square top, 8" deep receptor, stainless steel interior and top, stainless steel body, furnished with deep seal trap, secondary dome strainer, diameter of outlet as shown on drawings
Mfg: Zurn No. Z-1751

2.3 CLEANOUTS:

A. Cleanouts shall have cast iron body and screw type cleanout plug with lead seal. Cleanouts shall be manufactured by Watts, J.R. Smith or Zurn, and shall be as follows:

B. Outdoor Floor Finish: Watts model CO-300-MF. Six (6) inch cast iron cleanout with adjustable housing, ferrule with plug and round nickel brass scoriated top, vandalprof cover, spigot outlet.

C. Conc. Floor Finish: Watts model CO-200. Four (4) inch cast iron cleanout with adjustable housing, ferrule with plug and round nickel brass scoriated top, vandalproof cover, spigot outlet.

D. Cleanout in Concealed Vertical Piping: Wade Series 8400. Cast iron cleanout tee with brass plug and round stainless steel vandal proof access cover.

PART 3 - EXECUTION

3.1 INSTALLATION OF FIXTURES:

A. Unless otherwise indicated, PC shall furnish and install all plumbing fixtures shown on drawings, including all necessary components and accessories.

B. All fixtures shall be properly connected to waste, vent and supplies in an absolutely rigid and substantial manner.

C. All fixtures shall be caulked to the wall or floor with a soft elastomeric caulking compound of color to match fixtures.

D. All Wall Hydrants, and similar equipment normally held in place by the attached piping shall have the attached piping secured in the walls so that the item of equipment is held rigidly in place. At the time of final inspection or during the warranty period, if any item can be moved with normal hand pressure, that item shall be re-secured in the wall.

E. All wall-hung fixtures shall be secured, rigidly in place. At the time of final inspection or during the warranty period, if fixtures can be moved by normal hand pressure, they shall be re-secured to the wall.

F. If the preceding two paragraphs required cutting of the wall to secure the items in place, cutting and patching shall be done by the trade that originally installed the wall surface, but the work shall be paid for by the plumbing subcontractor.

3.2 INSTALLATION OF PIPING AND TRIM:

A. All piping through wall shall be grouted to wall with cement or plaster to assure rigidity and to prevent noise transmission to other rooms.
B. Provide chromium finished escutcheon plates on all piping passing through floor or wall. Escutcheon plates shall be held tight to wall with flush-head or socket type set screws.
C. Exposed bolt heads shall be covered with china or chrome plated caps.

3.3 INSTALLATION OF STOP VALVES:

A. Each water service connection to fixtures shall be individually valved.
B. Integral stops of flush valves or fixture fittings as specified will be considered as a stop valve.

3.4 INSTALLATION OF INDIVIDUAL SERVICE CONNECTIONS:

A. Individual service connection is defined as the short run of piping for water, waste and vent between the fixture and branch line or main.
B. Individual service connection to fixtures shall be of one pipe larger than the outlets provided on the fixtures and associated trim, or as indicated on drawings.

3.5 INSTALLATION OF CLEANOUTS:

A. Cleanouts in general must be screw plug which must be gas and watertight, provide quick and easy plug removal, located in such a manner to allow ample space for rodding tools.
B. Cleanout openings shall not be used for any other purpose than the proper cleaning of the system, except where approved in writing by the administrative authority.
C. Cleanout plugs shall not be covered with cement, plaster, or any other permanent finishing material. Where it is necessary to conceal a cleanout plug, a covering plate or access door shall be provided which will permit ready access to the plug.
D. Accessible cleanouts shall be installed at each change of direction of the building drain, or of horizontal waste or soil lines, which is greater than forty-five (45) degrees.
E. A cleanout shall be provided at or near the foot of each vertical waste or soil stack that serves more than one floor. Rain leaders and conductors connected to a building storm sewer shall have a cleanout installed at the base of each riser.
F. Cleanouts, when installed on underground piping shall be extended vertically to or above the finished grade level.
G. Cleanouts on concealed piping shall be extended through and terminate flush with the finished wall or floor, or pits or chases may be left in the wall or floor, provided they are of sufficient size to permit removal of the cleanout plug and proper cleaning of system.
H. Where sanitary crosses are installed in the system and are the type that would allow a cable (or cleaning equipment) to pass over the vertical waste and vent stack and into the adjoining fixture waste pipe and fixture trap, the Plumbing Contractor shall provide a wall cleanout above the sanitary cross which extends to the surface of the wall and is equipped with the proper cleanout cover.
I. Cleanouts shall be of the same nominal size as the pipes they serve up to four (4) inches and not less than four (4) inches for larger piping.
J. Exterior cleanouts shall have an 18” x 18” x 4” thick concrete collar with chamfered edges.

END OF SECTION 22 40 00

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SECTION 22 90 00 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RECORD DRAWINGS - BUILDING:

A. Submit as-built drawings as required by General Conditions and obtain written receipt from engineer.

1.2 DEMONSTRATION OF COMPLETE PLUMBING SYSTEMS:

A. The following systems shall be put into operation by the plumbing sub-contractor furnishing the equipment, and operated for the length of time required to prove proper operation and control.
   1. Cold water
   2. Hot water systems/recirculation systems
   3. Waste
   4. Storm

B. Thoroughly demonstrate and instruct (3) three designated representatives of the Owner in the care and operation of all the plumbing systems and equipment furnished and installed in the contract.

C. Manufacturers of certain equipment specified herein shall provide technically qualified factory representatives to train the Owner's representative in the care and maintenance and operation of their product. This instruction and service of the factory representative shall be furnished as specified elsewhere in the specifications. This time is in addition to what is specified above and will not be counted as part of this contractor's instructions.

D. The time and place of all training shall be coordinated and scheduled by the contractor at the convenience of the Owner and as approved by the architect.

E. Submit letters signed by the owner's representatives attesting to the satisfactory completion of all instructions.

1.3 OWNER'S RIGHT TO TEST SYSTEM:

A. Should, in the opinion of the architect, and during the guarantee period, reasonable doubt exist as to the proper functioning of any equipment installed under this contract, the right is reserved for the owner and architect to perform any test deemed practical to determine whether such equipment is functioning properly and performing at required capacity. If such tests show proper functioning, the cost of the test will be paid by the owner. If the tests indicate a deficiency in equipment capacity or performance, the contractor shall pay the cost of the test and also make good any deficiencies shown by the test to the full satisfaction of the owner and the architect.

1.4 OPERATING AND MAINTENANCE MANUALS:

A. The contractor shall carefully prepare an operating instructions and maintenance manual for each plumbing system, including all equipment furnished. The manual shall be submitted to the engineer for approval before final inspection and acceptance is made.

B. The form in which the operating maintenance manual is to be presented shall be subject to approval by the architect. Three copies of the manual shall be provided.

C. The following items together with any other necessary and pertinent data shall be included in the manual. This list is not necessarily complete and is only to be used as a guide.
1. Suggested settings of all control and switches for normal operation with description of control and its location.
2. A check list for periodic maintenance of all equipment.
3. As-built wiring, interlock, and control diagrams for the equipment, with color coding shown on wiring and interlock diagrams.
4. Part numbers of all replaceable items.
5. Manufacturer's cuts and rating tables for all equipment.
6. Oiling, lubricating and greasing data.
7. Complete electrical load data from operation tests.
8. Test data on all equipment
9. Belt sizes, types, and lengths
10. Serial number of all principal pieces of equipment
11. Valve tag schedule
12. Manufacturers', suppliers' and contractors' names, addresses and telephone numbers.

1.5 VALVE TAG SCHEDULE:

A. Copies of the valve tag schedule and wiring diagrams shall be framed under glass and posted in the equipment room.

1.6 WARRANTIES:

A. Deliver to Owner all warranties, etc., and obtain written receipts.

1.7 OBSERVATION REPORTS:

A. During construction period the engineer will issue observation reports. These items shall be completed before engineer will approve next application for payment. Final punch list work shall be complete before acceptance.

1.8 FINAL INSPECTION AND ACCEPTANCE:

A. The architect or his authorized representative will entertain the request for final inspection and acceptance only after the following items are done.
1. Submit a list of uncompleted items, if any, and advise when the items will be done.
2. Clean, test, and adjust all systems and equipment.
3. Lubricate all motors.
4. Complete all items on architect's or engineer's pre-final punch list.

5. Final inspection and tests of the completed construction shall be performed in the presence of the architect or his representative and shall be at such times as are convenient to the architect. Final tests shall show conclusively that all equipment performs its intended and specified function and that all work complies with the provisions of these specifications. All material, equipment, and instruments required for these tests shall be furnished by the contractor at his own expense.
6. Final Clean-up. During construction the contractor shall keep the site clear of debris and upon completion of construction he shall clean up the premises to remove all evidence of his work. In addition, upon completion of construction he shall clean, wash, and/or polish all fixtures, equipment, and exposed material and leave them bright and clean.

END OF SECTION 22 90 00

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