

SECTION 22 05 00**COMMON WORK RESULTS FOR PLUMBING****PART 1 – GENERAL****1.1 REFER TO RELATED SECTIONS**

- A. Section 23 05 01 – Mechanical and Electrical Coordination
 Section 23 05 02 – Basic Mechanical Requirements
 Section 23 05 03 – Basic Mechanical Material and Methods

1.2 DESCRIPTION OF WORK

- A. Except as otherwise specified under "Related work Not Included", the work of this Contract consists of furnishing all labor, materials, equipment and appliances necessary and required to completely do all Plumbing Work as indicated on the Drawings or described or referred to in the Specifications, including, but not limited to the following:

1. Interior natural gas service, including replacement of the existing piping as indicated on drawings, and reconnecting existing building service. Provide and install valves on both sides of relocated gas meter. Gas system installation shall be in accordance with Con Edison requirements. Obtain service layout.
2. Master domestic water meter assembly with removal and reuse of existing master meter, all in accordance with water company requirements. Obtain service layout.
3. Interior alteration work, removals, replacements, relocations, etc. to the existing plumbing system in all renovated areas as indicated on the Drawings.
4. Complete interior storm water drainage systems with leaders, roof and area drains, and piping system conveying storm water drainage to system.
5. Complete interior sanitary, soil, waste and vent piping systems, including all required connections to all plumbing fixtures and equipment, house sewer, and connections to the existing interior piping or to the site sanitary sewer system.

Note: Where existing soil and waste capped or plugged outlets are found to be inaccessible or where the elevation cannot be met, the Contractor shall have an option to cut into the existing stack or to run the new piping down to the next floor and connect to an existing outlet. The Contractor shall include this optional work in the base bid scope of work.

6. Complete interior domestic cold water system including connections to the site water system piping and/or existing interior piping systems, and connection to all fixtures and equipment requiring cold water.
7. Complete interior domestic hot water distribution systems including connections to all fixtures and equipment requiring hot water, connections to existing hot water supply and hot water circulation systems, existing hot water heaters and new circulation pump(s).
8. Disconnecting all fixtures and equipment to be removed, even if the fixture or equipment is to be removed and under another Division or Section of these Specifications.
9. Natural gas piping system with all connections to equipment and outlets requiring gas.
10. Plumbing fixtures and trim for same.
11. Furnishing of access doors for installation under another Division or Section of these Specifications.
12. Excavation and backfill for all work herein specified.

13. Make all plumbing connections required for equipment furnished under other Divisions or Sections of these Specifications.
14. Hose bibbs, wall hydrants, shock absorbers, vacuum breakers and backflow preventers.
15. Sleeves, hanger and supports.
16. Insulation for piping and equipment.
17. Apply for and obtain and pay for all permits, certificates, inspections and approvals required in connection with all Plumbing Work.
18. Shop drawings, samples and instructional manuals, tests and adjustments.
19. Installation of all fixtures furnished by City of New York and/or furnished under other Divisions or Sections of the Specifications.
20. Provide roughing (water supplies, soil, waste, and vent piping) for all fixtures and equipment furnished and/or installed under other Divisions or Sections of these Specifications.
21. All interlocking control wiring and conduit.
22. Concrete pads for pumps and equipment.
23. Color coding and stenciling of all piping systems.
24. Cutting and rough patching.
25. Cap flashing and prime painting.
26. Tests for all systems provided under this Section.
27. Where due to Union regulations or trade agreements, any of the work shown on the Drawings or specified herein is not considered Plumber's Work, this Contractor shall subcontract the work in question, but this Contractor shall be held responsible for the complete installation.
28. It is not the intention of these Specifications to describe nor the Contract Drawings to show in detail, all the various pieces of apparatus and appurtenances and their connections. This Contractor shall, as part of the Contract, furnish and install all incidentals, such as pipe, fittings, valves, etc., required to complete the installation of the equipment. This Contractor shall refer to Architectural Drawings and Plumbing Drawings for exact location of fixtures including type and quantities. This Contractor shall be responsible for providing isolation valves in locations suitable to isolate equipment, risers, building sections, etc. This Contractor shall be responsible for providing and connecting all fixtures and equipment.
29. All work described in the Specifications and not shown on the Drawings, or vice versa, shall be installed in a manner similar to the work shown or described.
30. Plumbing Contractor shall provide temporary water service on the site to the locations indicated by the Construction Manager, on the site temporary fire protection water, all in accordance with requirements of the state and local codes, the Water Company and the Fire Department. Plumbing Contractor to pay all fees and obtain all permits required in connection with the water services.
31. Approvals of cross-connection control devices for main water services:
Prepare and submit to the Engineer, all drawings, applications, test reports, correspondence, etc., as required in connection with the approval and installation of the backflow preventors and/or double check valves, as indicated on the Drawings or as required by the New York State Department of Health. Contractor shop drawings shall be suitable for filing with authority approving the installation. Engineer will serve as Engineer of Record.

1.3 RELATED WORK NOT INCLUDED

- A. The following principal items of work shall be provided under other Sections; the General Contractor shall be responsible for coordinating the purchase of this work from other trades:
 1. Finish painting.

2. Furnishing of toilet room accessories.
3. Installation of access doors. This Contractor shall furnish access doors.
4. Base flashing for roof drains, and piping passing through roofs.
5. All electrical power wiring conduits, etc., for pumps, equipment, etc., shall be provided under Division 26.
6. Drainage piping from HVAC equipment to and spilling over floor drain, mop sink, sump or roof, except as noted.
7. Temporary toilets and water supply.
8. Finish patching.

1.4 VISITING THE PREMISES

- A. This Contractor, before submitting his bid on the work, shall visit the site and familiarize himself with all visible existing conditions. As a result of having visited the premises, this Contractor shall be responsible for the installation of the work as it relates to such visible existing conditions.
- B. The submission of a bid will be considered as acknowledgment on the part of the bidder of his visitation to the site.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Instructions
 1. In addition to the requirements of these Specifications, comply with the manufacturer's instructions and recommendations for all phases of the work.
- B. Standards and Codes

New York City Building Code.
 New York City Plumbing Code.
 National Fire Codes (N.F.P.A.)
 Local Gas Utility Rules and Regulations.
 Local Municipal Rules and Regulations.
 Local Fire Department requirements.
 Other State and Local Authorities having jurisdiction.
 F.M. and/or F.I.A. regulations.
- C. All work and material not specifically described, but required for a complete and proper installation of the work of this Section, shall be provided by the Contractor and shall be new, first quality of their respective kinds, and subject to approval of the Commissioner.
- D. All water supply connections to plumbing fixtures and other equipment to be installed under this Division shall be in accordance with the rules relative to submerged inlets and protective methods to be applied to prevent contamination of water as required by Local and State Regulations.
- E. Manufacturing firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.
- F. Provide product produced by the manufacturers, which are listed in Section "Approved Manufacturer's List".

- G. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.
- H. All work shall be done by a licensed Plumbing Contractor.

1.6 ALTERATION WORK

- A. All equipment, piping, plumbing fixtures, etc. to be removed shall be disposed of.
- B. All piping to be removed shall be properly plugged or capped so that upon completion of all new work, all abandoned piping shall be concealed in finished area. No abandoned piping shall remain in concealed locations (behind walls or hard ceilings). Piping is to be removed to the nearest accessible location.
- C. No dead ends shall be left on any piping upon completion of job.
- D. Existing exposed piping not to be reused, and not specifically noted or shown on Drawings to be abandoned shall be completely removed. All existing exposed, unnecessary piping related to work being removed shall be completely removed.
- E. The existing system shall be left in perfect working order upon completion of all new work.
- F. Locations and sizes of existing piping are approximate. Exact sizes and locations of all existing piping shall be verified at the site.
- G. No removed existing piping, fittings, valves, etc. shall be reused except where specifically noted.
- H. This Contractor shall not interrupt any of the services of the existing facility, nor interfere with the services in any way without the express permission of the Commissioner. Such interruptions and interferences shall be made as brief as possible and only at the time stated by the Commissioner.
- I. Under no circumstances shall this Contractor or his workmen be permitted to use any part of the facility as a shop, except parts designated by the owner for such purposes.
- J. Reroute or remove all existing piping where necessary to avoid new equipment, structural or masonry work as required by the proposed alteration.
- K. Provide branch shut-off valves as required to install new work without continuous shut-down of entire building water supply.

1.7 CONCRETE WORK

- A. All concrete equipment bases that are installed on vibration isolators, all anchor and thrust blocks and all piping supports in trenches shall be provided under the work of this Section. All formed and poured-in-place concrete work including equipment housekeeping pads, sumps, etc., will be provided under another Division or Sections of these Specifications. The General Contractor shall be responsible for coordinating the purchase of this work from other trades.
- B. This Contractor shall furnish all required templates for anchor bolts, and dimension drawings for housekeeping pads and sumps. All concrete provided under the work of this Section shall be in accordance with that specified under other Division or Sections of these Specifications. The

General Contractor shall be responsible for coordinating the purchase of this work from other trades.

1.8 REPLACEMENT OF SURFACING

- A. Where required by operations under this Section, the Contractor shall remove and replace all street pavements, curbs, sidewalks, walkways, grassed areas and landscaped areas which are to remain, in a manner equal to their original condition when new.
- B. In those cases where final surfaces cannot be placed immediately, a temporary surfacing of two inches of bituminous concrete shall be placed and maintained. This shall be removed before placement of final surfacing.
- C. Landscaping and grassed areas shall be preserved and/or replaced to the satisfaction of the Commissioner.
- D. See additional requirements elsewhere in this specification.

1.9 COOPERATION WITH OTHERS

- A. The Plumbing Contractor shall cooperate with other trades whose work is to be correlated with his work, in order to avoid field interference, improper elevations, or inaccessible work. Any extra expense occasioned by lack of cooperation by this Contractor shall be borne by him.

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION

This Page Intentionally Left Blank

SECTION 22 05 23**PLUMBING VALVES****PART 1 - GENERAL****1.1 SUBMITTALS**

- A. Manufacturer's Data: Submit manufacturer's product data including:
 - 1. Dimensions
 - 2. Sizes
 - 3. End Connections
 - 4. Weights
 - 5. Installation instructions
 - 6. Instructions on repacking and repairing valves.
 - 7. Range of flow for balancing valves and plug valves.
 - 8. Pressure reducing valves.
 - 9. Backflow preventors.
 - 10. Backwater valves.
 - 11. All other applicable valves.
- B. Valve Tag List: Refer to Section 22 05 53 of the Specifications.

PART 2 – PRODUCTS**2.1 GENERAL**

- A. Where type or body material is not indicated, provide valve with pressure class selected from MSS or ANSI standards, based on the maximum pressure and temperature in the piping system.
- B. Except for balancing or otherwise indicated, provide valve of same size as connecting pipe size.
- C. Unless specifically required by note or symbol, all water valves shall be ball or butterfly valves. If ball, butterfly, globe, plug, or balancing valves are called out by note or symbol, only that type of valve is acceptable.
- D. Ball valves or butterfly valves may be used in lieu of gate valves in non-balancing applications when pressure and temperature ratings are adequate.
- E. Where pipe sizes overlap, contractor has the option of threaded or flanged valves.
- F. Where grooved pipe mechanical coupling systems are accepted, provide flange adapters to mate with valves as specified below. Valves manufactured by the mechanical coupling system manufacturer shall not be used unless they meet all of the specified requirements for a given valve.
- G. All valves shall be domestically manufactured unless approved for use by Engineer.
- H. Valves used for domestic water service shall be bronze or stainless steel. Iron and brass body valves are not acceptable.

- I. All valves shall be of a design which the manufacturer lists for the service and shall be of materials allowed by the latest edition of the ASME Code for pressure piping for the pressure and temperature contemplated, unless a higher grade or quality is herein specified.

2.2 GLOBE AND ANGLE VALVES

A. Manufacturers:

1. Design Basis: Milwaukee
2. Other Acceptable Manufacturers:
 - a. Crane
 - b. Nibco
 - c. Powell
 - d. Victaulic (for Grooved Pipe Systems)
 - e. Gruvlok
 - f. Stockham
 - g. Jenkins
 - h. Walworth

- B. Size 2" and Smaller: Bronze, 125 psi SWP, 200 psi WOG, rising stem, screwed bonnet. Bronze disk, MSS SP-80, Type 1.

1. Model:
 - a. Globe, Solder Ends: 1502
 - b. Globe, Threaded Ends: 502
 - c. Angle: 504

- C. Size 2½" and Larger: 125 psi SWP, 200 psi WOG, OS&Y bolted bonnet, gland packed, bronze disk, removable bronze seat ring, MSS SP-85.

1. Model:
 - a. Globe: F-2981

- D. Except where otherwise noted, all valves for use with copper tubing shall be as follows:

1. Globe valve: 2" & smaller: Jenkins No. 1310, 125 lb. WSP, Bronze. 3" and smaller: 300 lb. Nonshock CW bronze with solder joint adapter.
2. Angle valve: 2" and smaller: Jenkins No. 1311, 125 lb. WSP, bronze. 3" and smaller: Walworth No. 1202, 300 lb. Nonshock CW bronze with solder joint adapter.

2.3 SILENT/WAFER CHECK VALVES

A. Manufacturers:

1. Design Basis: Metra Flex
2. Other Acceptable Manufacturers:
 - a. Cla-Val
 - b. GA Industries
 - c. Nibco
 - d. Tyco
 - e. Victaulic (for Grooved Pipe Systems)
 - f. Gruvlok
 - g. Stockham

- B. Size 2" and Smaller: Bronze body, 200 psi @ 250 °F, threaded ends, resilient seats, center guided disk.

1. Model: 5700

2.4 GATE VALVES

- A. Manufacturers:

1. Design Basis: Milwaukee
2. Other Acceptable Manufacturers:
 - a. Crane
 - b. Nibco
 - c. Stockham
 - d. Victaulic (for Grooved Pipe Systems)
 - e. Gruvlok
 - f. Jenkins
 - g. Walworth

- B. Size 2" and Smaller: Bronze 125 psi WSP, 200 psi WOG, rising stem, threaded bonnet, gland packed MSS SP-80 Type 2.

1. Model: 148

- C. Size 2½" and Larger: Cast iron, 125 psi SWP, 200 psi WOG, gland packed, bolted bonnet, OS&Y, solid wedge disk, either all bronze or with bronze face ring, bronze seat rings, brass back seat bushing, brass stem, bronze yoke bushing.

1. Model: F2885

- D. Except where otherwise noted, all valves 2" and smaller for use with copper tubing shall be Crane No. 634E, 300 lb. WSP, rising stem.

2.5 BALL VALVES

- A. Manufacturers:

1. Design Basis: Nibco
2. Other Acceptable Manufacturers:
 - a. Apollo
 - b. Dyna Quip
 - c. Hammond
 - d. Milwaukee
 - e. Victaulic (for Grooved Pipe Systems)
 - f. Watts
 - g. Bray
 - h. Gruvlok
 - i. Stockham

- B. Cast bronze, 150, SWP, 600 WOG (min), chrome plated solid, tunneled bronze ball (stainless for steam service), two piece design, blow-out proof stem, adjustable packing gland nut (allowing handle to be removed without leaking) TFE seats, MSS-SP-110.

1. Model: T-585-70 - full port.

C. Options: Provide the following where required:

1. Extended stems for insulated valves.
2. Memory stop device for balancing applications.
3. Tee handle for tighter areas.
4. Hose end and cap for drain.
5. Mounting pads for actuator.
6. Provide "stop and drain" for compressed air.
7. Ball Valves up to 2" may be used for all water services as an alternate to gate valves, globe valves and balancing cocks.
8. Ball valves shall be bronze body, bronze ball and stem, Teflon seats and seals threaded ends, 400 psig cold W.O.G. Worchester No. 411T-SE or equal.

2.6 BACKFLOW PREVENTER

A. Backflow Preventer, (Reduced Pressure Zone Type) (Domestic Water Service)

1. Manufacturer:
 - a. Design Basis: Watts No. 909, (1/2" through 10")
 - b. Construction: Bronze body, stainless steel trim, complete with test cocks, resilient seat, shut-off valves, and air gap fitting.
 - c. Other Acceptable Manufacturers:
 - 1) Beeco
 - 2) Febco
 - 3) Wilkins
2. Complies with ASSE STD 1013.

B. Backflow Preventers – Double check detector assembly for fire protection service

1. Manufacturer:
 - a. Design Basis: Watts No 709DCDA
 - b. Construction: Epoxy coated cast iron body, replaceable bronze seats.
 - c. Other Acceptable Manufacturers:
 - 1) Beeco
 - 2) Febco
 - 3) Wilkins
2. Complies with ASSE STD 1048.
3. Where used in potable water system, preventer shall be NSF-61 listed and FDA approved.

C. Backflow Preventer (Atmospheric Vacuum Breaker)

1. Manufacturer:
 - a. Design Basis: Watts No. 008 Series (3/8" through 1")
 - b. Construction: Bronze body, ball valve shut offs.
 - c. Other Acceptable Manufacturers:
 - 1) Beeco
 - 2) Febco
 - 3) Wilkins
2. Complies with ASSE STD 1020.
3. Provide vacuum breakers on water supply piping to each fixture and equipment with submerged inlets, and on faucets and outlets, within the building, to which hose can be, or is attached, forming a submerged inlet. Set vacuum breakers in exposed readily accessible locations and at least 6'-6" above finished floor. Vacuum breakers shall be chrome plated brass, T&S Brass No. B-929-A watts 008 or approved equal. Vacuum breakers shall comply with ASSE STD 2010.

- D. Provide reduced pressure type master backflow preventer on main water supply and to each fixture and equipment requiring same as indicated on the Drawings and governed by the applicable codes. This shall include, but not be limited to, mechanical equipment, kitchen equipment, and equipment specified in other divisions.
- E. The reduced pressure backflow preventer shall consist of two separately spring loaded "Y" type check valves and one differential relief valve having two diaphragms separated by a spacer. This device shall automatically reduce the pressure in the "zone" between the check valves. Should the pressure differential, normally 4.5 psi, drop to 3.0 psi, the relief valve shall open, dumping the liquid to atmosphere and maintain the proper differential. A small hose in the spacer will bleed to atmosphere if either diaphragm is damaged, giving visual evidence of diaphragm failure. Provide drain opening and pipe to nearest floor drain or service sink. Both serviced without removing the device from the line. It shall be rated to 150 psi working pressure and 212°F water temperature. Backflow preventers 2" and smaller shall have bronze bodies and bronze trim. 2-1/2" and larger shall have cast iron bodies with epoxy coating and bronze trim. Backflow preventers shall be similar to Watts 900 or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the following requirements:
 1. Install valves except butterfly with stems pointing up, and as close to vertical as possible. Butterfly valves to be offset at least 10° from vertical.
 2. Install valves at each piece of equipment, fixture or appliance so that the supply and return services can be shut off to remove the item without draining the remainder of the piping system.
 3. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Install isolation valves at each concession, bathroom group and riser. Locate valves so as to be accessible.
 4. Combination balancing and shut-off valves may be used instead of a separate balancing valve and shut-off valve if the valve has a memory stop and the manufacturer lists its use as a leak-proof service valve.
 5. Provide drain valves at main shut-off valves, low points of piping and apparatus.
 6. Provide separate support where necessary.
 7. Do not allow meter connections of balancing valves to point downward.
 8. Install valves so bypass valves are accessible.
 9. Furnish all valves as indicated on the plans, or as may be required for the proper control of the pipe lines installed under this Specification, so that any fixture, line or piece of apparatus may be cut out for repair without interference or interruption of the service to the rest of the Building. All water valves shall have a minimum working pressure of 125 psi, water rated unless otherwise noted on the Drawings or specified herein. All valves shall be of one manufacture.
 10. All gate valves within the building shall be wedge gate valves with painted iron wheel handles, shall have gland followers in stuffing boxes, and shall be constructed that they may be repacked while open and under pressure. All valves shall have the name of the manufacturer and working pressure cast or stamped thereon.
 11. All gate valves 3" and smaller shall be all bronze with brazed or screwed joint ends as required by the piping system in which they are installed.

12. All gate valves 4" and larger shall have iron bodies with bronze mounting and shall be provided with screwed or flanged ends as required by the piping system in which they are installed. All gate valves controlling equipment shall be of the OS&Y rising stem type except where space conditions do not permit the installation of this type of valve. In such cases non-rising stem valves shall be provided.
 13. Globe valves shall be of all bronze with composition disc, threaded or brazed joint ends as required by piping system in which they are installed.
 14. Check valves up to and including 3" shall be all bronze swing check type with threaded or brazed joint ends. Check valves 4" and larger shall be iron body bronze mounting and shall be provided with screwed or flanged joint ends as required by piping system in which they are installed.
 15. Drain valves shall be 3/4" heavy cast brass with composition washers with male thread for hose connections.
 16. Provide at the high point of hot water piping system a 1/2" automatic IBBM air relief valve, 125 PSI, WOG Class. Pipe drain to spill over adjacent floor drain or service sink.
 17. All valves on the exterior domestic and fire protection water piping shall comply with Local Water Company.
 18. All valves shall have the trademark of the manufacturer and the guaranteed working pressure cast or stamped on the body of the valve. All gates or globes, etc., shall be of one manufacturer and working pressure cast or stamped thereon.
 19. The entire plumbing systems shall be supplied with valves so located, arranged and operated as to give a complete regulating control to all fixtures and apparatus
 20. Install check and globe valves on downstream side of the shutoff valve on hot water circulating riser and branch lines.
 21. Valves, where exposed and used in connection with finished piping, shall be same finish as the pipe.
 22. Provide shut-off valves and check valves on each pump discharge line.
 23. All valves used on branch piping to bathroom and kitchens shall be all bronze type globe valves with discs suitable for service to which they are connected.
 24. Install valves where required for proper operation of piping and equipment including valves in branch lines necessary to isolate sections of piping. Locate valves so as to be accessible.
 25. Install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.
 26. Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator. Install bronze valves where corrosion is indicated or can be expected to occur.
 27. Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.
 28. Except as otherwise indicated, install gate, ball, globe, and butterfly valves to comply with ANSI B31.1. Where throttling is indicated or recognized as principal reason for valve, install globe or butterfly valves.
 29. Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.
 30. Select and install valves with renewable seats, except where otherwise indicated.
- B. All valves of a given type shall be of one manufacturer.
- C. Provide extended stems on insulated system to prevent interference of operator with insulation.
- D. Provide chain wheel operators for valves more than 7' – 0" AFF in mechanical rooms and wherever shown on drawings.

3.2 CHECK VALVE INSTALLATION

A. Swing and Check Valves:

1. Install only in horizontal lines unless absolutely impractical. If installed vertically, flow shall be upwards.
2. Do not install in pump discharge piping.

B. Silent Check Valves:

1. Install in all pump discharge lines.
2. Silent check valves may be installed in vertical pipes with flow down upon Engineer's review for each instance.

C. Installation of Check Valves:

1. Wafer Check Valves: Install between 2 flanges in horizontal or vertical position.
2. Horizontal Lift Check Valve: Install in horizontal piping line with stem vertically upward.
3. Vertical Lift Check Valve: Install in vertical piping line with upward flow with stem vertically upward.
4. Spring Loaded Horizontal Lift Check Valve: Install in horizontal piping line with stem vertically upward.

3.3 BACKFLOW PREVENTOR

A. Provide backflow preventors as follows:

1. Vacuum breaker at all hose bibs.
2. Reduced pressure on water entry.
3. Reduced pressure zone at new make-up connection to existing boiler.

END OF SECTION

This Page Intentionally Left Blank

SECTION 22 05 29**PLUMBING PIPE SUPPORTS AND ANCHORS****PART 1 - GENERAL****1.1 STANDARDS**

- A. Comply with MSS Standard Practice SP-58, SP-69 and SP-89, published by Manufacturer's Standardization Society of the Valve and Fitting Industry for type and size.

1.2 SUBMITTALS

- A. Submit manufacturer's product data on the following:
 - 1. Hangers other than clevis type.
 - 2. Anchors.
- B. Submit structural calculations for trapeze type supports.

PART 2 - PRODUCTS**2.1 PIPE HANGERS**

- A. General:
 - 1. Use adjustable pipe hangers on suspended pipe. Trapeze hangers may be used at the Contractor's option. Contractor shall be responsible for sizing supports.
 - 2. Chain, wire or perforated strap hangers will not be permitted.
 - 3. Isolate hangers in contact with dissimilar materials with dielectric hanger liners. Tape is not acceptable.
 - 4. Provide supports between piping and building structure where necessary to prevent swaying.
- B. Hanger Rods:
 - 1. Exposed in public areas: Zinc electroplated steel.
 - 2. Concealed or in service areas: Black threaded steel.
 - 3. Outside, exposed to weather: Hot dipped galvanized.
- C. Spot Concrete Inserts: Steel case and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods and lugs for attaching to forms.
 - 1. Size inserts to match size of threaded hanger rods.
 - 2. Inserts to be UL and FM listed.
 - 3. Minimum 1000 lb. Capacity with ½" rod.
- D. Channel Type Inserts:
 - 1. Standard channel support with anchor tabs on 4" centers, and nail holes for attaching to forms.
 - 2. Styrofoam inserts to prevent wet concrete seepage.
 - 3. Minimum 2000 pounds/foot capacity.

E. Expansion Anchors:

1. For use only in renovations or where modifications to piping layouts require installation away from pre-installed insert locations.
2. Inserts shall be of the drill, insert, expand type. Power driven fasteners are not acceptable for piping.
3. Contractor shall select the appropriate type based on the following:

<u>Rod Size</u>	<u>Maximum Working Load</u>
3/8	600 pounds
1/2	1100 pounds
5/8	1800 pounds

F. Steel Structure Attachments:

1. Contractor may select welded or mechanically attached. All mechanically attached supports shall have jam nuts or other means to prevent loosening. Maximum loading requirements are as follows:

<u>Rod Size</u>	<u>Maximum Working Load</u>
3/8	600 pounds
1/2	1100 pounds
5/8	1800 pounds

G. Single Hangers:

1. Piping 2" and smaller: MSS type 1, Clevis hanger or type 7 adjustable swivel ring hanger. Minimum 180 pounds design load.
2. Piping 2" and smaller (steel): Clevis hanger, Grinnell Fig. No. 260, F & M Fig. No. 239, Paterson Fig. No. 100.
3. Piping 2" and smaller (copper): Adjustable wrought iron, Grinnell Fig. No. CT-65, F & M Fig. No. 364, Paterson Fig. No. 100 CT
4. Piping 2½" and larger: MSS type 1 Clevis hanger.
5. Piping 2½" to 4" (steel): Adjustable swivel pipe roll, Grinnell Fig. No. 174, F & M Fig. No. 2729, Paterson Fig. No., 16.
6. Piping 2½" to 4" (copper): Adjustable wrought ring, Grinnell Fig. No. CT-269.
7. Piping 5" and above: Two rod roller hanger, Grinnell Fig. No. 171, F & M Fig. No. 170, Paterson Fig. No., 142.
8. Bare copper pipe: Above hangers, plastic or Neoprene coating, sized for copper pipe O.D. and copper coated for identification.
9. Insulated pipe: Hangers to be sized for O.D. of insulation. Hangers shall not penetrate any insulation.
10. Cast iron pipe above hangers sized for O.D. of cast iron pipe.
11. Hanger wire, cable or perforated metal strapping are not acceptable.

H. Trapeze hangers and wall supports:

1. Channel strut or structural steel shapes. Contractor shall follow channel strut manufacturers guidelines for loading or provide structural steel supports designed by a professional Engineer, licensed in the state where the project is located.
2. All piping shall be attached to the support by means of a channel strut clamp, U-bolt, or pipe rollers which will maintain lateral position of the pipe but allow longitudinal movement. Provide dielectric isolation between all dissimilar metals.
3. All insulation shall be continuous at supports. Do not notch or penetrate insulation.

4. Kindorf or similar materials used for support of small piping shall not be used for piping 3" or larger.
 5. ½" through 3": Unistrut type channel and steel clamp.
 - a. Use Hydrosorb cushions on copper pipe.
 6. 4" and Over: Welded steel bracket and wrought steel clamp.
- I. Vertical Supports: Provide steel riser clamp at each floor penetration or every 14 foot supported from wall bracket. Do not anchor riser clamps. In exposed locations, coordinate clamp locations with Architect.
- J. Hangers:
1. General: Adjustable wrought steel clevis with locking nut attachment.
 2. Multiple or Trapeze: Steel channels with welded spacers and hanger rods.
 3. Hanger Sizes and Spacing:
 - a. For drain piping, conform to the code requirements for spacing, and the following table for hanger rod sizes.
 - b. For plumbing piping, conform to the following table:

PIPE TYPE	PIPE SIZE	MAXIMUM SPACING	MINIMUM HANGER ROD SIZE
Stainless Steel Pipe	½"	6'-0"	3/8"
	¾" thru 1¼"	8'-0"	3/8"
	1½" and 2"	10'-0"	3/8"
	2½" thru 3½"	12'-0"	½"
Copper Pipe	½" thru 1"	8'-0"	3/8"
	1¼" thru 2"	10'-0"	3/8"
	2½" thru 3"	10'-0"	½"
Cast Iron Soil	2"	5' And Each Joint	3/8"
	3" to 5"	5' And Each Joint	½"
	6"	5' And Each Joint	5/8"

- K. Insulated Pipe Supports:
1. Size pipe supports for outside diameter of pipe insulation.
 2. It is not acceptable to cut or notch insulation at support locations.
- L. Pipes over five inches and over 120°: Provide cast iron roller supports.
- M. Beam clamps - Hangers supported from floor steel shall be approved I beam clamps. I beam clamps for hangers supporting piping 2 inches and smaller shall be C & P Fig. No. 148 adjustable beam clamps. For piping 2-1/2 inches and larger, I beam clamps shall be wrought steel. C & P Fig. No. 268 or equal.
- N. Hangers for copper piping shall be copper plated.

2.2 INSULATION INSERTS

- A. Pipe shall be protected at the point of support by an insert of high density, 100 psi, waterproofed calcium silicate, or Hi-Low Temp insert, encased in a sheet metal shield. Insert to be same thickness as adjoining pipe insulation. Insulation insert to extend one inch beyond sheet metal shield on all "cold" lines. If pipe hanger spacing exceeds ten feet and for all pipe roller applications, utilize double layer shield on bearing surface.
- B. Provide 180° insulation inserts when utilizing clevis hangers. Provide 360° insulation inserts at all trapeze and wall supports.

2.3 ROOF MOUNTED PIPING

- A. Manufacturers:
 - 1. Miro Industries, Inc.
 - 2. Portable Pipe Hangers, Inc.
 - 3. Approved Equivalent.
- B. Description: Piping on roof shall be supported by an engineered prefabricated portable pipe system specifically designed to be installed on the roof without roof penetrations, flashing or damage to the roofing material. The system shall consist of recycled rubber or plastic bases, hot dipped galvanized or stainless steel frame with threaded rods and suitable pipe hangers and supports. The system shall be custom designed to fit the piping and conduits to be installed and the actual conditions of service.
- C. Provide seismic restraints as required for seismic zone. See 22 05 49.

PART 3 – EXECUTION

3.1 INSTALLATION OF PIPE SUPPORTS

- A. Adequately support piping from the building structure with adjustable hangers to maintain uniform grading where required and to prevent sagging and pocketing.
 - 1. Provide supports between piping and building structure where necessary to prevent swaying.
 - 2. Do not support pipe from other pipe or equipment.
 - 3. Provide thrust restraints at all changes in direction on 8" and larger cast iron piping with no hub or hub and spigot fittings.
- B. Install hangers to provide minimum ½" clear space between finished covering and adjacent work.
 - 1. Place a hanger within one foot of each horizontal elbow.
 - 2. Space hangers generally as called for in Table in Part 2, Products.
- C. Use hangers, which are vertically adjustable 1-½" minimum after piping is erected.
- D. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.
 - 1. Set inserts in position in advance of concrete work.
 - 2. Where concrete slabs form finished ceiling, finish inserts flush with slab surface.

- E. Provisions for Movement: Install hangers and supports:
 - 1. To allow controlled movement of piping systems.
 - 2. To permit proper movement between pipe anchors.
 - 3. To facilitate the action of expansion joints, expansion loops, bends and offsets.
 - 4. To isolate force due to weight or expansion from equipment connections.
- F. In general, attach hangers to upper chord of roof trusses and floor joists, using long rods to facilitate pipe movement.
- G. Anchors:
 - 1. Use no pipe anchors. Arrange piping such that pipe expansion and contraction is accommodated by controlled movement of the pipe within the pipe supports. Provide sufficient offsets in branch piping to accommodate movement of main piping due to expansion and contraction.
- H. Where such heavy piping runs parallel with the floor beams properly designed auxiliary steel must be provided. The spacing of such auxiliary steel supports shall in no case be greater than the spacing of the floor beams running perpendicular to the corrugations of the permanent slab steel forms. The Contractor shall be responsible for designing such system.
- I. Assume the responsibility for the proper transfer of the loads to the piping systems to the structure. No additional cost to the owner should be expected for any corrective work during construction.
- J. Provide necessary structural members, hangers, and supports of approved design to keep piping in proper alignment and prevent transmission of injurious thrusts and vibrations. In all cases where hangers, brackets, etc., are supported from metal decking and/or concrete construction, care shall be taken not to weaken decking and/or concrete or penetrate waterproofing. Hangers supporting piping expanding into loops, bends and offsets shall be secured to the building structure in such a manner that horizontal adjustment perpendicular to the run of piping supported may be made to accommodate displacement due to expansion. All such hangers shall be finally adjusted, both in the vertical and horizontal direction, when the supported piping is hot, or chilled, as required.
- K. Provide supplemental bolted steel in all locations where drilling of slab will create unacceptable noise in adjacent spaces.
- L. Where piping is run near the floor and not hung from the ceiling construction but is supported from the floor, such supports shall be of pipe standards with base flange and adjustable top yoke similar to C & P Fig. 247 or equal.
- M. All vertical piping shall be anchored by means of heavy steel clamps securely bolted or welded to the piping, and with end extension bearing on the building.
- N. Vertical runs of pipe not over 15 feet long shall be supported by hangers placed not over one foot from the elbows on the connecting horizontal runs.
- O. Vertical runs of pipe over 15 feet long but not over 60 feet long and not over 6 inches in size, or not over 30 feet long and not over 12 inches in size, shall be supported on heavy steel clamps. Clamps shall be bolted tightly around the pipes and shall reset securely on the building structure without blocking. Clamps shall be welded to the pipes or placed below couplings. Clamps shall be type 8, Federal Specification WW-H-171C, unless other types are approved.

- P. Hanger rods shall be attached to preset concrete inserts with steel reinforcing rod through the insert and both ends hooked over the reinforcing mesh. For pipes 4 inches and larger, rods shall extend through concrete slab above where they shall be attached to steel bearing plates 6" x 6" x 1/4".
- Q. Piping shall not be hung from other piping, ducts, conduits or from equipment of other trades and no vertical expansion shields will be permitted. Hanger rods shall not pierce ducts.
- R. All piping running on walls shall be supported by means of hanger suspended from heavy angle iron wall brackets. No wall hooks will be permitted.

END OF SECTION

SECTION 22 05 49

PLUMBING SEISMIC RESTRAINTS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Locate, select, design, and install seismic restraints for all plumbing systems. Include restraints for piping and equipment.

1.2 CODES, STANDARDS

- A. Comply with the requirements of the "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems", first edition.
- B. Design seismic restraint systems for seismic Zone 2 with an effective peak velocity - related acceleration coefficient (A_v) of 0.10 to 0.19.

DESIGN LEVEL OF ACCELERATION AT EQUIPMENT CENTER OF GRAVITY			
SEISMIC ZONE 2, $A_v = 0.10$ TO 0.19			
ELEVATION ABOVE GRADE	RIGIDLY FLOOR OR WALL MOUNTED EQUIPMENT	RESILIENTLY MOUNTED AND/OR SUPPORTED FROM CEILING OR STRUCTURE ABOVE	LIFE SAFETY EQUIPMENT (FIRE ALARM, EMERGENCY)
BELOW GRADE UP TO 20 FEET ABOVE GRADE	0.100 "G" 0.125 "G"	0.500 "G"	1.000 "G"
21 FEET to 300 FEET	0.500 "G"	0.750 "G"	

1.3 SUBMITTALS

- A. Submit manufacturer's data for all manufactured restraints.
- B. Submit shop drawings for all fabricated restraints.
- C. Show restraint type and location on the sheet metal and piping shop drawings.
- D. Provide an affidavit signed by a registered New York structural engineer certifying that all mechanical systems requiring such have been properly engineered and designed for seismic Zone 2.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Design Basis: Mason
1. Other Acceptable Manufacturers:
 - a. M.W. Sausse and Company, Inc.
 - b. Vibration Mounting and Controls, Inc.

- c. California Dynamics Corporation
- d. By prior approval

PART 3 - EXECUTION

3.1 GENERAL NOTES FOR BRACING OF PIPES

- A. Piping shall be designed with consideration given to the dynamic properties of the piping and the structure.
- B. Bracing details, support details, schedules and notes listed in the Guidelines apply to all types of pipe and all type of joints.
 - 1. Bracing
 - a. Brace all pipes 2½" diameter and larger:
 - b. Brace all piping 1¼" and larger located in boiler rooms, mechanical equipment rooms and refrigeration machinery rooms. Bracing requirements for pipes less than 2½" in diameter shall be the same as for 2½" pipes in all other locations.
 - c. Brace all fuel gas and oil piping, 1" and larger.
 - d. Seismic braces may be omitted:
 - 1) When the top of the pipe is suspended 12" or less from the supporting structure member and the pipe is suspended by an individual hanger.
 - 2) On all piping ¾" and smaller.
 - 2. Details shown in the Guidelines provide a lateral bracing system. A typical vertical support system conforming to the above standard must also be used.
 - a. Vertical Piping
 - 1) Attachment - Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and carry the weight of the pipe and contents. Stacks shall be supported at their bases and if over 2 stories in height at each floor by approved metal floor clamps.
 - 2) Screwed pipe (I.P.S.) shall be supported at not less than every other story height.
 - 3) Copper tubing - copper tubing shall be supported at each story for piping 1½" and smaller in diameter.
 - 4) Pipes of other approved material shall be supported in accordance with their approved installation standards.
 - b. Horizontal Piping
 - 1) Supports - Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.
 - 2) Screwed pipe - Screwed pipe (I.P.S.) or flanged pipe shall be supported at approximately 10 foot intervals.
 - 3) Copper tubing - Copper tubing shall be supported at approximately 6 foot intervals for tubing 1½" and smaller in diameter and 10 foot intervals for tubing 2" and larger in diameter.
 - 4) Pipes of other approved materials shall be supported in accordance with their approved installation standards.
 - 3. Provide transverse bracings at 40' - 0" o.c. maximum unless otherwise noted in the Guidelines.
 - 4. Transverse bracing for one pipe section may also act as longitudinal bracing for the pipe section connected perpendicular to it, if the bracing is installed within 24" of the elbow or tee of similar size.

5. For threaded piping the flexibility may be provided by the installation of swing joints. In welded or solder joint piping the flexibility shall be provided by expansion loops or manufactured flexible connectors. For piping with manufactured ball joints select length of piping offset using "Seismic Drift" in place of "Expansion Per Joint Manufacturers" selection table. Seismic Drift = 0.015 ft. per foot of height.
 6. Do not use branch lines to brace main lines.
 7. Trapeze hangers may be used. Provide flexibility in joints where pipes pass through building seismic or expansion joints, or where pipes pass through building seismic or expansion joints, or where rigidly supported pipes connect to equipment with vibration isolators.
 8. A rigid piping system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Examples: Wall and a roof; solid concrete wall and a metal deck with Lightweight concrete fill.
 9. Provide large enough pipe sleeves through walls or floors to allow for anticipated differential movements.
 10. A vertical pipe risers, wherever possible, support the weight of the riser at a point or points above the center of gravity of the riser. Provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed 30' - 0" on center.
 11. Cast iron pipe of all types, glass pipe and any other pipe joined with a shield and clamp assembly where the top of the pipe is 12" or more from supporting structure shall be braced on each side of a change in direction of 90° or more. Riser joints shall be braced or stabilized between floors.
 12. For gas piping, the bracing details, schedules and notes may be used except that transverse bracing shall be at 20' - 0" o.c. maximum and longitudinal bracing at 40' - 0" o.c. maximum. Also 1", 1¼", 1½", and 2" diameter pipes shall be braced the same as 2½" diameter pipe in the schedule. (No bracing is required for pipes ¾" diameter and smaller).
 13. Proprietary bracing systems approved by OSA may be used in lieu of the braces shown in the details.
- C. It is the responsibility of the contractor to ascertain that an appropriate size device be selected for each individual pipe section.
- D. Essential facilities or life safety equipment. "Essential facilities" mentioned in the Guidelines are those structures or buildings which must be safe and useable for emergency purposes after an earthquake in order to preserve the health and safety of the general public.

3.2 GENERAL NOTES FOR EQUIPMENT RESTRAINTS

- A. Mechanical Equipment Anchorages such as bolts, expansion anchors, screws, etc., shall comply with the force level requirements of the above standards as well as the New York City Building Code.
- B. Restraining Devices shall be designed to conform with the force level requirements of A above.
- C. Restraining Devices must be placed on all sides of the equipment base.
- D. It is the entire responsibility of the Equipment Manufacturer to design his equipment so that the strength and anchorage of the internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.

- E. It is the responsibility of the Plumbing Contractor to ascertain and assure that an appropriate size device be selected for each piece of equipment (including whole unit restraints for internally braced equipment).

END OF SECTION

SECTION 22 05 53**PLUMBING IDENTIFICATION****PART 1 - GENERAL****1.1 SUBMITTALS**

- A. Submit manufacturer's product data on the following:
 - 1. Plastic Pipe Markers and method of application.
 - 2. Engraved Plastic Laminate Sign.

PART 2 - PRODUCTS**2.1 GENERAL**

- A. Except as otherwise indicated, provide manufacturer's standard products.
- B. Where more than a single type is specified for an application, selection is Installer's option, but provide a single selection for each application.

2.2 PLASTIC PIPE MARKERS (TYPE A)

- A. Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, color-coded, plastic-sheet pipe markers, complying with ANSI A13.1.
- B. For Pipes Less Than Six Inches (including insulation if any): Provide full-band pipe markers, extending 360° 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. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than ¾" wide; full circle at both ends of pipe marker, tape lapped 1-½".
- C. Lettering: Manufacturer's pre-printed wording which conforms to contract document system descriptions.
- D. Where work is an extension or alteration of an existing system, new markers shall match existing terminology for systems which are modified or added by this work.
- E. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering or as a separate unit of plastic (to accommodate both directions).

2.3 STENCILING (TYPE B)

- A. Using a color contrasting to the surface to identify, spray or brush paint through neatly cut stencils.
- B. Lettering shall conform to wording on contract documents. Size shall be in accordance with ANSI A13.1.

2.4 BACKGROUND COLOR AND STENCILING (TYPE C)

- A. In addition to the requirements above, paint a background color band in accordance with ANSI A13.1.

2.5 VALVES TAGS

- A. Brass Valve Tags: Provide manufacturer's standard 19 ga brass tag; approximately 1-1/2" round with 1/2" high black filled numbers and 3/16" top hole.
 - 1. Numbers shall be sequential in accordance with schedule below.
 - 2. Provide separate numbering for each legend sequence. Provide separate sequences for the following:
 - a. Gas (GAS)
 - b. Plumbing (PLBG)
 - c. Domestic Cold Water (DCW)
 - d. Domestic Hot Water (DHW)
 - e. Domestic Hot Water Return (DHWC)
 - f. All other systems (No legend)
- B. Valve Tag Fasteners: Manufacturer's standard chain (wire link or beaded type), or S-hooks.

2.6 VALVE SCHEDULE

- A. Provide schedule for each piping system, as defined on the drawings, and below, typewritten and reproduced on 8-1/2" x 11" bond paper.
- B. Tabulate valve number, piping system, system legend (as shown on tag), location of valve (room or space), and variations for identification (if any).
- C. Provide piping schematic for each system as defined below in Part 3.
- D. In addition to mounted copies, furnish extra copies for maintenance manuals as specified.
- E. Valve Schedule Frames: For each page of the valve schedule, provide a glazed frame, with screws for removable mounting on masonry walls.

2.7 ENGRAVED PLASTIC-LAMINATE SIGNS

- A. General: Provide engraving stock melamine plastic laminate, 1/16" thick, black with white core (letter color).
- B. Fastening:
 - 1. Screws
 - 2. Rivets
 - 3. Permanent Adhesive
- C. Lettering and Graphics:
 - 1. Coordinate names, abbreviations and other designations used in the mechanical identification work, with the corresponding designations shown, specified or scheduled in the construction documents.

PART 3 - EXECUTION**3.1 GENERAL**

- A. Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, install identification after completion of covering and painting.
- B. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.2 PIPING SYSTEM IDENTIFICATION

- A. General: Install pipe markers on piping of the following systems and include arrows to show normal direction of flow.
 - 1. Domestic water piping (hot, cold, tempered; 120° hot, 180° hot, hot water re-circulating, etc.).
 - 2. Plumbing vent and sanitary (above grade) piping.
 - 3. Storm piping.
 - 4. Natural gas piping (indicate pressures)..
- B. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces above accessible ceilings, in accessible maintenance spaces, including chases, and above ceiling:
 - 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 a question of flow pattern.
 - 3. Near locations where pipes pass through walls, floors, or ceilings, or enter non-accessible enclosures.
 - 4. Near major equipment items and other points of origination and termination.
 - 5. Spaced intermediately at maximum spacing of 50' along each piping run.
 - 6. Within 6' of access doors above otherwise non-accessible ceilings and chases.
- C. Type:
 - 1. Normally exposed to view - Type A or C.
 - 2. Normally concealed from view - Type B.

3.3 VALVE IDENTIFICATION

- A. Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory fabricated equipment units, plumbing fixtures faucets, 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.
 - 1. Shut off valves located at least 10' from fixture(s) shall be provided with valve tag unless otherwise directed by Engineer.
- B. Mount framed valve schedules with piping schematics where directed by Architect.

- C. Identify each valve tagged on as-built drawings.

END OF SECTION

SECTION 22 05 93**TEST-ADJUST-BALANCE****PART 1 - GENERAL****1.1 RESPONSIBILITY**

- A. A work of this section shall be completed by a sub-contractor of the Plumbing contractor.
- B. The Balancing Contractor shall not be a sub-contractor of any other Division 21, 22 or 23 Contractor.

1.2 QUALITY ASSURANCE

- A. Qualification:
 - 1. The firm shall be an independent testing and balancing firm specializing in testing and balancing of environmental systems.
 - 2. The firm shall have an experience record of not less than three (3) years experience in the testing and balancing industry.
- B. Registration: Work shall be done under the supervision of a licensed professional engineer licensed in the jurisdiction of the work. Engineer shall be available for all meetings and interpretation of all materials in the report.
- C. Pre-qualification of Testing and Balancing Contractor.
 - 1. The firm must have experience and qualifications satisfactory to the consulting mechanical engineer and must be accepted by him prior to bidding.
 - 2. Firms desiring approval to provide work under this section shall submit a booklet indicating procedures and data forms that they would use in the performance of the work.
 - 3. Only firms which have been approved by the engineer may provide work under this section.

PART 2 - PRODUCTS**2.1 PRODUCTS (Not applicable)****PART 3 - EXECUTION****3.1 GENERAL**

- A. Sequence work to commence after completion of system and start-up procedures and schedule completion of work before Substantial Completion of Project.
- B. Examine the installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable.

- C. Notify the Contractor in writing of conditions detrimental to the proper completion of the test-adjust-balance work.
 - 1. Do not proceed with the work until unsatisfactory conditions have been corrected.
 - 2. Provide Commissioner with a copy of the notification.
- D. Adjust flows to within 10% of values shown. If design flows cannot be obtained within specified limits the Balancing Contractor will perform the following (at the minimum):
 - 1. Measure and record major pressure drops in the system.
 - 2. Consult with the Engineer and Installer as required.
 - 3. Upon receiving written directions to proceed and after any corrections are performed, re-balance affected portion of system.
- E. Optimization: Work closely with the plumbing contractor to optimize setpoints.
 - 1. Establish the minimum water differential pressure for variable or bypass flow system.
 - 2. Establish the position of valve and sequencing relays.
 - 3. Confirm suitable operation of all backflow prevention devices.
 - 4. Confirm proper operation of hot water return system.
 - 5. Confirm proper flow through all heat exchangers.
- F. Patch holes in insulation and housings which have been cut or drilled for test purposes, in a manner recommended by the original Installer.
- G. Make all final readings for each system at the same time, and after all adjustments have been made.
- H. Mark equipment settings, including control positions, balancing cocks, circuit setters, valve indicators, to show final settings at completion of test-adjust-balance work.
 - 1. Mark with paint or other suitable permanent identification material.
- I. Check all new thermal overloads.
 - 1. Identify improperly protected equipment in report.
- J. All piping and equipment shall be tested; labor including standby electrician, materials, instruments and power required for testing shall be furnished unless otherwise indicated under the particular section of the Specification.
- K. Tests shall be performed in the presence and to the satisfaction of the Commissioner and such other parties as may have legal jurisdiction.
- L. In no case shall piping, equipment, or accessories be subjected to pressure exceeding their ratings.
- M. All defective work shall be promptly repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the Commissioner.
- N. Any damage resulting from tests to any and all trades shall be repaired and damaged materials replaced, all to the satisfaction of the Commissioner.
- O. The duration of tests shall be as determined by all the New York State Department of Health, but in no case less than the time prescribed below.

- P. Equipment and systems which normally operate during certain seasons of the year shall be tested during the appropriate season. Tests shall be performed on individual equipment, systems, and their controls. Whenever the equipment or system under test is interrelated and depends upon the operation of other equipment, systems and controls for proper operation, functioning and performance, and latter shall be operated simultaneously with the equipment or system being tested.
- Q. All pumps and piping systems shall be completely balanced by the adjustment of the plug cocks, globe valves or other control devices, to obtain the flow quantities indicated on the design drawings.

3.2 DOMESTIC WATER SYSTEMS

- A. Before any adjustments are made:
 - 1. Check temperature control valve operation.
 - 2. Check pump rotation.
 - 3. Adjust pressure reducing valve.
 - 4. Remove any roughing strainer screens in systems.
- B. Procedure:
 - 1. Measure and report all domestic water recirculation systems by all of the below means which are applicable.
 - a. System, pump, branch, or terminal flow measuring stations.
 - b. Terminal or heat exchanger pressure drop, compare to submittal data.

3.3 DETAILED REQUIREMENTS

- A. Measure, adjust and report the following:
 - 1. Pumps:
 - a. Water flow
 - b. Inlet and outlet pressure
 - c. Motor amps and KW

3.4 REPORT

- A. Provide a general information sheet listing:
 - 1. Instruments used:
 - a. Most recent calibration date.
 - 2. Method of balancing.
 - 3. Altitude correction.
 - 4. Manufacturer's performance data for all air devices used.
- B. Provide data sheets for all equipment, including motors and drives, listing:
 - 1. Make
 - 2. Size
 - 3. Serial number
 - 4. Capacity Rating
 - 5. Amperage
 - 6. Voltage input
 - 7. Thermal heater size for each motor
 - 8. Operating speed of driver and driven devices

- 9. Any additional pertinent performance data
- C. Include design and final values for all items listed in Detailed Requirements, and totals for each system.
- D. Provide data sheets showing:
 - 1. Instrument used
 - 2. Velocity reading
 - 3. Manufacturer's free area factors
- E. Provide recap sheet with explanation for each device not meeting specified performance.
- F. Provide a set of prints with equipment, inlets and outlets marked to correspond to data sheets.

END OF SECTION

SECTION 22 07 00**PLUMBING INSULATION****PART 1 - GENERAL****1.1 SUBMITTALS**

- A. Submit manufacturer's product data on the following:

1. Insulation.
2. Jackets, coatings and protective finishes.
3. Sealers, mastics and adhesives.
4. Fitting covers.

1.2 FLAME AND SMOKE RATINGS

- A. Provide insulation tested on a composite basis (insulation, jacket, covering, sealer, mastic and adhesive) complying with the following for:

1. Flame Spread: 25 or Less
2. Smoke Developed: 50 or Less
3. Fuel Contributed: 50 or less
4. Method: ASTM E84 (NFPA 255), UL 723

- B. Accessories such as adhesives, mastics, cements, tapes and cloths for fittings shall have component ratings as listed above. All products shall bear UL labels indicating the above are not exceeded.

1.3 PRODUCT DELIVERY

- A. Deliver insulation products in factory containers bearing manufacturer's label showing fire and smoke hazard rating, density and thickness.
- B. Protect insulation against, dirt, water, chemical and mechanical damage. Do not install damaged insulation; remove from project site.
- C. Store insulation in original wrappings and protect from weather and construction traffic.

1.4 DEFINITIONS

- A. Exposed Location: Located in mechanical rooms or other areas exposed to view.
- B. Concealed Location: Located in pipe chases, furred spaces, attics, crawl-spaces, above suspended ceilings, or other locations not exposed to view.

1.5 STANDARDS

- A. Comply with the latest edition of National Commercial and Industrial Insulation Standards.
- B. Provide certifications or other data as necessary to show compliance with these Specifications and governing regulations. Include proof of compliance for test of products for fire rating, corrosiveness, and compressive strength.

PART 2 - PRODUCTS**2.1 PIPE INSULATION****A. Manufacturers:**

1. Design Basis: Johns-Manville
2. Other Acceptable Manufacturers:
 - a. Armstrong
 - b. Foster
 - c. Owens-Corning
 - d. Knauf
 - e. Nomaco
 - f. Imcoa
 - g. Pittsburgh Corning
 - h. Cell-U-Foam

B. Materials:

1. Fiberglass Pipe Insulation with Vapor Barrier: Johns-Manville Micro-Lok heavy density pipe insulation with AP-T jacket or Owens-Corning Fiberglass Corp. ASJ/SSL-11.
2. Fiberglass Pipe Fitting Insulation: Johns-Manville "Zeston" fitting covers with factory-cut fiberglass insulation insert. Insulation blanket with foil tape and tie wire will not be accepted.
3. Flexible Unicellular Pipe Insulation: Armstrong Armaflex, II or Therma-cel By Nomaco.
4. Cellular glass with vapor barrier coating: Pittsburgh Corning.
5. Rigid Closed Cell Insulation: Dow Trymer 2000 (not for use indoors).

C. Thickness: (Thickness listed below are minimum required. Provide thickness required by Local Building or Energy Codes.

1. Service (Domestic) Water Piping:
 - a. Hot:
 - 1) 2" and Smaller: 1"
 - 2) 2-½" and Larger: 1 ½"
 - 3) Runouts up to 2" and 10 feet long: ½"
 - b. Cold: 1"
2. Storm Water:
 - a. All Sizes: 1"
3. Repairs to Existing Insulation: Match thickness of existing insulation.
4. All Heat Traced Piping:
 - a. Size 2" and smaller: 1"
 - b. Size 2½" and larger: 2"

D. Application: Unless otherwise indicated, use the following:

1. Inside, above ground: Fiberglass with a maximum K factor of 0.22 BTU/inch per sq. ft. per degree F. per hour at 75°F. mean temperature with factory-applied all service vapor proof jacket. Density shall be not less than 3 lbs. per cubic foot. For hot pipe insulation, insulation shall be suitable for 250°F.
2. Inside exposed: Fiberglass with PVC jacket (jacket not required in mechanical rooms).
 - a. A vapor barrier mastic compatible with the PVC shall be applied around the edges of the adjoining pipe insulation and on the fitting cover throat overlap seam. The PVC fitting cover is then applied and shall be secured with pressure sensitive pearl gray Z-Tape along the circumferential edges. The tape shall extend over the adjacent pipe insulation and have an overlap on itself at least 2" on the downward side.
 - b. Refrigerant systems and cold systems in severe ambient conditions: Fittings shall be insulated to a full thickness the same as the adjacent pipe insulation, with insulation which has been mitered to conform to the PVC fitting cover. An intermediate vapor barrier compatible with the PVC shall be applied, completely sealing the insulation and on the fitting cover overlap seam. The PVC fitting cover is then applied and shall be secured with pressure sensitive pearl gray Z-Tape along the throat seam and the circumferential edges overlapping itself 2" on the downward side.
 - c. Qualifications for Using Insulation: When the pipe insulation thickness is greater than 1-1/2" or the pipe temperature is greater than 250°F or less than 45°F, additional insulation inserts should be used. Use one Hi-Lo Temp insert for each additional 1" of pipe insulation. 2 or more layers of the Hi-Lo Temp insulation inserts shall be applied with the first layer being secured with a few wrappings of fiberglass yarn.
 - d. Fitting Cover: the temperature of the PVC fitting cover must be kept below 150°F by the use of proper thickness of insulation and by keeping the PVC cover away from contact with, or exposure to, sources of direct or radiant heat.
3. Outside, protected: Fiberglass with aluminum jacket.
4. Outside, exposed to weather: Rigid closed cell with aluminum jacket.
5. Below grade or slab:
 - a. Pipe size 1½" and less: Single piece of flexible closed cell insulation slipped over soft annealed copper tube without slitting insulation.
 - b. Pipe size 2" and larger: Rigid closed cell insulation with shrink fit jacket.
6. PVC: 1½" thick fiberglass (duct) insulation, or 1" heavy density pipe insulation installation to meet ASTM E84 (NFPA 255) flame spread and smoke developed ratings.
7. All fittings, valves and flanges for pipe sizes 4" and larger shall be insulated with fabricated mitered segments of pipe insulation of same thickness as the adjoining pipe insulation, secured with no. 20 gauge galvanized annealed steel wire and covered with Zeston 2000 molded PVC fitting covers as manufactured by Manville or equal.
8. Direct contact between pipe and hangers will not be accepted. Hangers shall pass outside of a metal saddle which shall cover a section of high density insulation of sufficient length to support pipe without crushing insulation. Hangers shall not pierce insulation and all vapor barriers shall be unbroken and continuous. High density insulation shall be one of the following:
 - a. Foam glass.
 - b. Fiberglass, high density, minimum of 7 lb. material or heavier.
 - c. High density calcium silicate insulation.

9. Provide vapor barrier dams at locations and intervals recommended by the insulation manufacturer, maximum 20' spacing.

2.2 EQUIPMENT INSULATION

A. Manufacturer:

1. Design Basis: Johns Mansville
2. Other Acceptable Manufacturers:
 - a. Armstrong
 - b. Certainteed
 - c. Owens-Corning
 - d. Knauf
 - e. Pittsburgh Corning

B. Materials:

1. Insulation: 3" thick flexible board type insulation. 3 PCF glass fiber insulation with all purpose jacketing. Maximum thermal conductivity .27 BTU-IN/(hr-FT²-°F) at 150°F. Glass fibers oriented such that insulation will conform to rounded shapes while maintaining high compressive strength.
2. Jacketing Material: PVC or aluminum jacketing material, except as otherwise indicated. Seal all joints.
3. Fiberglass: Johns-Manville Micro-Lok 850 insulation with APT jacket.
4. Flexible Unicellular Insulation: Armstrong Armacell sheet form.

C. Application:

1. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors, stud pins, metal covers, adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

3.1 GENERAL

- A. Verify acceptability of all materials which are to be used in air plenums (above ceiling, etc.). Materials must meet all requirements of Local Building Code.
- B. Insulation Packing:
 1. Piping:
 - a. Wherever piping penetrates walls, partitions, floor slabs, etc., the space between the piping and the sleeve shall be packed with mineral wool and sealed with approved type non-hardening caulking compound for sleeves through exterior walls.
 2. Material:

- a. Packing material shall be rockwool insulation as manufactured by United Stated Gypsum Co. or equal and shall comply with Fed. Spec. HH-1-558, Form A, Class 4, K=0.24, melting point 2000°F.
- C. All Lines That Are Electrically Traced
 - 1. The basic insulation shall be dual temperature, Manville Micro-Lok piping insulation, 1-1/2" thick. The insulation shall be sized to accommodate the electric heat tracing applied against the pipe surface.
 - 2. Finish for insulation shall be .02 aluminum.
- D. Contractor shall examine location where this insulation is to be installed and determine space conditions and notify the Commissioner in writing of conditions detrimental to proper and timely completion of the Work.
- E. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 GENERAL INSTALLATION

- A. Install insulation in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that insulation complies with requirements and serves intended purposes.
- B. Coordinate with other work as necessary to interface installation of insulation with other components of systems.
- C. All insulating materials shall be applied only by experienced workmen, in accordance with the best covering practice. All piping equipment shall be blown out, cleaned, tested and painted prior to the application of any covering. Adhesives, sealers and mastics shall not be applied, when the ambient temperature is below 40°F, or surfaces are wet.

3.3 PIPE INSULATION

- A. Insulate the following:
 - 1. Domestic hot water piping.
 - 2. Domestic cold water piping above ground and under slab.
 - 3. Existing roof drain bodies and all existing and new horizontal storm water piping.
 - 4. All existing piping which is currently insulated and which is modified as a result of this work.
 - 5. Heat traced piping
- B. Installation:
 - 1. Install insulation on pipe system subsequent to testing and acceptance of tests.
 - 2. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full length units of insulation, with a single cut piece to complete the run. Do not use cut pieces or scraps abutting each other.
 - 3. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure a complete and tight fit over surfaces to be covered.

4. Extend piping insulation without interruption through pipe clamps, hangers, walls, floors and similar piping penetrations, except where otherwise indicated.
5. Install protective metal shields and saddles where needed to prevent compression of insulation.
6. Except as noted, cover valves, flanges, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run.
 - a. Install factory-molded, pre-cut or job-fabricated units (at Installer's option), except where a specific form or type is indicated.
 - b. Do not cover:
 - 1) Valve operators. Provide extended valve stems as required to maintain continuous insulation and vapor barrier.
 - 2) Nameplates or identification tags.
 - c. Provide removable access for:
 - 1) Strainers.
 - 2) Other components requiring access for service.
7. Mark location of unions and flanges covered by insulation with permanent paint or ink, or approved label.
8. Maintain integrity of vapor-barrier jackets on insulation of cold pipes and storm drainage piping, and protect to prevent puncture or other damage. Insulation on cold surfaces where vapor barrier jackets are used shall be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold services shall be adequately insulated and vapor sealed to prevent condensation.
9. Inserts shall be installed at hangers for insulated piping. Inserts between the pipe and pipe hangers shall consist of rigid pipe insulation of equal thickness to the adjoining insulation and shall be provided with vapor barrier where required. Insulation inserts shall not be less than the following lengths:

2-1/2" pipe size and smaller	6" long – 18 GA
3" to 6" pipe size	9" long – 16 GA
10. Provide 18 gauge galvanized metal shields between hangers or supports and pipe insulation. Form shields to fit insulation. Extend shields up to centerline of pipe. Make shields same length as that specified above for inserts.
11. Where insulation is specified for piping, insulate similarly all connections, vents, drains, and any piping connected to system.
12. Fill surface imperfections such as chipped edges, small joints or cracks and voids or holes with insulation material and smooth all such areas with a skim coat of insulating cement.
13. Seal ends of sections with vapor barrier cement to create moisture dams at:
 - a. 20 ft. intervals.
 - b. Valves and fittings.
 - c. All hangers and supports.
14. On underground pipe insulation, install unicellular insulation on pipe without slitting insulation. Seal all transverse joints with adhesive.

15. Replace existing insulation removed or damaged because of work of this project.
16. Insulate new pipes and replace insulation on existing pipes to remain where insulation was removed or damaged by demolition or revisions.
17. Insulate between fingers of spiders in alignment guides.
18. Insulate between pipe and pipe slide.
19. Perform all work in a neat and workmanlike manner. Poor work (as determined by Commissioner) will be cause for rejection.
20. Specialties shall be insulated to match those of the systems to which they are connected.
21. No insulation shall be installed until the piping systems have been hydrostatically tested as specified elsewhere to the satisfaction of the Engineer.

3.4 EQUIPMENT INSULATION

- A. Install insulation materials with smooth and even surfaces and on clean and dry surfaces, after inspection and release for insulation application.
 1. Re-do poorly fitted joints.
 2. Do not use mastic or joint sealer as filler for gaping joints and excessive voids resulting from poor workmanship.
- B. Maintain integrity of vapor-barrier on equipment insulation and protect it to prevent puncture and other damage.
- C. Apply insulation using the staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.
- D. Do not insulate handholes, cleanouts, ASME stamp and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.
- E. Hot Equipment (Above Ambient Temperature):
 1. Do not apply insulation to equipment while hot.

3.5 PROTECTION AND REPLACEMENT

- A. Replace damaged insulation which cannot be repaired satisfactorily, including any damage to continuous vapor barrier or damage due to moisture saturation. The insulation installer shall advise the Contractor of required protection for the insulation work during the remainder of the construction period, to avoid damage and deterioration.

END OF SECTION

This Page Intentionally Left Blank

SECTION 22 10 00**PLUMBING PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplemental Conditions of the Construction Contract (General Requirements), apply to this Section.

1.2 SUBMITTALS

- A. Submit manufacturer's data on the following:
 - 1. Water hammer arresters.
 - 2. Roof drains, floor drains, floor sinks, cleanouts and area drains.
 - 3. Downspout nozzles.
 - 4. Water meter.
 - 5. Trap primers.
 - 6. Trap guards.

1.3 STANDARDS

- A. Materials shall comply with the following standards.
 - 1. Plumbing Code of New York City
 - 2. Plumbing Code of New York State
 - 3. Cast iron: ASTM A-74-87
 - 4. Cast iron pipe fittings ASTM A-888
 - 5. Cast iron pipe couplings ASTM C-564
 - 6. Copper pipe:
 - a. Type K, L, M: ASTM B88
 - b. DWV: ASTM B306-88
 - 7. Ductile iron pipe: ASTM A377-89
 - 8. All potable water piping and fixtures should be compliant with NSF-61 requirements for lead free piping

1.4 RELATED WORK

- A. Section 22 05 29 Plumbing Pipe Supports and Anchors.

PART 2 PRODUCTS**2.1 DOMESTIC WATER PIPING AND ACCESSORIES**

- A. Comply with NSF-61 for lead free potable water piping.
- B. **Above Ground Inside Building, Size 4" and Under:**
 - 1. Pipe: Copper tube, hard temper, Type L.
 - 2. Fittings: Wrought copper, or cast bronze.
 - 3. Solder: 95-5 tin antimony (no lead).

- 4. Refer to other plumbing sections for other acceptable joining methods.
- C. Use approved fittings for connections between dissimilar pipe systems.

2.2 TRAP PRIMERS (TP)

- A. Manufacturers:
 - 1. Design basis: PPP as noted in Plumbing Fixture Schedule.
 - 2. Construction: Corrosion resistant brass. "O" rings shall have a flexibility range of -40°F to 450°F.
 - 3. Provide distribution units for connector points as shown on plans.
 - 4. Complies with ASSE STD 1018.

2.3 WATER HAMMER ARRESTER (Shock Absorber)

- A. Manufacturers:
 - 1. Design Basis: Zurn Shoktrol Z-1700
 - 2. Construction: Stainless Steel, Bellows
 - 3. Other Acceptable Manufacturers:
 - a. Josam
 - b. Sioux Chief
 - c. J.R. Smith
 - d. MIFAB-WHB
 - 4. Standards: PDI WH201, ASSE STD 1010.
- B. Install permanently sealed water hammer arrestors on all hot and cold water branches and headers to plumbing fixtures whether it is indicated on the Plumbing Drawings or not.
- C. Shock absorbers are to be of size and location in accordance with the manufacturer's recommendations and with DPI Standard WH 201 and shall be PDI approved. Provide accessibility to all shock absorbers.
- D. Provide shock absorbers at the top of water risers and at all quick closing valves, solenoid valves and at equipment such as sterilizers, washers, etc.

2.4 SANITARY AND VENT PIPING (WITHIN BUILDING)

- A. Above Ground:
 - 1. Cast iron hub and spigot, neoprene gasket.
 - 2. Cast iron no hub, neoprene gasket and stainless steel sleeve joint (as allowed by jurisdiction).
- B. Underground:
 - 1. Cast iron hub and spigot with oakum packing and caulked molten lead in one continuous pour.

2.5 HEAVY DUTY NO HUB COUPLINGS

- A. Use on the following:
 - 1. Sanitary vent piping 4" and larger.
 - 2. Sanitary piping 3" and larger.
 - 3. All storm piping.
- B. 1-1/2", 2", 3" and 4": 3" wide 304 stainless steel shield; (4) minimum stainless steel clamps; fixed and "floating" eyelet.
- C. 5" and over: 4" wide 304 stainless steel shield, with six (6) stainless steel clamps mounted in series.
- D. Torque to minimum 80 inch pounds or per manufacturer's recommendation.
- E. Acceptable manufacturers: Husky Series 4000 or Mission Heavy Weight.

2.6 STANDARD DUTY NO HUB COUPLINGS

- A. Standard duty couplings shall conform to CISPI 310-85: 0.008" thick corrugated stainless steel.
- B. Use of the following:
 - 1. Sanitary vent piping up to and including 3" piping.
 - 2. Sanitary piping up to and including 2" piping.
 - 3. As allowed by jurisdiction.
- C. Torque to inch pounds per manufacturer's recommendation.
- D. Acceptable manufacturers: Tyler, Mission, AB&I, Clamp All, Huskey.

2.7 PUMPED SANITARY PIPING (ABOVE & BELOW GRADE)

- A. 125 lb. galvanized steel, threaded.
- B. Galvanized malleable or ductile iron grooved pipe fittings, designed for cut grooved joint.
- C. Hub and spigot or no hub couplings are not allowed.

2.8 SOIL AND VENT PIPING ACCESSORIES

- A. Use approved fittings for connections between dissimilar pipe systems.
- B. Acceptable Manufacturers:
 - 1. Josam
 - 2. Wade
 - 3. Zurn
 - 4. J.R. Smith
 - 5. Jones Spec
 - 6. Watts Ancon

C. Cleanout Plugs:

1. Material: Cast bronze or brass.
2. Type: Countersunk.
3. Threads: ANSI B2.1.

D. Wall Cleanout Covers:

1. Type: Frameless, round, low profile plate.
2. Material: Stainless steel or chrome plated brass.
3. Attachment: Single exposed flush screw.
4. Finish:
 - a. Non-painted surfaces: Bright polished.
 - b. Surfaces to be painted: Prime coat.

E. Floor Cleanouts:

1. Body: Standard round Duco cast iron.
2. Attachment: Bronze screws.
3. Sleeve: Full thickness of floor slab.
4. Top:
 - a. Shape:
 - 1) Where floor covering has rectangular pattern: Square.
 - 2) Other areas: Round.
5. Cover:
 - a. For Vinyl Tile and Similar Floor Coverings: Recessed to receive inset of floor material.
 - b. For carpeted floor covering provide carpet cleanout marker.
 - c. Other areas: Nickel bronze scoriated finish.

2.9 STORM WATER PIPING (INSIDE BUILDING)

A. Above Ground:

1. Cast iron, hub and spigot, neoprene gasket joints.
2. Cast iron no hub, neoprene gasket and heavy duty no hub couplings.
3. Schedule 40 galvanized steel with screwed or grooved mechanical fittings. (Optional: Welded joints)

B. Underground:

1. Cast iron hub and spigot, neoprene gasket, with oakum packing and caulked molten lead in one continuous pour.

2.10 STORM DRAINAGE PRODUCTS

A. Acceptable Manufacturers:

1. Josam
2. Wade
3. Zurn
4. Jones Spec
5. Watts Ancon

- B. Roof Drain: (RD)
 - 1. Material: Cast Iron
 - 2. Dome: Cast Iron
 - 3. Include:
 - a. Combined flashing collar and gravel stop.
 - b. Extension for insulation.
 - c. Under-deck clamp.
 - d. Sump receiver.
 - e. Expansion joint.
- C. See Plumbing Fixture Schedule and Plumbing Fixture specification for additional information.

2.11 DISSIMILAR METALS

- A. Connections between pipe, fittings, hangers and equipment of dissimilar metals shall be insulated against direct contact one with the other, by using a high quality or grade of dielectric insulated material
- B. Dielectric unions or insulated couplings shall be installed between copper or brass piping material and steel piping material or steel tanks. 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.

2.12 PIPE SLEEVES

- A. Any pipe required in walls and floors shall be provided with a pipe sleeve.
- B. Provide watertight sleeves for all pipes penetrating exterior foundation walls and waterproof floor areas and where such areas are noted on the Architectural and Structural Drawings.
- C. Except where indicated or specified otherwise, provide and install Schedule 40 galvanized steel sleeves for all piping passing through concrete walls or floor slabs. Sleeves shall be securely set in the framework and where not specified otherwise shall be of such length as to extend flush with each face of the wall in which they are installed, 3" above unfinished floor and 2" above the finished floor or tile, as applicable. Sleeves in kitchen and laundry areas shall be chrome plated.
- D. Sleeves shall have an internal diameter of at least 1" larger than the outside pipe size diameter of the pipe passing through them. Sleeves in exterior foundation walls shall be James B. Clow and Sons, No. F-1430 or F-1435, or approved equal, extra-heavy cast iron wall sleeves with intermediate integral flange. Cast iron wall sleeves with intermediate integral flange. Cast iron sleeves shall be set with end flush with wall faces.
- E. Where sleeves penetrate waterproofing, install caulking between pipes and pipe sleeves as follows:
 - 1. Pack oakum to a depth of 1" between pipe and pipe sleeve at a location permitting 3" of sealant to be installed above the oakum.
 - 2. Fill space above oakum to a depth of 3" with sealant similar and equal to Igas Joint Sealer as manufactured by Silka Chemical Corporation.
- F. Sleeves for gas piping shall extend 4 inches beyond exterior face of wall and 1 inch beyond inner face.

- G. Sleeves in waterproof floors shall be as manufactured by Zurn Inc. or equal, cast iron sleeve with integrally cast flange and flashing device.

2.13 STACK SLEEVES

- A. Stack sleeves for pipes passing through roof shall be equal to Zurn Z-195-10 or MIFAB R1900 with cast iron body, adjustable flashing ring, rust resistant bolts, and under deck clamp. The adjustable flashing ring shall be caulked after it is in the proper position. The space between the flashing sleeve and the pipe passing through same shall be caulked watertight.

2.14 CLEANOUTS

- A. Provide easily accessible cleanouts at base of vertical stacks and leaders; at ends of horizontal drainage lines and at intervals not exceeding 50 ft.; at each change of direction; on hand holes of running traps; and where indicated to make entire drainage system accessible for roding. Provide at least 18 inch clearance to permit access to cleanout plugs.
- B. Cleanouts for cast iron pipe shall consist of tapped extra heavy cast iron ferrule caulked into cast iron fittings, and extra heavy brass screw plug with solid hexagonal nut.
- C. Cleanouts turning out through walls and up through floors shall be made by long sweep ells of "Y" and 1/8 bends with plugs and face or deck plates to conform to architectural finish in room. Where no definite finish is indicated on the Architectural and/or Mechanical Drawings, wall plates shall be chrome plates cast brass and floor plates shall be nickel bronze. Screws in cleanouts in finished areas shall be vandal-proof.
- D. Cleanouts shall be full size at the pipe up to 6" inclusive. On larger size piping 6 inch size plugs shall be used.
- E. The following list indicates the various types of cleanout desired at various locations indicated on the Drawings. These cleanouts have been selected from the catalog of Zurn and are representative of quality design and finish desired. Cleanouts of Josam Mfg. Co., or J.R. Smith, or MIFAB, or approved equal may be submitted provided they meet fully in every respect (such as material, weight, clamping features, finish, etc.). The characteristics and quality of the cleanout shall be as follows.
 1. Cleanout fitting in vertical stacks shall consist of tapped tees, capable of receiving a rough brass raised head cleanout plug; Zurn 1460-8 or MIFAB #C-1400S-9.
 2. Cleanouts in Mechanical Equipment Room shall be Zurn 1420-25 or MIFAB #C1100 XR-4-Z.
 3. Cleanouts in finished areas shall be Zurn Z-1420-3 or Z-1400HD or MIFAB #C1100 TS-1 with recess for tile floors.
 4. Cleanouts for 3 or more fixtures piped horizontally shall be extended to wall cleanouts, and shall be Zurn No. Z-1470 or MIFAB #C1430.
- F. All cleanout plugs shall be brass and lubricated with graphite before installation.
- G. Cleanouts will not be allowed to be located in inaccessible locations.

2.15 DRIP PANS

- A. In so far as possible, piping shall not be installed within the ceiling or exposed in operating and delivery rooms, nurseries, food preparation centers, food serving facilities, food storage areas, central services, electronic data processing areas, electric closets, and other sensitive areas.

- B. When overhead piping in these areas is unavoidable, provide aluminum drip pans with indirect waste extended and spilled to a safe place.

PART 3 - EXECUTION

3.1 GENERAL

- A. Testing: Test in accordance with the applicable Plumbing Code.
- B. Connections to Equipment Furnished Under Other Sections:
 - 1. Make final connections to all equipment shown on drawings as connected to supply and/or drain piping.
 - 2. Furnish all devices necessary for final connection, including:
 - a. Tail pieces
 - b. Stops
 - c. Supplies
- C. Corrosion Protection:
 - 1. Provide isolation between concrete or mortar and any copper pipe.
 - 2. All below grade piping shall be adequately protected from corrosion.
- D. Comply with Section 22 05 29 Pipe Supports and Anchors for pipe support requirements.

3.2 INSTALLATION OF DOMESTIC WATER PIPING AND PRODUCTS

- A. Install all horizontal water piping level and parallel to building construction (except piping noted to be drained down slope toward drain at 1/8" /ft. min.). Make any changes in direction with fittings, don't kink or bend. All vertical piping to be plumb. Provide dielectric isolation between uninsulated pipe and hangers. Provide plastic grommets when going through metal studs. Tape is not acceptable for dielectric isolation.
- B. Water Hammer Arrestors: Install arresters as shown on the drawings and as described in this specification. At minimum any branch line connected to a flush valve shall have one arrestor.
- C. Disinfection:
 - 1. After installation of all fixtures served, fill all domestic water lines with a chlorine-water solution of 50 parts per million minimum.
 - 2. Hold solution in pipe for at least 24 hours.
 - 3. Open and close all valves 3 times during chlorination.
 - 4. Waste chlorine solution from each outlet.
 - 5. Measure solution at end. If not 10 ppm, repeat.
- D. Meters:
 - 1. Install water meter in accordance with Water Supplier's standard.

- E. It is the intent that each part of the plumbing systems shall be complete in all details and all lines provided with all control valves as indicated on Drawings, or as may be required for the proper control of the pipe lines under this Section so that any fixture, line or piece of apparatus may be cut out for repair without interference or interruption of the service to the rest of the building.
- F. The Contractor shall examine carefully the architectural plans and details and familiarize himself with all conditions relative to the installation of piping, particularly where same is concealed behind furring or in hung ceilings. In no case shall the Contractor permit his pipes to be exposed beyond finished plaster lines unless specifically shown on Drawings. He shall consult with the other trades in the building and install his piping in such a way as to least interfere with the installation of other trades. All piping installed in finished areas shall be completed concealed within hung ceilings, furrings, soffits, pipe spaces.
- G. The water piping shall all be installed so as to drain, and branches shall not be trapped, but shall have continuous pitch. Where necessary to raise or lower mains, the same shall be provided with a drip and shall be properly valved and capped.
- H. Piping shall be installed, whether indicated or not, so as to rise and/or drop to clear any and all conduits larger than 1", lighting fixtures, ductwork and heating mains, to maintain the desired clear heights. The Contractor shall consult with the other trades and facilitate the erection of the equipment and piping.
- I. Run piping straight and as direct as possible, in general forming right angles with or parallel to walls or other piping. Risers shall be erected plumb and true.
- J. After cutting, all pipes shall be reamed out to full bore and before erection the inside of all pipes shall be thoroughly cleaned.
- K. No piping or work shall be concealed or insulated until all required tests have been satisfactorily completed and work has been approved by the Commissioner and all other authorities having jurisdiction.
- L. Expansion loops and anchors shall be provided on all hot water and hot water circulation mains. Expansion loops shall be made with four elbows and three lengths of pipe, except as otherwise noted on the drawings. All loops shall be prestressed.

3.3 INSTALLATION OF SANITARY AND VENT PIPING

- A. Couplings: Apply standard and heavy duty couplings as specified.
- B. Gaskets: Install gaskets in accordance with manufacturer's recommendations for the use of lubricants, cements, and other special installation requirements.
- C. Joint Adapters: Make joints between cast iron pipe and other types of pipe with standard manufactured cast iron adapters and fittings.
- D. Cleaning Piping:
 - 1. Clear the interior of pipe of dirt and other superfluous material as the work progresses.
 - 2. Place plugs in the end of uncompleted pipe at the end of the day or whenever work stops.

E. Test Plugs:

1. Provide test plugs in floor drains and roof drains at the time of installation.
2. Leave test plugs in place for the duration of construction until sewer or drainage system is complete.

F. Expansion:

1. Provide a vertical expansion joint at each connection to roof drain unless an offset is provided.
2. Where piping crosses building expansion joints, provide expansion joints to allow for building movement.
3. Refer to Section 22 30 00 for additional requirements.

G. Vent Flashing:

1. Provide 4 lb. sheet lead (24" x 24" minimum).
2. Extend lead 5" above the vent and turned down into vent pipe.

H. Vent Location: Do not install vents within 2 ft. of roof edge, parapet, wall line, or an "on-the-roof structure" or within 10 ft. of any air intake.

I. The size of storm, soil, waste, water, and vent piping shall be as determined by the local rules and regulations for plumbing and drainage, except where specifically noted to be larger by the Specifications or plans; and all fixed rules of installation as set forth in the Rules and Regulations shall be followed as part of the Specifications.

J. The Contractor shall examine carefully the architectural plans and details and familiarize himself with all conditions relative to the installation of piping, particularly where same is concealed behind furring or in hung ceilings. In no case shall the Contractor permit his pipes to be exposed beyond finished plaster lines unless specifically shown on Drawings. He shall consult with the other trades in the building and install his piping in such a way as to least interfere with the installation of other trades. All piping installed in finished areas shall be completed concealed within hung ceilings, furrings, soffits, pipe spaces, etc.

K. Branch connections of the drainage systems shall be made with "Wye" and long "Tee-Wye" fittings, short 1/4" bends, common offsets and double hubs will not be permitted. Short "Tee-Wye" fittings are to be used in vertical piping only.

L. Piping shall be installed, whether indicated or not, so as to clear any and all conduits, lighting fixtures, ductwork and heating mains, to maintain the desired clear heights. The Contractor shall consult with the other trades and facilitate the erection of the equipment and piping. Gravity systems shall have priority.

M. Run piping straight and as direct as possible, in general forming right angles with or parallel to walls or other piping. Risers shall be erected plumb and true.

N. After cutting, all pipes shall be reamed out to full bore and before erection the inside of all pipes shall be thoroughly cleaned.

O. No piping or work shall be concealed or insulated until all required tests have been satisfactorily completed and work has been approved by the Commissioner and all other authorities having jurisdiction.

- P. Cleanouts shall be provided at foot of all stacks, all changes of directions, at the ends of branch runs where shown, every 50'-0" and as required by Code, and shall be terminated as described under cleanouts.
- Q. The house drains must be run at a minimum grade of 1/8" per foot downward in the direction of flow. Wherever possible, a 1/4" per foot pitch shall be maintained. Branch connections to stacks from fixtures shall pitch 1/4" per foot where possible. Attention is again called to the necessity of maintaining the ceiling heights established. All piping installed in finished areas shall be completed concealed within hung ceilings, furrings, soffits, pipe spaces, etc.
- R. Furnish and install complete systems of ventilating pipes from the various plumbing fixtures and other equipment to which drainage connections are made. Ventilating pipes shall be connected to the discharge of each trap and shall be carried individually to point 6" above the ultimate overflow level of the fixture before connecting with any other vent pipe; in general, this will be approximately 3'-6" above the finished floor. Branches shall be arranged to pitch back to fixtures.
- S. The individual vent pipes shall be collected together in branch vent lines and connected to vent stacks, in general paralleling soil and waste stacks. Wherever possible, vent stack offsets shall be made with 45 degree fittings. The heels of vent stacks shall be connected to adjacent soil stacks for purpose of draining condensation where possible. The waste of a fixture shall be connected to the base of each vent stack for the purpose of washing out any scales or dirt which may accumulate, or the soil stack shall be used to wash out the heel of the vent.
- T. The tops of all soil and waste stacks shall be extended as additional ventilating pipes. The tops of all ventilating stacks shall run independently through the roof. Pipes smaller than 4" size shall be increased to 4" by means of approved increasers before passing through the roof slab.
- U. Vent piping sized less than 1½" will not be allowed, even if shown on the drawings or permitted by Code.
- V. All open vent pipes that extend through a roof shall be terminated at least 24 inches above the roof, except that where a roof is to be used for any purpose other than weather protection or maintenance, the vent extension shall be run at least 7 feet above the roof.

3.4 INSTALLATION OF STORM DRAINAGE PIPING (ABOVE GROUND WITHIN BUILDING)

- A. Couplings: Use heavy-duty couplings on all no hub storm piping above grade. Do not use no hub couplings on piping more than 20 feet below the drain fixture unless offsets are made down through buildings in no more than 20 feet increments. Utilize galvanized steel pipe with screwed or grooved mechanical fittings.
- B. Gaskets: Install gaskets in accordance with manufacturer's recommendations for the use of lubricants, cements, and other special installation requirements.
- C. Joint Adapters: Make joints between cast iron pipe and other types of pipe with standard manufactured cast iron adapters and fittings.
- D. Cleaning Piping:
 - 1. Clear the interior of pipe of dirt and other superfluous material as the work progresses.
 - 2. Place plugs in the end of uncompleted pipe at the end of uncompleted pipe at the end of the day or whenever work stops.

- E. Test Plugs:
 - 1. Provide test plugs in floor drains and roof drains at the time of installation.
 - 2. Leave test plugs in place for the duration of construction.
- F. Roof Drains:
 - 1. Install drains on the center line of roofing reinforcement.
 - 2. Clamp flashing into drain flashing collar.
 - 3. Install domes immediately after completion of roof installation.
- G. Expansion:
 - 1. Provide a vertical expansion joint at each connection to roof drain unless an offset is provided.
 - 2. Where piping crosses building expansion joints, provide expansion joints to allow for building movement.
 - 3. Refer to Section 22 30 00 for additional requirements.
- H. Cleanouts shall be provided at foot of all stacks, all changes of directions, at the ends of branch runs where shown, every 50'-0" and as required by Code, and shall be terminated as described under cleanouts.
- I. The house drains must be run at a minimum grade of 1/8" per foot downward in the direction of flow. Wherever possible, a 1/4" per foot pitch shall be maintained. Branch connections to stacks from fixtures shall pitch 1/4" per foot where possible. Attention is again called to the necessity of maintaining the ceiling heights established. All piping installed in finished areas shall be completed concealed within hung ceilings, furrings, soffits, pipe spaces, etc.
- J. Piping shall be installed, whether indicated or not, so as to clear any and all conduits, lighting fixtures, ductwork and heating mains, to maintain the desired clear heights. The Contractor shall consult with the other trades and facilitate the erection of the equipment and piping. Gravity piping shall have priority.
- K. Run piping straight and as direct as possible, in general forming right angles with or parallel to walls or other piping. Risers shall be erected plumb and true.
- L. After cutting, all pipes shall be reamed out to full bore and before erection the inside of all pipes shall be thoroughly cleaned.
- M. No piping or work shall be concealed or insulated until all required tests have been satisfactorily completed and work has been approved by the Commissioner and all other authorities having jurisdiction.
- N. Branch connections of the drainage systems shall be made with "Wye" and long "Tee-Wye" fittings, short 1/4" bends, common offsets and double hubs will not be permitted. Short "Tee-Wye" fittings are to be used in vertical piping only.
- O. Connection to roof drain shall be installed in conjunction with the roofing called for under another Division or Section of these Specifications and at such times as designated by this Contractor, so that the building is adequately protected during construction from damage by storm water. All piping shall be adequately and properly supported, and all joints shall be made up as hereinafter specified.

END OF SECTION

SECTION 22 21 23**NATURAL GAS SYSTEMS****PART 1 - GENERAL****1.1 WORK INCLUDED**

- A. Furnish and Install:
 - 1. Natural gas piping.
 - 2. Valves and specialties.
 - 3. Meter.
- B. Gas Meter: Provide gas meter piping and spool piece in accordance with utility requirements. The gas meter will be provided by the Gas Utility Company. Gas piping from street service to start of owners piping shall be by utility.

1.2 SUBMITTALS

- A. Manufacturer's Product Data: Submit for:
 - 1. Gas cocks.
 - 2. Gas meter.
 - 3. Gas piping.

PART 2 - PRODUCTS**2.1 NATURAL GAS PIPING**

- A. 2 Inches and Smaller: Schedule 40 black steel with 150 lb. malleable iron threaded fittings.
- B. Over 2 Inches: Schedule 40 black steel with standard weight steel butt weld fittings and welded joints.
- C. All piping within return air plenums or concealed (inaccessible) in building construction shall be Schedule 40 black steel with standard weight steel butt weld fittings and welded joints.
- D. Natural gas piping shall meet local code and Con Edison guidelines.
- E. Steel pipe shall be Schedule 40 steel pipe with maker's name rolled in the metal. Pipe three inches in diameter and larger shall be seamless.
- F. All shoulder nipples shall be made of extra heavy pipe, no close nipples shall be accepted.
- G. All welding of gas distribution piping shall be subject to special inspection provisions of the New York City Code. Contractor shall provide engineer to complete inspections and file with the Department of Buildings.

2.2 GAS COCKS

- A. Description: Corrosion-resistant plug, permanently lubricated, corrosion-resistant bearings, suitable seals for intended service, lever operator.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Remove cutting and threading burrs before assembling piping.
- B. Do not install defective piping or fittings.
- C. Do not use pipe with threads which are chipped, stripped or damaged.
- D. Use teflon tape on male pipe threads.
- E. Plug each gas outlet, including valves with a threaded plug or cap, immediately after installation, and retain until continuing piping or equipment connection is completed.
- F. Do not install any valves or unions inside concealed areas or above ceiling in building.
- G. Vent gas PRV's and regulators outside the building in accordance with local code. Each device shall be vented independently.
- H. Where installed above accessible ceiling, indicate location of solenoid valves with a visible label.

3.2 TEST

- A. Prior to initial operation, test and purge fuel gas piping in accordance with local code requirements and the National Fuel Gas Code.
 - 1. Test at 65 psig minimum.
 - 2. Repair or replace piping as required to eliminate leaks, and re-test.

END OF SECTION

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 - GENERAL**1.1 SUBMITTALS**

A. Submit manufacturer's product data for the following:

1. Pumps.
2. Sump Basins.
3. Startup report for gas fired heaters.
4. Warranty and service policies.
5. Escutcheons.
6. Traps.
7. Dissimilar Metals.
8. Pipe Sleeves.
9. Stack Sleeves.
10. Unions.
11. Water hammer arrestors.
12. Hose Bibbs.
13. Wall Hydrants.
14. Thermometers.
15. Pressure Gauges.
16. Vacuum Breakers.
17. Fixed air gaps.
18. Flow control fittings.
19. Drains.
20. Cleanouts.
21. Tie-rods.

PART 2 - PRODUCTS**2.1 PUMPS**

A. General:

1. Statically and dynamically balance rotating parts.
2. Construction shall permit complete servicing without breaking piping or motor connection.
3. Pumps operate at 1750 rpm unless scheduled otherwise.
4. Pump connections shall be flanged.
5. For duplex sump pumps/sewage ejectors provide a remote mounted alternating panel.

B. In-Line Circulating Pumps:

1. Manufacturers:
 - a. Design Basis: Bell & Gossett.
 - b. Other Acceptable Manufacturers:
 - 1) Armstrong
 - 2) Taco
2. Description:
 - a. Type: In-line circulating pumps.
 - b. Casing: Bronze for 125 psi working pressure.

- c. Impeller: Bronze.
- d. Shaft: Steel with copper sleeve or stainless steel.
- e. Bearings: Oil lubricated, bronze, sleeve.
- f. Seal: Carbon rotating against a stationary ceramic seat, rated for 225°F.

C. Sewage Ejectors – Submersible Type

- 1. Manufacturers:
 - a. Design Basis: Zoeller
 - b. Other Acceptable Manufacturers:
 - 1) Weil
 - 2) Aurora
 - 3) Hydromatic
 - 4) Pacific
 - 5) Swaby
- 2. Motor: Submersible
- 3. Motor Shell: Cast iron, finned, with lifting handle
- 4. Shaft: Stainless steel
- 5. Power Cable: Neoprene jacket
- 6. Bearings: Pre-lubricated ball bearing
- 7. Seal: Mechanical
- 8. Impeller: Phenolic
- 9. Control: Mechanical Float

D. Sump Basins:

- 1. Acceptable Manufacturers:
 - a. AK Industries.
 - b. Topp Industries.
 - c. Fiberbasin Incorporated.
- 2. Material: Fiberglass reinforced polyester.
- 3. Minimum Wall Thickness:
 - a. At Flange: 1/2"
 - b. At Hubs: 3/8"
 - c. Other Areas: 3/16"
 - d. Top flange to be extended for support to suspend unit from structural slab.
- 4. Connections: To accommodate piping shown on drawings.
- 5. Cover Attachment: Tapped bronze inserts in flange for bolt down cover.
- 6. Size: As shown on drawings, or, if not shown, of size determined by pump manufacturer.
- 7. Basin Cover:
 - a. Material: Steel.
 - b. Provision for Lifting: Ring or handle.
 - c. Cut-Outs: For removal of cover without disturbing piping or wiring.

2.2 PIPE EXPANSION COMPENSATORS

- A. Any breaks or damage to the piping system or to the Work of other Sections within the period of the guarantee due to improper provision for expansion and contraction must be replaced at this Contractor's expense.
- B. This Contractor is to provide for expansion of pipes by providing expansion compensators and/or expansion loops and shall provide anchors at pump discharge and suction line. All expansion loops shall be pre-stressed.

- C. Make adequate provisions for proper expansion and contraction of piping. At connections of branches to water mains, risers and at connections to heaters, coolers and other equipment, provide sufficient number of elbow swings to allow for proper expansion and contraction of piping. Provide adequate elbow swings, expansion compensators, expansion loops or approved type extension joints, wherever noted, indicated, or required to allow for proper expansion and contraction of mains and risers.
- D. This Contractor shall provide, where necessary to absorb expansion and contraction in hot water recirculation, pipe lines (except at building expansion joints) 3 inches and smaller and for system pressure less than 50 psi, Flexonics Model HP expansion compensators having two-ply phosphor bronze elbows and brass shrouds and end fittings, as manufactured by U.O.P. Flexonics Division, Bartlett, Illinois. All internal parts shall be of non-ferrous metals. Service pressure shall be external to the bellows. Compensators shall have integral guides extending the full length of the bellows travel. Compensators shall have external positive anti-torque devices to prevent twist.
- E. This Contractor shall provide as shown on the plans and/or where necessary to absorb expansion and contraction in hot, hot water recirculation and larger and for system pressures exceeding 50 psi, Flexonics controlled-flexing expansion joints as manufactured by U.O.P. Flexonics Division, Bartlett, Illinois, or approved equal, with plate steel flanges having ANSI drilling, pipe nipple ends beveled for welding, by hydraulically formed from a stainless steel reinforcing neck ring and control rings shall be of a design to limit movement of each corrugation, as well as to carry hoop stresses caused by internal pressures. Where required, the bellows shall be annealed and/or stress relieved. Before assembly, the corrugated bellows must be pickled to remove all scale formed by annealing and passivated to provide that maximum corrosion resistance.
- F. All lines in which expansion joints are installed must be securely anchored and guided in accordance with Manufacturer's recommendations.
- G. Provide expansion loops/joints in all hot water and hot water circulating piping which exceeds 60 feet developed length, horizontally or vertically without offsets, and as indicated on the drawings.

2.3 ESCUTCHEONS

- A. This Contractor shall provide escutcheons on all exposed pipe wherever they pass through floors, ceilings, walls or partitions.
- B. Escutcheons for pipes passing through outside walls shall be Ritter Pattern and Casting Co., No. 1, solid, cast brass, flat type secured to pipe with set screws.
- C. Escutcheons for pipes passing through floors shall be Ritter Pattern and Casting Co., No. 36A, split hinged, cast brass chromium plated type.
- D. Escutcheons for pipes in unfinished areas shall be cast iron, secured with set screws.

2.4 TRAPS

- A. Each fixture and piece of equipment requiring connection to the drainage system shall be separately trapped by means of a water seal trap placed as close to the fixture as possible.

- B. All running traps on drains, etc., shall have inlet handhold cleanouts and brass plug cleanouts in bottom. Cast iron trap in ground shall have bottom plug omitted. All exposed P traps shall have bottom cleanouts and shall be chromium plated brass.

2.5 UNIONS

- A. Where required: On inlet and outlet of all apparatus and equipment having connections 2" and smaller. Where valves are adjacent to equipment unions shall be on downstream side of valves.
- B. Type:
 1. Steel piping: Malleable iron, WOG female pattern, brass seat, ground joint, 300 lb.
 2. Copper tubing: Ground joint, 150 lb. WOG pattern.
 3. For piping over 2" flanged joints to be used.
- C. Gaskets shall be 1/16" thick similar to Garlock or Cranite factory cut, one piece.

2.6 HOSE BIBBS

- A. Hose bibbs shall be Chicago Faucets #952, MIFAB #HY-9241, or approved equal, with vacuum breaker and loose key except as specified herein. Combination hot and cold hose bibbs shall be Chicago #305-VBC.P., MIFAB #HY-8500, or approved equal; modify for piped mounting less loose flange.

2.7 WALL HYDRANTS

- A. Provide 3/4" non-freeze wall hydrants where indicated on Drawings. Wall hydrants shall be Zurn A-1315, MIFAB MHY-15 or approved equal, all bronze with bronze working parts throughout, renewable nylon seat, nickel bronze face.

2.8 THERMOMETERS

- A. Thermometers shall be the adjustable angle, red reading mercury type with 7" black baked enamel case, black on white scale, range from 30°F. to 240°F., and separable brass socket. Thermometers shall be so installed and adjusted that they are easily readable from a normal standing position on the floor, U.S. Gauge "Multi-angle".

2.9 PRESSURE GAUGES

- A. Pressure gauge shall have 3-1/2" diameter black enamel cast aluminum case threaded brass ring with heavy glass, phosphor bronze bushed rotary precision movement and dial range of 0 to 200 psi for water service; Trerice Co. No. 500X or approved equal, with brass tee handle cock.

2.10 FIXED AIR GAPS

- A. Provide where indicated on the Drawings or required by Code (Kitchen) a fixed air gap to prevent contamination due to back flow in the stationary drain line. Air gap shall be Zurn No. Z-1025 or MIFAB MI- CAG to suit piping installation. Finish shall match piping connection.

PART 3 - EXECUTION**3.1 IN LINE CIRCULATING PUMPS**

- A. Install pumps to allow complete removal without dismantling connecting piping. Provide air cock and drain connection on horizontal pump casings.
- B. Provide line sized gate valve and strainer on suction and line sized soft seated check valve and globe valve or plug valve on discharge.
- C. Support pump and piping so that weight of pipe is not carried on pump casing. Additionally, support such that neither pump nor piping is supported by associated equipment.
- D. Provide manual switch and aquastat where required.
- E. Verify motor position is in accordance with manufacturer's installation instructions.
- F. Provide flexible connection for pumps. Provide spring hangers for piping for pump to partition or wall penetration.

3.2 SEWAGE EJECTION PUMPS

- A. Provide union in discharge piping above floor.
- B. Provide gate valve above floor.
- C. Provide lift check valve close to pump discharge.
- D. Install and adjust float control.
- E. Test pump staging and float operation by flooding pit to simulate operation. Test shall be observed by Engineer or Commissioner.
- F. The alignment of all pumps shall be checked and each pump shall be properly aligned after the piping is completed and before the pumps are placed in service.
- G. Mechanical seals and shaft sleeves shall be replaced by this Contractor without charge in the event the unusual wear of faulty operation occurs during guarantee period.
- H. Where pump's components are or may come in contact, although the materials may basically be similar, use hardness differentials of at least 50 Brinell to prevent seizure and reduce wear.
- I. Provide shaft packing or seals compatible with the pump design, fluid handled and in accordance with the manufacturer's recommendations.
- J. Balance pump's impellers and all other moving components statically and dynamically.
- K. Completely align and level pumps, motors and bases. Where pumps and motors are shipped as a unit, realign them in the field.
- L. Grout equipment base plates completely to provide a rigid-non- deflecting support.
- M. Install and align mechanical seals in accordance with the manufacturer's recommendation.

2.11 DRAINS

- A. Drains shall have heavy cast iron, with double drainage flange and weep holes, with outlet connections as indicated and of sizes indicated on Drawings. Drains (except as noted) shall be furnished with high polished brass tops consisting of one-piece rim secured to the body and vandalproof spanner type screws, solid brass grate with reinforcing members on underside. Removable sediment basket shall be of heavy duty one-piece construction as specified hereinafter. All strainers or grates shall be secured with vandalproof spanner type screws, unless otherwise specified.
- B. All drains in membrane waterproof floor shall be equipped with 6 lb. lead flashing or 20 oz. soft rolled sheet copper and secured to the flashing flange with brass bolts and cast iron clamping device. Flashings shall bond not less than 1'-0" on all sides into membrane waterproofing.
- C. On roofs, furnish and set, in conjunction with the roofer, and when directed by the General Construction Contractor, approved roof drains of cast iron unless otherwise indicated.
- D. Flashing of 6 lb. or 20 oz. soft rolled sheet copper 34" x 34" shall be furnished and installed at each roof drain by means of non-puncturing type flashing clamping device.
- E. Set all drains in such a way that the floor finish and top of the drain will be plumb and flush with finish floor without requirements for future additional extension, modifications, etc.
- F. Provide trap primers in all locations where a hose bib is not shown within 10' of a drain.
- G. All drains, except as noted, shall be similar to or equal to Zurn, J.R. Smith, Josam, Wade or Ancon and shall be as follows:
 - 1. Roof Drains R.D. Type A - Similar and equal to no. Z-100-ERC or MIFAB #R 1200 BUV dura-coated cast iron body with combination flashing collar and gravel stop, cast iron dome, underdeck clamp and sump receiver and perforated extension collar to accommodate roof insulation. Drain must be applicable for each roof construction.
 - 2. Floor Drains F.D. Type A (Mechanical and Concealed Equipment Rooms) - Similar and equal to No. Z-505 or MIFAB #F1340-Y-14-4-F-50 Funnel cast iron body and flashing collar with cast iron tractor grate and flat bottom strainer. No Z-414 cast iron funnel attached to grate where indicated on the Drawings.
 - 3. Floor Drains F.D. Type C (Kitchen/Bathroom) - Similar and equal to No. Z-525 or MIFAB #F1100 C S8-1 cast iron body, flashing collar, adjustable square nickel bronze top, flat bottom strainer.
 - 4. Floor Drains:
 - a. Refer to Architectural drawings for exact locations and additional installation requirements.
 - b. Install floor drains with P-traps and vent as required.
 - c. Install drains on the center line of sheet lead pan and/or membrane in waterproofed areas and in floors above lowest floor.
 - d. Clamp pan and/or membrane into drain flashing collar.
 - e. Install strainers immediately after completion of finish floor installation.
 - f. Coordinate locations with mechanical equipment.
 - g. Install trap primers at all drains where a hose bib is not shown within 10' of drain.

- N. Provide water supply for cooling and lubrication of seals and/or packing where required.
- O. Provide flexible connection for pumps. Provide spring hangers for piping for pump to partition or wall penetration.
- P. Pump operation must be stable without pulsation, vibration or internal recirculation. Pump operating characteristic curves must meet the following requirements:
 - 1. The pump operating point must fall on or below an impeller diameter curve which is not more than 85% of the maximum diameter impeller which can satisfactorily operate in the casing.
 - 2. The pump operating point must fall below the point of no flow head pressure.
 - 3. Pump operating point must be to the right of the midpoints of the peak efficiency curves. Selected efficiency shall be not more than 3% points below maximum efficiency.
 - 4. A 10% increase in head pressure over the specified will result in not more than a 20% reduction in GPM and will not affect the stability of the pump
- Q. Where initial and ultimate operating conditions are specified, these shall be achievable by changing the pump impeller with no modifications to the casing.
- R. Upon completion of the installation, test all equipment under field operating conditions to demonstrate capability of the equipment to meet specification requirements.
- S. Submit results of factory tests with the equipment shop drawings. Include result of factory and field tests in the Instruction Manual.
- T. Perform field tests to demonstrate the ability of the pumping equipment to meet contract requirements. Compile and certify the following data:
 - 1. Water flow, GPM, at rated head.
 - 2. Shutoff head.
 - 3. Operating kilowatts for measured voltage, amperes, power factor.

3.3 DRAINS

- A. Contractor shall protect drains immediately upon installation. Drain grates shall be covered throughout construction to prevent construction debris from entering the drainage system.
- B. Contractor shall test all drains just prior to turnover to confirm all drains, traps and pipes are clear and draining properly.
- C. Drains, traps and pipes that are found to be clogged upon testing shall be cleaned and/or replaced, water jetted and scoped by a camera immediately, at no additional cost to the City of New York.
- D. The contractor shall be responsible for a set period of time after project completion to clean drains, traps and pipes that do not appear clogged upon testing.

END OF SECTION

This Page Intentionally Left Blank

SECTION 22 40 00**PLUMBING FIXTURES****PART 1 - GENERAL****1.1 SUBMITTALS**

- A. Submit manufacturer's product data for plumbing fixtures and accessories.

PART 2 - PRODUCTS**2.1 GENERAL**

- A. All manufacturers are listed in alphabetical order and not by preference.
- B. All fixtures shall be as specified by Commissioner. Fixture selections by Commissioner shall supersede those listed in this section.
- C. Provide factory fabricated fixtures.
- D. Provide trim, carriers, valves and accessories as required for complete installation. All carriers are floor mounted unless otherwise noted. All carriers shall be bolted down to floor structure.
- E. Comply with Local, State and Governing ordinances concerning maximum water requirements of plumbing fixtures: Tank type W.C. and flush valve type W.C. = 1.6 gal./flush; lavs = .5 GPM; urinals = 1.0 gal./flush and showers = 2.5 GPM.
- F. All fixtures used for potable water service should be compliant with NSF-61.

2.2 PLUMBING FIXTURES

- A. All fixture trimmings, including faucets, strainers, escutcheons, shower head and arm, water closet supplies, stops, waste trap, escutcheons, visible hanger or chair carrier nuts shall be made of brass and shall be polished chromium plated. All material to be specified as chromium plated and shall be thoroughly and evenly applied and guaranteed not to strip or peel. All chromium plating on plumbing fixture trim shall be in accordance with Federal Spec. WW-P-541b for grade "R" plating. Manufacturer shall submit certification that all chrome plating on finished trim meets aforementioned Federal Specification. All plated work shall be highly buffed. Plastic, zinc or white metal will not be approved.
- B. All fixtures shall be free from imperfections, true as to line, angles, curves and color, smooth, watertight, nameplate in every respect and practically noiseless in operation. Fixtures as specified are given as a typical standard and they or other approved fixtures shall be furnished, set and connected in good substantial, neat and workmanlike manner.
- C. All fixtures, specified to be vitreous ware, shall be fixed vitreous china ware of the best quality, non-absorbent and burned so that the whole mass is thoroughly fused and vitrified, producing a material white in color which, when fractured, will show a homogenous mass, close grained and free from pores. The glazing and vitreous china fixtures shall be white, thoroughly fused and united to the body, without discoloration, chips, or flaws, and shall be free from craze. Warped or otherwise imperfect fixture will not be acceptable.

- D. Each supply fixture, casework fixture and equipment, shall be separately controlled by its own stops. Locate as required on wall, above floor or as directed.
- E. All faucets shall have metal handles.
- F. All trim shall be permanently stamped with manufacturer's identification and visible after installation.
- G. All fixtures, faucets, flush valves, etc., are to be ADA compliant, unless specifically noted otherwise.
- H. Exposed diaphragm type, chrome plated flush valve. Valves will have paraflow diaphragm kit for flush discharge adjustment. Valve will be a non-hold open, and have no external volume adjustment. Valve will have ADA compliant handle, back check control stop will have a sweat solder adapter kit with cast set screw with flange. Valve body, cover, tailpiece and control stop will be in conformance with ASTM alloy classification. Valve will be in compliance with applicable sections of ASSE 1037 and ANSI A117.1 requirement for people with disabilities.

2.3 P-1 WATER CLOSETS

- A. Fixture by Commissioner
- B. Flush Valves:
 - 1. Diaphragm Type
 - a. Sloan Model: 111-ES-S Low Consumption.
- C. Exposed diaphragm type, chrome plated flush valve. Valves will have paraflow diaphragm kit for flush discharge adjustment. Valve will be a non-hold open, and have no external volume adjustment. Valve will have ADA compliant handle, back check control stop will have a sweat solder adapter kit with cast set screw with flange. Valve body, cover, tailpiece and control stop will be in conformance with ASTM alloy classification. Valve will be in compliance with applicable sections of ASSE 1037 and ANSI A117.1 requirement for people with disabilities.

2.4 WATER CLOSET SEATS

- A. Acceptable Manufacturers:
 - 1. Bemis
 - 2. Centoco
 - 3. Church
 - 4. Olsonite
- B. Construction: Unless otherwise specified seats shall be heavy duty solid plastic, white with open front, concealed self sustaining check hinge less cover. Seat shall have an antimicrobial compound as an integral part of the plastic and shall match shape of bowl (elongated or regular).

2.5 P-2 URINALS

- A. Flush Valves
 - 1. Diaphragm Type
 - a. Sloan Model 186-1.0-ES-S Low Consumption

- 3. Supplies
 - 4. P traps, standard and/or offset
 - 5. Escutcheons
- B. All fixture trimmings, including faucets, strainers, escutcheons, shower head and arm, water closet supplies, stops, waste trap, escutcheons, visible hanger or chair carrier nuts shall be made of brass and shall be polished chromium plated. All material to be specified as chromium plated and shall be thoroughly and evenly applied and guaranteed not to strip or peel. All chromium plating on plumbing fixture trim shall be in accordance with Federal Spec. WW-P-541b for grade "R" plating. Manufacturer shall submit certification that all chrome plating on finished trim meets aforementioned Federal Specification. All plated work shall be highly buffed. Plastic, zinc or white metal will not be approved.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install each fixture with P trap with cleanout plug, easily removable for servicing and cleaning.
- B. Provide chrome plated, rigid supplies to fixtures with stops, reducers and escutcheons. Flexible supplies will not be permitted.
- C. Finish wall and floor penetrations when exposed to view in finished areas with set screw type, chrome plated brass escutcheons.
- D. Set plumbing fixtures level and plumb, spaced in accordance with architectural dimensioned drawings, and securely install to be rigid. Install wall mounted lavatories, urinals and water closets with wall carriers mounted to the floor. Solidly attach floor mounted carriers for all fixture to floor using proper fasteners based on floor construction. Securely anchor flush valves behind or within walls to be rigid and not subject to movement due to push or pull action on the valve.
- E. Cover fixture bolts with china bolt caps of the same color where required.
- F. All wall mounted fixtures to be caulked between fixture and wall.
- G. Refer to Architectural drawings and ADA standards for fixture mounting heights.
- H. The Contractor shall make all plumbing connections to all equipment and fixtures requiring such connections as shown on Drawings whether the equipment and fixtures are furnished under this Section or other Divisions or Sections. Investigate the equipment furnished under other Divisions or Sections to determine if combination fittings have a means of shutoff or required the installation of check valves, backflow preventors and/or pressure reducing valves. Make final connections to such, including installations of all special traps, supplies, control valves, etc. furnished with such equipment, and furnish all material necessary that is not supplied with the equipment.
- I. The Contractor shall leave valved water connections in equipment spaces and other locations where shown for the use of other trades or other Sections. On each valved outlet for equipment with submerged inlets, provide a backflow preventor after the shut-off valve.

b. Zurn

- B. Exposed diaphragm type, chrome plated flush valve. Valves will have paraflow diaphragm kit for flush discharge adjustment. Valve will be a non-hold open, and have no external volume adjustment. Valve will have ADA compliant handle, back check control stop will have a sweat solder adapter kit with cast set screw with flange. Valve body, cover, tailpiece and control stop will be in conformance with ASTM alloy classification. Valve will be in compliance with applicable sections of ASSE 1037 and ANSI A117.1 requirement for people with disabilities. Sloan Royal 186, exposed, chrome plated flush valve, 3/4" screw driver angle stop protective cap, set screw escutcheon, adjustable tailpiece, vacuum breaker.
- C. Provide Zurn Z-1222 or MIFAB MC – 32 carrier with block feet bolted into construction.

2.6 P-3 LAVATORIES

- A. Fixture by Commissioner.
- B. Faucets :
 - 1. American Standard Model 2275.509
- C. Provide offset P traps on all ADA lavatory installations.
- D. (Pair) 1/4" offset threaded tailpieces.
- E. (Pair) 3/8" SPS wall supplies with loose key stops with cast brass set screw escutcheons.
- F. 1-1/4" x 1-1/2" chrome plated cast brass "P" trap with cleanout plug.
- G. 1-1/2" SPS chrome plated brass trap nipple and cast brass set screw escutcheon.
- H. Supported on Zurn ZX-1231 or MIFAB MC – 41 (250 - lbs - load) concealed chair carrier with concealed arms and block feet bolted into construction.
- I. All exposed piping serving plumbing fixtures that may be used for ADA purposes shall have traps and supplies insulated per ADA requirements.

2.7 STAINLESS STEEL SINKS

- A. Fixture by Commissioner.
- B. Trap: 1½" adjustable, cast brass.
- C. Stops: Loose key, ½" FPT, flexible supply, flange.
- D. Provide chrome plated brass tailpiece and grid strainer.

2.8 EQUIPMENT FURNISHED UNDER OTHER SECTIONS

- A. Provide all materials necessary to make final connections to equipment furnished under other Sections of these Specifications including:
 - 1. Tail pieces
 - 2. Stops

- J. Fixture supplies and traps as specified, shall be chrome plated brass, where exposed to view. Where concealed from view in cabinets, etc., they may be rough brass. All fixture supplies shall have stops.
- K. As soon as installed, all metal fixture trimming shall be thoroughly covered by this Contractor with noncorrosive grease which shall be maintained until all construction work is completed.
- L. Upon completion of the Work, test flush valves and faucets for leaks or drips and adjust same for quiet operation.
- M. All fixtures shall be left thoroughly clean. All plated or polished fittings, pipes and appliances shall be coated with non corrosive grease, immediately after installation, and shall be finally polished and free from all marks and foreign substances.
- N. Equipment and all connections shall be in accordance with the rules relative to submerged inlets, and shall be provided with all necessary vacuum breakers and check valves, in accordance with the applicable codes.
- O. Connection between any fixture with a floor outlet and the flange shall be made with an approved prepared gasket that shall be a germicide, absolutely gas and fumeproof, watertight, stain-proof, containing neither oil nor asphaltum, and which will not rot, harden or dry under any extreme of climate change, and must adhere on wet surfaces.
- P. Each fixture shall be separately trapped, using the type and size of trap called for specifically in the Specifications, or the type required by the Plumbing Code. The traps shall be approved type.
- Q. All fixtures requiring hot and cold water shall have the cold water faucet on the right hand side of the fixture and the hot water faucet on the left hand side of fixture.
- R. The Contractor shall be responsible for protecting against injury from the building materials, acids, tools and equipment, all plumbing fixtures equipment, etc., provided under Plumbing Work Sections.
- S. No slip joints will be permitted on water piping.
- T. Double compartment sinks or lavatories shall be provided with faucet, trap, supplies, etc., for each compartment.
- U. Funnel drains and/or floor drains shall be provided for the air conditioning, heating and refrigeration work.

3.2 CLEANING AND ADJUSTING

- A. Cleaning:
 - 1. Clean strainers, traps, aerators, and valves of debris, sand and dirt.
 - 2. At completion, thoroughly clean plumbing fixtures and equipment.
 - 3. All fixtures shall be left thoroughly clean. All plated or polished fittings, pipes and appliances shall be coated with Vaseline, immediately after installation, and shall be finally polished and free from all marks and foreign substances.

B. Adjusting:

1. After cleaning and flushing operations are accomplished, adjust flush valves, faucets, showers, bubblers for proper flow.

3.3 PROTECTION

- A. Protect fixtures and related components from damage before, during, and after installation to date of Final Acceptance or City of New York move-in. Provide protective coverings or other protection as required.
- B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit.
- C. Feasibility and match to be judged by Commissioner.
- D. Remove cracked or dented units and replace with new units.
- E. Contractor shall be responsible for replacing damaged fixtures or components.

3.4 SERVICES TO FIXTURES AND EQUIPMENT FURNISHED UNDER OTHER SECTIONS

- A. The list of equipment for the project shall be reviewed by this Contractor, who shall include in the Contract price the costs for installing all equipment as herein specified and as claimed by the Trade Unions as Plumbing Work.
- B. Refer to Architectural and Plumbing Drawings for exact locations of equipment and fixtures. Provide all materials, equipment and appliances necessary and required to complete the installation of all Hospital casework and equipment, including but not limited to the following: plumbing, roughing and final connections, valves, stops, trim, escutcheons, fittings, traps, etc. Install faucets, trim, etc., furnished with the equipment provided by others.
- C. Unless otherwise detailed on Drawings, roughing of proper size and capacity for equipment indicated on Architectural, Heating and Ventilation, Plumbing or Electrical Drawings or provided under another Division or Section shall be provided and installed in such a manner and location that final connection can be made with a minimum of work and without cutting patching permanent walls, partitions, ceilings or floors. Drawings are of necessity, schematic, for special equipment as exact roughing and requirements may vary with different manufacturers.

END OF SECTION

SECTION 22 90 00**PROJECT CLOSEOUT****PART 1 – GENERAL****1.1 WORK INCLUDED**

- A. The contractor shall summarize and document adherence with the requirements of the specifications for project closeout including:
 - 1. Copies of all warranties
 - 2. Operation & Maintenance Manuals
 - 3. Required tests
 - 4. Test and balance reports
 - 5. Record drawings
 - 6. Permit requirements
 - 7. Valve tag list
- B. The contractor shall compile a closeout manual which shall include:
 - 1. A list of all required tests and a place for signoff of date completed.
 - 2. A list of all submittals with dates of acceptance by the engineer.
 - 3. A schedule indicating dates for beginning testing and startup of equipment and dates of tests to be witnessed by the engineer, or designated representative, as required by the specifications.
 - 4. Test procedures to be used for life safety systems.
 - 5. Project close out check list.
- C. The final closeout manual shall include the following:
 - 1. Test reports as required by the specifications with signoff by the appropriate individual (engineer, architect, building official, etc.).
 - 2. Documentation indicating all equipment is operating properly and is fully accessible for maintenance.
 - 3. Copies of all warranties.
- D. This section only includes the requirements for documentation of the contract documents, by the contractor, for project completion. This section does not in any way decrease the scope of any of the drawings or specifications.

1.2 SUBMITTALS

- A. Within 90 days after notice to proceed submit a preliminary closeout manual with the following:
 - 1. A list of all required tests.
 - 2. Preliminary schedule showing major milestones for completion of the plumbing systems.
- B. Within 30 days of the first major milestone submit the completed closeout manual as described in Part 1.
- C. Within 2 weeks of substantial completion submit a completed "Project Closeout Check List", and the Final Closeout Manual.

D. Listed below is a checklist for use by the contractor. This list is not all inclusive for this project.

Project Close-Out Summary – Plumbing

- ☐ All required submittals have been submitted and either been approved or modified in accordance with the Engineer's "make corrections noted" comments.
- ☐ All equipment has been started up and is functioning within manufacturers' recommendations without any undue noise or vibration. (Submit a list of equipment with startup dates. Provide list at a point 65% into construction schedule).
- ☐ All vibration isolation has been installed and is operating properly.
- ☐ Access doors have been installed as required for concealed equipment, water hammer arrestors, valves, controls, actuators, etc.
- ☐ All equipment has been installed with the manufacturers recommended service clearances and is fully accessible for required maintenance.
- ☐ All equipment and piping is labeled per specifications.
- ☐ All gas and plumbing piping cleaned, flushed and tested per specifications. Submit testing reports for record. Submit letter stating domestic water disinfection (chlorination) has been completed per the specifications.
- ☐ All action items are complete as listed in the action items reports. Submit a list of action items with sign off by Commissioner for record. Punch list to be completed prior to turn over of building.
- ☐ Contractor to test all drains to verify that they are clear and draining properly upon project completion.
- ☐ Operation and maintenance manuals submitted with table of contents and required documentation for extended warranties.
- ☐ Factory Testing documented and submitted for record.
- ☐ Record drawings submitted per specifications.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 EQUIPMENT STARTUP AND TESTING

- A. Prior to completion and punchlist by the engineer, the contractor shall startup and test each piece of equipment as required by the specifications. The contractor shall provide documentation of all required tests with signoff of by the appropriate individual (engineer, commissioner, and building official).

3.2 COORDINATION WITH OTHERS

- A. The Division 21 through 23 contractor shall coordinate his requirements with the General Contractor to ensure the other building systems are completed to the point that they will not adversely affect the operation of the Division 21 through 23 systems.

END OF SECTION

This Page Intentionally Left Blank