

SECTION 22 00 00  
PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings, Addenda, General Provisions of Contract, including General and Supplementary conditions and General Requirements apply to work specified in this Section.

1.02 ALTERNATES

There are no alternates that apply to this section of the project.

1.03 DEFINITIONS

- A. ADA: Designed to meet the requirements of the Americans with Disabilities Act.
- B. Concealed: Shall mean in walls, in chases, above ceilings, within enclosed cabinets, otherwise enclosed.
- C. Equal: Shall mean essentially the same as that product specified, but a model of a different manufacturer
- D. Exposed: Shall mean in finished spaces, in closets, under counters, behind and/or under equipment and/or otherwise visible.
- E. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- F. Others: Shall mean provided by sections other than this section. If not purposely assumed by another section, shall be provided by the General Contractor.
- G. Materials: Shall mean any product used in the construction, including but not limited to: fixtures, equipment, piping and supplies.
- H. Piping: Shall mean pipe, fittings, hangers and valves.
- I. Provide: Shall mean the furnishing and installing of materials.
- J. Reviewed equal: Shall mean that the Architect or a designated Consultant, not the contractor, shall make final determination whether materials are an equal to that which is specified.
- K. Substitution: Shall mean materials of significantly different physical, structural or electrical requirements, performance, dimensions, function, maintenance, quality or cost, than that specified.

1.04 DESCRIPTION OF WORK

A. Work Included

1. Furnish all labor, materials, equipment, transportation, and perform all operations required to install complete additions and alterations to the plumbing systems in the building, in accordance with these specifications and applicable drawings.
2. Provide the following:
  - a. Sanitary, waste and vent systems
  - b. Domestic hot and cold water system
  - c. Storm water system modifications
  - d. Pipe, valve and fittings
  - e. Water specialties
  - f. Drainage specialties
  - g. Pumps
  - h. Plumbing fixtures and accessories
  - i. Insulation
  - j. Installation and/or connections to fixtures/equipment provided by others
3. Specifications and accompanying drawings do not indicate every detail of pipe, valves, fittings, hangers, fixtures and equipment necessary for complete installation; but are provided to show general arrangement and extent of work to be performed.
4. Before submitting proposal, This Contractor shall be familiar with all conditions. Failure to do so does not relieve This Contractor of responsibility regarding satisfactory installation of the system.

1.05 PERMITS

- A. This Contractor shall be responsible for providing and filing all Plans, Specifications and other documents, pay all requisite fees and secure all permits, inspections and approvals necessary for the legal installation and operation of the systems and/or equipment furnished under this Section of the Specifications.
- B. The Contractor shall frame under glass/ clear plastic all permits, secured by him, adjacent to the respective system and/or equipment and required to be displayed by Code, law or ordinance. Those permits secured but not required to be displayed shall be laminated in plastic and included in the Owner's maintenance manual.

1.06 CODES AND ORDINANCES

- A. All work performed under this Section of the Specifications shall be done in accordance with applicable Maine State Laws, Uniform Plumbing Code, Subsurface Wastewater Disposal Rules, and local plumbing codes, and ordinances. The following standards are also to be followed when applicable:

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ADA	Americans With Disabilities Act
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
BOCA	Building Officials & Code Administrators International, Inc.
NFPA	National Fire Protection Association (a.k.a. NFC, National Fire code)
NEMA	National Electrical Manufacturer's Association
OSHA	Occupational Safety and Health Act
UL	Underwriter's Laboratories

- B. If an obsolete code section or standard is specified, the latest replacement issue of each Code or standard for the application, in effect at the time of bidding, shall be used. Code requirements are the minimum quality and/or performance acceptable. Where the Specifications and/or Drawings indicate more stringent requirements, these requirements shall govern.

1.07 QUALITY ASSURANCE

- A. Use sufficient qualified workmen and competent supervisors in execution of this portion of the work to ensure proper and adequate installation of the system throughout. Work performed shall conform to manufacturers recommendations, good standard practice and industry standards.
- B. Any work deemed unacceptable by the Engineer, Architect or Clerk of the Works shall be redone correctly, at no additional cost to the owner.

1.08 MATERIALS AND SUBSTITUTIONS

All materials and equipment shall be new and of the latest design of respective manufacturers. All materials and equipment of the same classification shall be the product of the same manufacturer, unless specified otherwise.

- A. Any proposal for substitution of Plumbing equipment shall be made in writing PRIOR TO OPENING OF BIDS, see Division 1. Submit full details for consideration and obtain written approval of the Architect. The phrase "or approved equal" shall be intended to mean that the Architect, not the contractor, shall make final determination whether or not substitute materials are an equal to that which is specified. The contractor shall be responsible to certify within his submittals that any equipment to be considered as an "approved equal" meets or exceeds the requirements of this specification in all aspects and will physically fit within the space provided and still provide adequate space adjacent to the equipment for service. If requested by the Architect the contractor shall provide said certification in the form of scale drawings before review will be made. Architect will not be responsible to provide drawings for substituted materials unless the substitution is agreed upon prior to opening of bids. Architect's decision on acceptability of substitute materials shall be final.
- B. Approval by Architect for such substitution shall not relieve the Plumbing Contractor from responsibility for a satisfactory installation and shall not affect his guarantee covering all parts of work

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- C. Any material or equipment submitted for approval which are arranged differently or is/are of different physical size from that shown or specified shall be accompanied by shop drawings indicating different arrangements of size and method of making the various connections to equipment. Final results will be compatible with system as designed.
- D. Materials and equipment determined as an “approved equal” and /or substitutions must meet the same construction standards, capacities, code compliances, etc. as the equipment (i.e. manufacturer, model, etc.) specified.
- E. Any additional cost resulting from the substitution of equipment shall be paid by this Contractor.

1.09 PLANS AND SPECIFICATIONS

The Plumbing Contractor shall provide his sub-contractors and suppliers with a copy of the ENTIRE portion of Part 1 of this specification, portions of this specification and copies of drawings, which pertain to the equipment to be supplied to the sub-contractor, at no cost. Failure to do so may result in the Architect providing the required materials at the Contractor’s expense.

Sketches pertaining to changes and amendments during construction (ASI’s, RFI’s and RFP’s for example) shall be contract form documents issued by the Architect and/or Engineer of Record for use during construction and it shall be the Architect’s and/or Engineer’s discretion to provide sketches or full size drawings. Requests for documentation other than what is provided (full size revised drawings for instance) and deemed suitable for the particular situation shall be paid for by the contractor making the request. Billable cost(s) shall include, but not limited to, drafting time and reproduction costs.

1.10 ELECTRONIC DRAWINGS AND FILE SHARING

Plans and specifications may be made available in electronic format on request. Plans may be provided in either Adobe (.pdf) or CAD (.dwg or .dxf) formats and will be compressed using WinZip (.zip format). Recipient is responsible to obtain the necessary software to open the files. Note: CAD (.dwg and .dxf) files will be made available to successful bidders only after a contract is awarded.

CAD drawings are produced with AutoCAD 2006 and may be provided in the 2004 or 2010 file format. Upon request for CAD files a release form will be provided which must be signed and returned to the Engineer prior to transmission of electronic files. Physical mailing address, telephone numbers and e-mail address for this office are indicated on each drawing. A signed release will not be required for Adobe based files.

All contract documents are copyrighted material. No portion of materials may be reproduced or duplicated except as indicated in the release form. Where release forms are not required (Adobe based files), materials may be printed for use by the intended recipient only and may not be reproduced or copied in any other manner or for any purpose other than for use pertaining to the construction of this project unless written permission is obtained.

1.11 SHOP DRAWINGS & SUBMITTALS

- A. As soon as possible after award of contract (*but not longer than 21 calendar days*), before any material or equipment is purchased, the Plumbing Contractor shall submit shop drawings for review. Unless prior arrangements are made with the Architect all shop drawings must be submitted to the General Contractor who in turn will forward them to the Architect. The quantity of copies shall be as outlined in Division 01. If shop drawings are rejected or returned for re-submittal, the Plumbing Contractor shall provide said re-submittals within 14 calendar days of receipt of original submittals with engineer's comments. If original or re-submitted shop drawings are not submitted within the allotted time frames indicated all substitutions included in the late shop drawings will be invalid and the equipment primarily specified must be provided. Any costs resulting from delays in the project schedule due to failure to submit shop drawings related to this section in a timely manner shall be the responsibility of the Plumbing Contractor. The Plumbing Contractor's and vendor's name, address, telephone & fax numbers and e-mail addresses shall be provided with every shop drawing submission. Capacities indicated are minimums. Equipment submitted with capacities below specified parameters will be refused.
- B. Each item shall be properly identified, preferably by fixture/equipment tag number (such as WC-3), and shall describe in detail the material and equipment to be provided, including all dimensional data, performance data, pump curves, computer selection print-outs, etc. Capacities indicated are minimums. Equipment submitted with capacities below specified parameters will be refused.
- C. Corrections or comments made on the shop drawings do not relieve the contractor from compliance with requirements of the drawings and specifications. Shop drawing review is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades and performing his work in a safe and satisfactory manner.
- D. Should any materials or products be purchased and/or installed without prior review and comment the contractor shall be required to remove or replace those products and/or materials if directed by the Architect at his own expense. If the materials are not removed (or replaced) or if the project is delayed as a result the Architect reserves the right to order the withholding of payment until the situation is resolved in a manner satisfactory to the Architect.
- E. Plumbing shop drawings shall be separate from Mechanical shop drawings. All submittals shall have a clear area on the front no less than 4inches x 3inches to be reserved exclusively for the Engineers' shop drawing stamp or they will be refused for re-submittal.
- F. It is desirable for shop drawings to be submitted electronically, including all documentation outlined in paragraph "A" above. Hard copies of shop drawings must be original documents or good quality photocopies of original documents (photocopies of color samples are not acceptable). Faxed copies of submittal sheets will be refused.
- G. Review must be obtained on all items specified in Section 2 Products or shown on the

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drawing, and any significant items implied or otherwise required but not specified.

H. Format

1. Related items shall be stapled or Bound together as a package. The number of copies of each package shall be as listed above. Examples of packages of related items include:
  - a. Hangers and Supports
  - b. Identification
  - c. Insulation
  - d. Valves
  - e. Piping
  - f. Plumbing Fixtures with accessories
  - g. Drainage Specialties
  - h. Water Specialties
  - i. Pumps
2. If due to circumstances beyond his control, the contractor is unable to include all the related items in the submitted package, he shall insert in its place a plain sheet of paper with a notation stating that the item will be submitted separately.

1.12 PRODUCT HANDLING

Use all means necessary to protect materials before, during and after installation, and to protect the installed work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

1.13 AS-BUILT DRAWINGS

Keep in good condition at the job, apart from all other prints used in actual construction, one complete set of all blueprints furnished for this job. On this special set of blueprints, record *completely and accurately* all differences between the work as actually installed and the design as shown on the drawings. These record prints must be kept up to date by recording all changes within one week of the time that the changes are authorized. At the completion of the work, this set of drawings shall be delivered to the Architect for the Owner electronically in the form of CAD drawings. If a complete record of changes is not made and electronic CAD drawings not provided by the Plumbing Contractor, a record shall be made by the Engineers, and *the cost of the record shall be paid by the Plumbing Contractor*. Copies of the plumbing CAD drawings may be made available electronically to the Contractor if desired. Drawings shall be dated accordingly and clearly identified as "AS-BUILT". Contact the Architect directly or the Engineer via e-mail at [mechsyst@maine.rr.com](mailto:mechsyst@maine.rr.com). Specify required CAD format when requesting the files. CAD drawings were generated using AutoCAD 2006 and utilize both paper space and model space with external references to various other drawings. Files will be compressed and will require "WinZip" (<http://www.winzip.com>) for extraction. A release form will be provided which must be signed and returned to the Engineer prior to transfer of files.

#### 1.14 MAINTENANCE MANUAL

On completion of this portion of the work, and as a condition of its acceptance, submit for review two copies of a manual describing the system. Plumbing equipment manuals shall be separate from mechanical manuals. All manuals shall be original copies, not photocopies, or they will be refused for resubmittal. Prepare manuals in durable 3-ring binders approximately 8.1/2" by 11" in size with at least the following:

- A. Project name on the spine and front cover, and identification on the front cover stating the project name, general nature of the manual, and name, address and telephone number of the General and Plumbing Contractors.
- B. Neatly typewritten index.
- C. Complete instructions regarding operation and maintenance of all equipment involved.
- D. Complete nomenclature of all frequently replaceable parts and supplies, their part numbers, and name, address and telephone number of the vendor.
- E. Copy of all guarantees and warranties issued, and dates of expiration.
- F. Shop drawings and equipment/fixtures manufacturer's catalog pages. Clearly indicate the precise item included in this installation and delete, cross out or otherwise clearly indicate, all manufacturers' data with which this installation is not concerned.

#### 1.15 OBJECTIONABLE NOISE AND VIBRATION

All equipment shall operate without objectionable noise and vibration. Should objectionable noise or vibration be transmitted to any occupied part of the building by apparatus, piping or ducts, as determined by the Architect, the necessary changes eliminating the noise or vibration shall be made by this Contractor at no extra cost to the Owner.

#### 1.16 GUARANTEE

This Contractor shall guarantee all materials and workmanship furnished by him or his sub-contractors to be free from all defects for a period of no less than one (1) year from date of final acceptance of completed system and shall make good, repair or replace any defective work which may develop within that time at his own expense and without expense to the Owner. Any additional costs required to extend manufacturer's guarantee and warranty for the period specified, shall be included in Contractor's base bid.

#### 1.17 DEVIATIONS, DISCREPANCIES AND OMISSIONS

- A. The drawings are intended to indicate only diagrammatically the intent, extent, general character and approximate locations of plumbing work. Work indicated, but having details obviously omitted, shall be furnished complete to perform the functions intended without additional cost to the Owner. This shall include but not limited to:
  - 1. All items that are required to meet all applicable codes and referenced standards.

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2. Piping for cold and hot water supply, drain, vent, gas, etc to each plumbing fixture/equipment shown on the drawings or scheduled as required.
  3. Shut-off valves on lines feeding individual fixtures without integral stops.
  4. Minor single phase electrical or control wiring between plumbing provided items that require it, unless indicated on the Division 16 Electrical Drawings.
  5. Plumbing related items indicated on the drawings of other trades.
  6. Items indicated on one plumbing drawing but not shown on a corresponding drawing.
  7. Items implied on the plumbing drawings but not shown.
  8. All plumbing related items clearly shown in dark print on the Plumbing drawings but not included in the specification (See paragraph 2.01), unless it is noted as being provided by the owner or other contractor or unless other sections assume the responsibility.
- B. The drawings and specifications are complimentary to each other and what is called for in one, shall be as binding as if called for by both. In the event of conflicting information on the drawings, or in the specifications, or between drawings and specifications, or between trades, that which is better, best or most stringent shall govern.

1.18 WORKPLACE SAFETY

- A. All Trade Contractors shall comply with the provisions of the "Construction Safety Act" and the "Occupational Safety and Health Act", as well as all other applicable Federal, State, and local requirements.
- B. The Trade Contractor alone shall be responsible for the safety, efficiency and adequacy of his plant, appliances and methods, and for any damage, which may result from their failure of their improper construction, maintenance, or operation.
- C. All Trade Subcontractors shall notify the General Contractor of any flammable, combustible and/or toxic materials intended for use on the project and shall furnish the General Contractor literature pertinent to the use and control of such materials.

1.19 CHANGE ORDERS

- A. No change shall be made from the work, equipment, or materials under this section except as directed in writing by the Architect or Engineer of record.
- B. All requests for change in contract price and scope shall be accompanied by a breakdown list of materials with unit and extended prices and labor hours with unit and extended price, plus markups that have been applied.



1.20 REQUESTS FOR INFORMATION

Requests for Information (RFI) or other correspondences which are submitted electronically must be in an open format, meaning files must not be locked and comments may be added without altering the original content, or have interactive fields intended specifically for commenting. Locked files will not be accepted.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Unless otherwise indicated, the materials to be furnished under this contract shall be new and the standard products of manufacturers regularly engaged in the production of such equipment, and shall be the manufacturer's latest standard design that complies with the specification requirements. All materials and equipment of the same classification shall be the product of the same manufacturer, unless specified otherwise.
- B. All products shall be manufactured within the United States, unless specified otherwise, and supplied locally (within the State) wherever possible. It is preferable to obtain materials that are manufactured within 500 miles of the work site when practical.

2.02 UNSPECIFIED ITEMS

Products required, implied or indicated, but not specified, shall be by the same manufacturer and level of quality and as similar items specified, whenever possible. When no similarity exists, the Contractor shall submit for review an appropriate commercial/institutional quality item, complete to perform the functions intended, using his best discretion. The Architect or a designated Consultant, not the contractor, shall make final determination whether materials are of suitable quality and perform the functions intended.

2.03 MOTORS AND ELECTRICAL WORK

- A. Provide and erect all motors, temperature controls, limit switches as specified.
- B. Power supply to switches, fused switches, outlets, motor starters, to line terminals of equipment, and all related wiring and fuses to properly connect and operate all electrical equipment specified shall be furnished and installed under, "ELECTRICAL" (Electrical Contractor). Coordinate all wiring between Mechanical and Electrical to ensure a complete and operating system.

2.04 HANGERS AND SUPPORTS

- A. General
  - 1. All hangers and supports shall be especially manufactured for that purpose and shall be the pattern, design and capacity required for the location of use.
  - 2. Piping specified herein shall not be supported from piping of other trades.
  - 3. All steel hangers shall be factory painted.
  - 4. Hangers shall be heavy-duty steel adjustable clevis type, plain for steel, cast iron and plastic pipe, and copper plated for piping in direct contact with copper tubing (i.e. copper hot water piping) shall be equal to Carpenter & Paterson Inc., Fig. 100 (Fig. 100CT copper plated).

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5. Hangers shall go outside of insulation for cold water piping. Each hanger shall be furnished with metal shield; Fig. 100 SH.
6. Exposed vertical risers  $\frac{3}{4}$  inch and smaller shall be supported at 6 foot intervals between floor and ceiling with split ring type hangers; copper plated for piping in direct contact with copper tubing equal to Carpenter & Paterson Inc., Fig.81 (Fig. 81CT copper plated). ALL PIPING DROPS TO FIXTURES SHALL BE ANCHORED SOLID TO WALL WITH A STEEL SUPPORT BRACKET WITH ADJUSTABLE CLIP, ESPECIALLY PIPING TO FLUSH VALVES
7. Piping suspended from walls and partitions shall be supported by steel support bracket with adjustable clips equal to Carpenter & Paterson Inc., Fig. 69. All attachments to bar joists shall be from top chord.

B. Hanger Rods & Attachments

1. Hanger rods shall be galvanized all thread rod. Rod size shall be as follows:

<u>Pipe Size</u>	<u>Rod Size</u>
3/8" to 2"	3/8"
2.1/2" to 3.1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

2. All nuts for hanger rods and hangers to be galvanized steel.
3. Provide lag points with rod couplings for fastening to wood, toggle bolts in concrete blocks and compound anchor shields and bolts in poured concrete.
4. Provide toggle bolts with rod couplings for fastening in the pre-cast concrete plank decks.
5. Provide and install angle iron supports for pipe hangers in locations as required. Angle iron supports shall be adequate size for span and piping or equipment.
6. Hot and cold water piping at each fixture shall be securely fastened in wall with split ring type hanger fastened to studs within wall.

2.05 SEISMIC RESTRAINT AND MOVEMENT

All seismic products shall be in accordance with the International Building Code.

A. Piping Suspended by Hangers

Piping suspended by individual hangers 12 inches or less in length, need not be braced. The following piping shall be braced:

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1. Fuel Oil, Fuel Gas, 1 inch and larger
  - a. Brazed or Soldered Joints - Transverse bracing every 20 feet and longitudinal every 40 feet.
  - b. Threaded or Mechanical Joints - Transverse bracing every 10 feet and longitudinal every 20 feet.
- B. Piping Risers
  1. All vertical pipe risers shall be laterally supported with a riser clamp at each floor.
  2. No-hub joints shall be braced or stabilized between floors.
- C. Equipment
  1. All floor/pad mounted equipment including: water heaters, above ground water storage tanks, expansion tanks and boilers shall be anchored to the floor.
  2. Suspended equipment shall be cross braced in all directions.

2.06 IDENTIFICATION

- A. Tag each new pump /equipment, and switch with 2½ inches x ¾ inch rectangular engraved nameplates with white letters on black, #2060-20 by Seton Name Plate Corp. or reviewed equals. Nameplates shall be mechanically fastened to equipment (adhesives are not acceptable). Embossed labels are not acceptable.
- B. Identify all new water and drain piping with “Set Mark” snap-around pipe markers by Seton Name Plate Corporation or reviewed equal. Markers shall include both identification and arrows indicating direction of flow. Markers shall be placed on pipe segments 5 feet and longer, and spaced no less than 10 feet apart. Heating hot water piping shall be labeled differently from Domestic hot water piping. On parallel runs of piping, plumbing markers shall be grouped together, and grouped with heating markers whenever practical.

<u>Legend</u>	<u>Background/Letter Color</u>
“Cold Water”	Green/ white letters
“Nonpotable Water”	Green/ white letters
“Domestic Hot Water”	Yellow/ black letters
“Plumbing Vent”	Green/ white letters
“Sanitary Drain”	Green/ white letters
“Storm Water”	Green/ white letters
“Natural Gas”	Yellow/ black letters

- C. Tag all new valves with Seton #M4506 1½ inch square brass tags and #6 bead chains, stamped with appropriate identification: “CW”, “DHW”, “DHWR”, “Gas”, etc. Tag shall be consecutively numbered. **DO NOT DUPLICATE EXISTING VALVE IDENTIFICATION NUMBERS.** Fixture stops, control valves or valves adjacent to equipment, the use of which is obvious, are not to be tagged.

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- D. Provide valve charts identifying valve number, valve identification and service. Mount charts in Boiler Room in 8½ inch x 10 inch and 8½ inch x 11 inch self-closing aluminum frame with plastic windows. Provide additional copies for maintenance manuals.

2.07 INSULATION

A. Domestic Water Piping

1. Insulate all above grade Cold, Hot and Recirculating Water Piping with fiberglass heavy density sectional pipe insulation system, with minimum of 7 lb. density and 450° temperature rating having a factory applied vapor barrier with butt and longitudinal adhesive.

a. Concealed Piping.

Insulation shall have standard paper ASJ.

b. Exposed Piping.

Shall be Owens Corning Evolution SSL II paper free ASJ with tough, wrinkle resistant, easy-to-clean jacket. Or reviewed equal.

- OR -

Use the same insulation as for Concealed Piping indicated above and then cover with Zeston pre-cut, pre-curved PVC jacketing, 0.030 thickness. Or reviewed equal. Jacketing shall be carefully and neatly applied. Covering shall be installed in no less than 4 foot lengths with shingle joints. Longitudinal joints shall be sealed with adhesive materials provided with the jacketing and then rotated to the top or back sides so as to be out of sight. Material shall be butted to finish walls and ceilings.

2. Insulations Thickness

- a. Cold Water – ½” minimum.  
b. Hot and Recirculating – 1-1/2” minimum

3. Shields of 28 gauge metal approximately 8 inches long and forming an arc of approximately 120 degrees to fit the insulation shall be provided at each hanger for all Domestic Water piping. (Note: this is done on cold water lines to prevent points of condensation that may promote mold growth, and on hot and recirculating water lines to minimize rate of cooling between uses, as well as to prevent unintentional overheating of the building in the warmer months.) Shields to be provided by this Contractor. Hangers shall be provided large enough to be outside the covering.

4. Insulate any below grade hot water piping runouts with ½” Armaflex closed cell piping insulation.

B. Storm Water

1. Insulate all new storm water lines above ground with (1/2”) thick fiberglass heavy

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density sectional pipe insulation as specified above. Cut insulation to include hangers, then butt insulation tightly together and seal to prevent condensation points. Insulation shall have standard paper ASJ.

2. Underside of roof drain boxes (if any):

One inch (1") thickness of a hydraulic setting insulating cement applied in one coat, troweled smooth and finished with 6 oz. canvas pasted over.

- OR -

One inch (1") Armaflex closed cell insulation, neatly and carefully applied (paint with white Armaflex paint where exposed.)

C Fittings

1. All fittings and valves shall be covered with a one piece PVC insulated fitting cover secured.
2. The ends of insulation on exposed pipes at valves, flanges, unions, etc., shall be finished neatly with covering to match jacket and secure with mastic.
3. Valves, flanges and unions on hot water piping shall not be insulated.

D. Installation

All insulation work shall be executed by skilled insulation workmen regularly in the trade.

2.08 VALVES

A. General

1. Valves shall be provided as shown and as required to make the installation and its apparatus complete in operation; locate to permit easy operation, replacement and repair.
2. All valves must be so constructed that they may be repacked under pressure while open.
3. Globe valves shall be installed in all lines where regulation is required.
4. Check valves shall be installed in all lines where flow may reverse from intended direction.
5. Valves shall have name and/or trademark of manufacturer as well as working pressure stamped or cast on valve body.
6. Valves shall comply with Manufacturer's Standards Society (MSS) specifications and be so listed.

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B. Types and Manufacturers

All valves shall be of one manufacturer and by one of the manufacturers listed. The following list is provided as a means of identifying the quality and type required.

1. Gate Valves 3 inches in size and smaller

Shall have bronze bodies, rising stem, solid wedge, union bonnet, rated for 150# WSP, 300# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1169	1151
Stockham	B-124	B-120
NIBCO	S-134	T-134
Hammond	IB648	IB629

2. Globe Valves 2 inches in size and smaller

Shall have bronze bodies, union bonnet, renewable composition disc for service intended, rated for 150# WSP, 300# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1590-T	590-T
Stockham	B-24-T	B-22-T
NIBCO	S-235-Y	T-235-Y
Hammond	IB423	IB413T

3. Ball valves 1¼ inches in size and smaller

Shall have bronze bodies, Type 316 stainless steel stems and balls, reinforced Teflon seats and seals, blowout proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Ports shall be "full port". Rated for 400# WOG and 350°F:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	BA-350S	BA-300S
Apollo	82-200	82-100
Watts	B-6081	B-6080
NIBCO	-----	-----
Hammond	8614	8604

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4. Ball valves 1½ inches in size and larger

Shall have bronze bodies, Type 316 stainless steel stems and balls, reinforced Teflon seats and seals, blowout proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Ports shall be “conventional port”. Rated for 400# WOG and 350°F:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Apollo	70-200	70-300
Watts	B-6000-SS	B-6001-SS
NIBCO	S-585-66	T-585-66
Hammond	8514	8503

5. Check Valves 2 inches in size and smaller

Shall be horizontal swing type with bronze body, Teflon disc. Rated for 125# WSP, 200# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1509-T	509-T
Stockham	B-310-T	B-320-T
NIBCO	S-413-Y	T-413-Y
Hammond	IB945	IB904

6. Drain Valves

Shall be conventional ball valves and provided with hose nipples and threaded metal cap on chain. Watts B-6001-CC or reviewed equal.

7. Balancing Valves

Shall be Watts CSB-61-S. For ¾” pipe, initially set dial at 30. For ½” pipe initially set dial at 60. Or reviewed equal.

2.09 DOMESTIC WATER PIPING

A. Interior

1. All exposed hot and cold water piping above finish floor (not buried) shall be hard-drawn type “L” copper tube with cast or wrought fittings and made up with Silvabrite 100 lead-free solder.
2. All concealed hot and cold water piping above finish floor (not buried) shall be either Flowguard Gold CPVC pipe and fittings or copper as specified above. PEX may not be substituted.
3. All buried water and trap primer piping shall be AquaPEX or type “K” soft copper tubing. No joints below slab.
4. All exposed, uninsulated water piping in finished areas shall be chromium plated



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I.P.S. copper or red brass pipe or tubing and fittings. Valves shall also be chrome plated brass or bronze. Any chrome trim with wrench marks shall be removed and new trim installed.

5. Type of tubing shall be stamped or printed on each length by Manufacturer.

2.10 STORM WATER, SANITARY WASTE AND VENT PIPING

- A. Sanitary Waste and Vent piping everywhere but basement.

For sound attenuation and use in air plenums, all pipe and fittings, shall be standard weight cast-iron, conforming to Commercial Standards CS188-66. Fittings shall be cast-iron, no-hub ASA Group 022 pipe, complete with neoprene elastomer, corrosion-resistant stainless steel shield and clamping assemblies conforming strictly to ASME Standard C654 and requirements of CISPI Standard 310.

- B. Storm Water and Sanitary Waste and vent piping in basement.

All piping and fittings shall be PVC Schedule 40 polyvinyl chloride plastic, as per ASTM-A-2665 or latest standard. Solvent as per ASTM-D-2564.

2.11. FUEL GAS SYSTEM

- A. Coordinate with General Contractor and contact the Gas Supplier for modification of the gas meters at the existing/entrance.

- B. Seismic requirements, see SEISMIC RESTRAINT AND MOVEMENT section.

- C. Piping inside the building shall be Schedule 40 black steel pipe, ASTM 120 with 150# fittings.

1. Piping 2" and less in diameter shall be screwed pattern malleable iron fittings, shall meet ASTM A-47, ASA B16.3. Pipe joint compound shall be used on all threaded joints.

2. Piping shall use welded fittings if over 2" in diameter, or if pressure in excess of 14" W.C.

- D. Provide dirt leg, gas cock and union at boiler. Provide gas cock and flex connect with union at any each clothes dryer. No copper tubing shall be concealed in solid partitions. No piping/tubing shall be run horizontally inside hollow partitions. Piping concealed in walls shall be without fittings, except elbows, tees and screw couplings. Piping passing through masonry shall be sleeved to prevent corrosion.

- E. Installation shall meet the requirements of the gas supplier and NFPA 54.

## 2.12 PIPE SLEEVES AND ESCUTCHEONS

### A. Sleeves

1. Contractor shall set sleeves for all piping penetrating walls and floors. Sleeves through masonry shall be steel pipe sleeves two sizes larger than pipe. Piping passing through walls other than masonry shall be provided with # 24 gauge galvanized steel tubes with wired or hemmed edges.
2. Sleeves set in concrete floors shall finish flush with underside, but extend minimum of 1 inch above finish floor. Weld clips to sleeves for support in concrete pre-cast planks of a size that will be covered by concrete topping. Sleeves set in partitions shall finish flush with each side.
3. Space between sleeves and pipes shall be sealed to make smoke and water tight with 3M Brand Fire Barrier Caulk CP25 or Putty 303.
4. Masonry sleeves shall be Schedule 40 steel pipe.
5. This Contractor has the option to use the Pro-set system on lieu of the above.

### B. Exterior Sleeves

Where piping passes through exterior walls, provide and install a complete pipe sleeve/hydrostatic wall closure system.

1. Wall sleeve shall be schedule 40 steel pipe, two pipe sizes larger than carrier pipe. Sleeve shall be the same length as the thickness of the wall served.
2. The hydrostatic closure device shall consist of identical interlocking links of solid synthetic rubber compounded to resist ozone, water, chemicals and extreme temperature variations. Each link shall be connected by corrosion resistant bolts and nuts to form a belt that is to fit snugly around the pipe. Under each bolt and nut there shall be a metal pressure plate so that when each nut is tightened the rubber links will expand between the pipe and sleeve to form a continuous, air tight and water tight seal.
3. Units to be Link-Seal system Model LS wall seal by Thunderline Corp. or reviewed equal.

### C. Escutcheons

Where piping passes through finish walls, floors, ceilings and partitions, provide and set two piece nickel plated steel floor and ceiling plates.

## 2.13 PLUMBING FIXTURES

### A. DW-1 Dishwasher, Under-counter

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Appliance supplied by G.C. Install with all required accessories.

- B. LV-1 Lavatory, Countertop – ADA
1. AMERICAN STANDARD 476.028 Aqualyn Countertop Lavatory, oval, vitreous china, self rimming, front overflow, faucet ledge, holes on 4” centers, color “Linen”. Or reviewed equal. Counter by G.C.
  2. Moen model 8218 commercial lever handle lavatory faucet, cast brass body, two handle, 4” centers, heavy duty ceramic disk cartridges, 2.2 GPM vandal resistant aerator, grid drain assembly, chrome, meets ADA, 5 year warranty. Or reviewed equal.
  3. McGuire Prowrap insulated P-trap and supply covers, chrome plated angle supplies, wheel stops, wrought (not bell) escutcheons. Or reviewed equal.
- C. LV-2 Lavatory, Countertop – ADA
1. Same as LV-1.
- D. MB-1 Mop Basin
1. The mop basin shall be Fiat MSB-2424, molded stone or reviewed equal. The molding shall be done in matched metal dies under heat and pressure resulting in a one-piece homogeneous product. Size of unit shall be 24”x24”x10” high.  
  
The drain body shall be cast brass, chrome plated, complete with cast brass lock nut and gaskets. A combination dome strainer and lint basket made from #302, 16 gauge stainless steel attached with tamper proof screws shall be included. The drain body shall provide for a lead caulked joint to be 3” I.P.S.  
  
Provide the following accessories:
    - a. Stainless steel wall guard, MSG-2424
    - b. Service faucet with vacuum breaker; integral stops and wall brace plate #830-AA.
    - c. 30” Hose with ¾” coupling at one end; Plate #832-AA.
    - d. Mop Hanger, stainless steel, 24” long with (3) holders, Plate #889-CC.
    - e. Silicone sealant #833-AA.
    - f. Vinyl bumper guard #-77-AA.
- E. SH-1 Shower, Right Hand – ADA Adaptable
1. Enclosure shall be Comfort Designs prepackaged model 38381\_5, gel-coated fiberglass, Right hand unit, open top, 1/2” threshold, outside dimensions 38” x 39” x 78-1/4”, ½” tri-cell honeycomb wall construction, textured floor, molded soap ledges, smooth tile pattern, color white, 3 year warranty. Optional Max-Guard antibacterial protection finish. Accessories: fold-up frameless HDP seat, stainless steel grab bars, semi-permanent dam, no-caulk brass drain with stainless steel strainer, stainless steel curtain rod, heavy duty shower rings, Impact heavy duty

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weighted washable shower curtain. Or reviewed equal. Note: if submitting an equal with a wall thickness less than 1/2", provide factory installed full wall plywood reinforcement.

2. Controls shall be Moen model 8346 metal commercial hand shower system with single handle Posi-temp pressure balanced valve with trim, integral stops, single function hand shower with slide bar, chrome, 69" flexible hose assembly, integral vacuum breaker. Install slide bar with A750 secure mount anchor. Or reviewed equal.
- F. SH-2 Shower, Right Hand – ADA Adaptable
1. Same as SH-1 except a left hand unit.
- G. SK-1 Sink, Single Bowl, Kitchen - ADA
1. Elkay LRAD-2522-65-4 single bowl stainless steel sink, 21" x 16" x 6-1/2" bowl, 18 gauge, type 302 SS, self-rim, satin finish, sound guard undercoating, 4 hole drilling, **rear drain**. LK-35 Standard strainer. Or reviewed equal.
  2. Moen model 8241 commercial lever handle kitchen faucet, cast brass body, two handle, heavy duty ceramic disk cartridges, 9-1/2" reach spout, vandal resistant aerator, chrome, meets ADA, 5 year warranty. Or reviewed equal.
  3. McGuire Prowrap insulated 1-1/2" P-trap and supply covers, chrome plated angle supplies, wheel stops, wrought escutcheons. Or reviewed equal. Provide drain tailpiece with dishwasher drain connection where required.
- H. SK-2 Sink, Double Bowl - ADA
1. Elkay LRAD-3322-65-3 double bowl stainless steel sink, two 13-1/2" x 16" x 6-1/2" bowls, 18 gauge, type 302 SS, self-rim, satin finish, sound guard undercoating, 3 hole drilling, rear drains. Or reviewed equal.
  2. Moen model 8241 commercial lever handle kitchen faucet, cast brass body, two handle, heavy duty ceramic disk cartridges, 9-1/2" reach spout, vandal resistant aerator, chrome, meets ADA, 5 year warranty. Or reviewed equal.
  3. McGuire Prowrap insulated 1-1/2" P-trap, continuous waste and supply covers, chrome plated angle supplies, wheel stops, wrought escutcheons. Or reviewed equal.
- I. UR-1 Urinal, Wall - ADA
1. AMERICAN STANDARD 6590.525 Washbrook, FloWise 0.125 GPF, Ultra High Efficiency Pint Urinal System, 3/4" top spud, siphon jet, 2" threaded outlet, white, vitreous china, wall mounted, with matched Selectronic automatic flushvalve. Or reviewed equal.

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3. Provide adjustable floor mounted carrier as specified under Plumbing Specialties, Drainage.
- J. WB-1 Water Box, Coffee Maker
1. Appliance supplied by Owner.
  2. LSP Products Group model OB-504 metal ice maker box with ¼” Comp valve. Mount just above counter height.
  3. Provide 18-24” long, 1/4" Braided S.S. Flex connector..
- K. WB-2 Water Box, Refrigerator Ice Maker
1. Same as WB-1 above except provide 24-36” long flex connector, and mount at height and location in accordance with refrigerator manufacturer’s recommendations.
- L. WC-1 Water Closet, Wall
1. AMERICAN STANDARD 2257.103 elongated “Afwal”, 1.6 GPF, white, vitreous china, 1.1/2” top spud, wall carrier mounted, siphon jet action, bolt caps, rim 15” above finished floor. Or reviewed equal.
  2. Sloan Uppercut WES-111-YO, chrome, quiet exposed dual flush valve for 1.6/1.1 GPF, wall flange, 1” screwdriver angle check stop, vacuum breaker, spud coupling flange, green antimicrobial ADA handle, sweat solder adapter kit, two instructional wall plates. Or reviewed equal. Note: mount one instructional wall plate near handle and one on toilet partition door or wall that can be read while occupant is sitting.
  3. Church 3155SSC white, elongated, extra heavy duty, solid plastic open front seat with self-sustaining external checks, antimicrobial, stainless steel posts and hardware. Or reviewed equal extra heavy duty seat by Beneke or American Standard.
  4. Provide adjustable floor mounted carrier.
- M. WC-2 Water Closet, Wall – ADA
1. Same as WC-4 except mount rim at 16-1/2” to 17”.
- N. WC-6 Water Closet, Wall – ADA
1. Same as WC-5 except flush valve handle mounted on right hand side.
- O. WC-4 Water Closet, Floor – ADA
1. AMERICAN STANDARD 3461.160 elongated “Madera 16-1/2 Height”, 1.6 GPF, white, vitreous china, 1.1/2” top spud, floor mounted, siphon jet action, bolt caps,

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rim 16-1/2" above finished floor. Or reviewed equal with bowl rim between 16-1/8" and 16-1/2" AFF.

2. Sloan Uppercut WES-111-YO, chrome, quiet exposed dual flush valve for 1.6/1.1 GPF, wall flange, 1" screwdriver angle check stop, vacuum breaker, spud coupling flange, green antimicrobial ADA handle, sweat solder adapter kit, two instructional wall plates. Or reviewed equal. Note: mount one instructional wall plate near handle and one on toilet partition door or wall that can be read while occupant is sitting.
3. Church 3155SSC white, elongated, extra heavy duty, solid plastic open front seat with self-sustaining external checks, antimicrobial, stainless steel posts and hardware. Or reviewed equal extra heavy duty seat by Beneke or American Standard.

P. WC-5 Water Closet, Floor, Right Hand – ADA

Same as WC-4 except flush valve handle mounted on right hand side.

2.14 PLUMBING FIXTURES BY OTHERS

Equipment and fixtures by other sections will be provided and set in place by those sections. This contractor will connect domestic water, drain, waste and vent as required.

2.15 PLUMBING SPECIALTIES, DRAINAGE

A. Carriers

1. Wall hung fixtures including water closets, urinals, wall lavatories, and drinking fountains shall be supported with adjustable floor mounted carriers to fit building conditions, piping system, and fixtures specified. Each carrier shall be provided with a wall finishing frame. All carriers shall be secured to the floor with tie down lugs.
2. Carriers shall be as manufactured by Zurn or reviewed equal.

B. Traps

1. Traps of material and design as approved by the State and shall be furnished and installed at all fixtures and appliances. Trap each fixture separately, keeping all trap screws below water line; vent each trap. Make offsets in vent piping with 45-degree angle fittings when possible. Pitch horizontal vents toward waste lines, group vents and take through roof as shown. All traps, at fixtures and appliances shall be provided with accessible clean outs.
2. All exposed traps under sinks and lavatories, and all piping and fittings shall be chrome-plated. All concealed traps and fittings may be rough brass or copper.

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C. Cleanouts

Provide cleanouts for soil and waste where shown on the drawings and as required by code.

1. Wall Cleanouts (WCO)

All wall cleanouts shall be Zurn Z-1445 cleanout tee with threaded plug. Polished nickel bronze cover, Zurn ZANB-1462 or reviewed equal by Watts, Smith, Josam or Wade.

D. Floor Drains (FD)

1. All floor drains above grade shall be complete and each provided with flashing flange, flange device, and 24"x24", Chloraloy® 240 thermoplastic elastomeric sheet membrane for concealed waterproofing, or other approved flashing material, lock into drain clamping collar.

a. Type "1" General for Wooden Floors

Zurn Cast iron body, wide flange flashing collar, nickel bronze, 6" adjustable strainer head, inside caulk, trap primer connection.

Coordinate installation with GC to ensure that top of strainer is flush with finished floor.

b. Type "2" Indirect Waste

Cast iron body, flashing collar, sediment bucket, polished bronze, 5" adjustable recessed grate, inside caulk. Zurn ZB-415-5I-Y or equal by Josam, Wade or Smith.

2. Traps for floor drains shall be deep seal traps.

2.16 PLUMBING SPECIALTIES, WATER

A. Trap Primer (TP)

1. Type "1", Under Lavatory

Furnish and install self-adjusting automatic trap primers equal to Model PR-500 as manufactured by Precision Plumbing Products Inc. Provide Angle stop w/ secondary 5/8" compression fitting outlet. Or reviewed equal.

B. Shock Absorbers (SA)

Shock protection shall be provided where shown on drawings and at all quick closing devices. Devices shall be Zurn stainless steel shell, welded expansion bellows surrounded by on-toxic mineral oil or gas, pressurized compression chamber charged and factory sealed, all, in-line design, threaded nipple and PDI reviewed.

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1. Type "1", 'A' P.D.I. units  
Zurn Z-1700, #100. Or reviewed equal.
  2. Type "2", 'B' P.D.I. units  
Zurn Z-1700, #200. Or reviewed equal.
- C. Thermometer (T)
- Units to be dial type, 4.1/2" with 30° to 180° range; Terice Universal angle or reviewed equal.
- D. Pressure Gauge (PG)
- Furnish and install pressure gauges with gauge cocks on piping where shown on drawings. The dial range shall be such that the normal pressure shall be approximately mid-way of dial. Gauges shall be Terice No. 600 or equivalent by Weiss or Nurnburg, 4.1/2" dial size, cast aluminum case, with brass "T" handle cocks and No. 872 bronze pressure snubbers on water units.
- E. Vacuum Relief Valve
- Watts Model N36 or reviewed equal.
- F. Backflow Preventers (BFP)
- Provide and install all necessary components to provide protection against potentially hazardous backflow or back siphonage and the contamination of the potable water system at the required GPM demand. Unit shall be UL, USC, ASSE, 1APMD and AWWA approved.
1. Type "1", Entrance  
Watts 007M2QT-S double check backflow preventer, 2", quarter turn full port ball valves, strainer, 6 psi fall-off at 75 GPM. Or reviewed equal.
  2. Type "2" Mechanical Equipment  
Watts #9DM2 double check with atmospheric port, or reviewed equal.
- G. Relief Valve
- Watts #530 calibrated pressure relief valve. Set at 100 PSI. Or reviewed equal.
- H. Braided Stainless Steel Water Connectors
- EPDM tubing jacketed by type 304 stainless steel braid, stainless ferrule, brass nuts. By Zurn or reviewed equal.



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- I. Dielectric Unions  

Series 3000 as manufactured by Watts or reviewed equal.
  - J. Meter  

Provide a meter that meets the size and criteria of the local water district, and has a remote reader.
  - K. Hose Bibs (HB)
    - 1. Type "1" Exterior Hose Bib  

Zurn Z-1321 exposed Ecolotrol "Anti-Siphon" automatic draining, non-freeze wall hydrant, integral backflow preventer, all bronze interior parts, operating key. Or reviewed equal.
  - L. Mixing Valves (MV)
    - 1. Type "1" Master Mixer  

Leonard TM-50 thermostatic mixing valve, inlet size 3/4", outlet size 1" capacity 29 GPM @ 10 psi differential pressure for exposed piping, rough bronze, check stops, set at 120°F. Or reviewed equal.
  - M. Expansion Tank  

Watts Model DET-5M1. Potable water expansion tank, 2.1 gallon, 0.85 gallon acceptance, precharged to 40 psi. Or reviewed equal.
  - N. Pressure Reducing Valve (PRV-1)  

Watts Model U5B-GG Standard capacity Water pressure reducing valve with integral stainless steel strainer, pressure gauge. Set at 70 psi. Or reviewed equal.
- 2.17 SUMP PUMP (SP)
- A. Type 1, Elevator Pit  

Stancor model SE-50 sump pump with oil minder probe and alarm, 1/2 hp 115 V, 1 phase, 8 amps, 50 GPM or reviewed equal.
- 2.18 EJECTOR PUMP (EP)
- A. Type 1, Boiler Room  

Zoeller 900 Simplex Indoor commercial sewage pump system, complete, 18" diam. indoor basin, depth as required, one 1/2 HP pump, 115, 1 phase, 60 Hz, float switches, air tight basin lid.

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2.19 DOMESTIC HOT WATER CIRCULATOR PUMPS (DCP)

A. Circulators

Provide and install in-line all bronze, corrosion proof, circulating pump on hot water circulating lines. Unit to be provided with internal overload protection.

1. Type 1 – 120 deg System

Circulator to be bronze construction, 3/4" (provide unions on ends), 5 GPM at 5 ft. head, with 24 hour timer and optional aquastat, 1/40 HP, 0.54 A, 115V/60/1, Taco or reviewed equal.

B. Outlet / power wiring and manual power switch shall be provided and installed by Division 16.

2.20 WATER HEATER (WH)

A. Type 1, Electric Water Heater with Heat Pump

Rheem model HP50ES Hybrid Electric Water heater, 50 Gal capacity, 10 year warranty, 2.0 EF, 240 V, single phase, T&P relief valve. Or reviewed equal.

B. Type 2, Point of Use Electric Water Heater

Aniston model GL6 PLUS Electric Water heater, 6 Gal capacity tank, 12.5 Gal first hour recovery, 6 year warranty, 120 V, single phase, T&P relief valve. Or reviewed equal.

2.21 PAINTING

Painting shall be provided for all steel/iron equipment supports, steel/iron fuel piping, exposed flanges, fittings and valves within boiler rooms, basements and outside and where specified elsewhere within this section. Painting shall consist of no less than two (2) coats of rust inhibiting paint. Paint shall be capable of withstanding temperatures of up to 250°F. Colors shall be as follows:

Equipment supports	Flat black
Fuel Gas Piping outside	Prime, then paint with a color to blend into exterior finish.
Fuel Gas Piping inside	Prime, then paint yellow.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that plumbing may be installed in strict accordance with all pertinent codes and regulations and the reviewed Shop Drawings.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.02 COORDINATION WITH OTHER TRADES

A. Before installation, participate in a coordination meeting with the Clerk of the Works, General Contactor, Mechanical/HVAC, Fire Protection and Electrical trades. Establish and resolve areas of conflict and congestion, especially those indicated on the drawings. Priority to be given to HVAC equipment and large ductwork, then gravity piping, then small ductwork, then piping based on descending order of size. Special consideration given to allow access to valves, dampers etc. Mutually develop coordination sketches documenting space allocation and provide copies to all effected trades.

B. Failure to coordinate will result in this contractor removing and relocating his piping at no additional expense to the owner.

3.03 INSTALLATION OF PIPING AND EQUIPMENT

A. General

1. Install all piping promptly, making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.
2. Provide uniform pitch of at least ¼ inch per foot for all horizontal waste and soil piping 3" or less. For piping 4" and above, slope at 1/8" minimum per foot
3. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions; promptly remove all defective material from the jobs site.
4. Install pipes to clear all beams and obstructions. Do not cut into or reduce the size of load carrying members without the approval of the Architect.
5. Plumbing vents

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- a. Back vent all plumbing fixtures.
- b. Pitch all vents at 1/32" per foot minimum toward waste lines for proper drainage to prevent unintended traps.
- c. Install vent piping with each bend 45 degrees minimum from the horizontal, wherever structural conditions will permit.
- d. Group plumbing vents and take through roof as shown.
- e. Increase vents 3" and smaller one size before going thru roof. Make size transition a minimum of 12" below the surface of flat roofs and 72" (or as structure permits) below sloped roofs.
- f. Terminate 24" above roof.
- g. If installing in locations other than as shown on the drawings, line up with other plumbing vents for a neat appearance.
- h. Do not install vents within 10 feet of an operable window or door or within 25 feet of a ventilation air intake.

6. All risers and off-sets shall be substantially supported.

7. Pipe hangers shall be placed on center as follows:

<u>MATERIAL</u>	<u>HORIZONTAL</u>	<u>VERTICAL</u>
Cast-iron	At joints not to exceed 10'	15' or at each story whichever is less, and stacks at the base
Copper 1-1/4" & less	6'	6'
1-1/2"	6'	10'
2" & up	10'	10'
PVC, DWV	4'	4'
Steel	10'	10'

8. Arrange all piping to maintain required grade and pitch to lines to prevent vibration. Expansion loops to anchors shall be provided where shown on drawings.
9. Make all changes in pipe size with reducing fittings.
10. All low points in water piping shall be drained with 1/2" gate valve with hose nipple and metal cap.
11. No piping shall be installed in such a manner to permit back-siphonage or flow of any liquid in water piping under any conditions.
12. No water piping shall be installed outside of building or in an exterior wall unless adequate provisions are made to protect such pipe from freezing.
13. All piping and drain openings left unattended will be capped, plugged or securely covered to prevent accidental entry of foreign matter. Roof drains in use will be provided with domes.

B. Joints and Connections

1. Smoothly ream all cut pipe; cut all threads straight and true; apply best quality

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Teflon tape to all male pipe threads but not to inside the fittings; use graphite on all clean out plugs. DO NOT use Teflon tape on gas piping.

2. Smoothly ream all cut P.V.C. pipe. Clean and use solvent for fitting connection and in strict accordance with the manufacturer's recommendations.
  3. Make all joints in copper water tube with solder applied in strict accordance with the manufacturer's recommendations.
- C. Coordinate with the General Contractor to depress the finished floor where indicated on drawings. Install floor drains at low points of surface areas to be drained. Set grates of drains 1/32" below finished floor, unless otherwise indicated. Square top floor drains must line up with floor finish, coordinate final orientation with Flooring Installer. Finished floor shall be depressed according to the following drainage area radii:
1. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
  2. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.

#### 3.04 STERILIZATION AND FLUSHING OF PIPES

- A. After preliminary purging of the system, chlorinate the new potable water system in accordance with the current recommendations of the American Water Works Association, and in accordance with all pertinent codes and regulations. Chlorinate only when the building is unoccupied.
- B. Upon completion of the sterilization, thoroughly flush the entire potable water system.
- C. After sterilization and flushing are complete, a sample shall be collected from the end of the longest main, or at any other location selected by the Architect, and a water analysis test provided. The test must prove the water acceptable or additional disinfecting of system performed. A copy of the test report shall be submitted to the Architect.

#### 3.05 CLOSING IN UNINSPECTED WORK

- A. Do not cover up or enclose work until it has been properly and completely inspected and approved.
- B. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Architect and at no additional cost to the Owner.

#### 3.06 TESTING OF PIPING

Tests shall be applied to the plumbing installation as required by codes and where as directed by the Architect, and in all cases before work is covered by earth fill or pipe covering.

- A. Sanitary piping shall be tested when all underground work is complete (before covering) and

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again, after all piping is installed, but before it is further closed in. Sanitary systems shall be securely stopped, except at the highest point, and the entire system filled with water to the point of overflow for 24 hours. All leaks shall be repaired. Cracked pipes and fitting shall be removed and replaced. No doping of soil pipe or fittings will be allowed. Plan testing around expected weather and temperature conditions or provide protection so that pipes do not freeze.

- B. New domestic water piping shall be filled and subjected to a hydrostatic pressure test of 150 psi for 8 hours with no leaks. If leaks are detected they shall be repaired and the test repeated until work is tight. NOTE: Testing with compressed air only is NOT ACCEPTABLE.

3.07 CLEANING

Prior to acceptance of the buildings, thoroughly clean all exposed portions of the this installation, removing all labels and all traces of foreign substance, using only a cleaning solution approved by the manufacturer of the plumbing item, being careful to avoid all damage to finished surfaces. Additional attention may be required to thoroughly clean any used, re-used or owner provided fixtures. Clean out all strainers and aerators and adjust or replace washers, cartridges, etc

3.08 INSTRUCTIONS

On completion of the job, this Contractor shall provide a competent technician to thoroughly instruct the Owner's Representative in the care and operation of the system. The time of instruction shall be arranged with the Owner.

3.09 RECYCLING

Discarded materials, both new and removed, shall be recycled whenever practical through metal salvage dealers (piping, etc.), paper salvage (cardboard shipping containers, etc.), wood products, etc. The Mechanical Contractor shall retain the salvage value of discarded materials and may use this value to offset his project bid price if so desired. Toxic materials such as adhesives, coolants, etc. SHALL be disposed of in a manner acceptable to the State of Maine Department of Environmental Protection.

3.10 HAZARDOUS MATERIALS

Mercury or any other material deemed by the Federal Environmental Protection Agency or the State Department of Environmental Protection to be hazardous shall not be used in any components of the plumbing systems.

END OF SECTION 22 00 00