SECTION 22 05 00

PLUMBING BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.01 Section Includes

A. Design-Build Plumbing system(s).

1.02 Provide: Any and/or all plumbing systems required by state and/or local codes and/or owner requirements. Provide all required drawings, certifications, and submittals required to acquire appropriate approvals and permits. See plans for schematic of required fixtures. Provide and submit plumbing plans and calculations to the State of Wisconsin DSPS for review and approval.

1.03 Submittals

A. Product Data: Provide for each plumbing fixture.

B. Plumbing Plans: Provide plumbing design plans and calculations designed by a certified Wisconsin Plumbing Designer or Engineer.

1.04 Provide: Installation of all designed and approved systems

END OF SECTION

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hangers and Supports.

1.02 RELATED DOCUMENTS

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

B. Section 220719 – Plumbing Piping Insulation.

C. Section 221005 – Plumbing Piping.

D. Section 221006 – Plumbing Piping Specialties.

1.03 REFERENCES

A. ASME B31.9 – Building Services Piping; The American Society of Mechanical Engineers; 2008.

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide data on hangers and supports. Provide manufacturers catalog information.

PART 2 PRODUCTS

2.01 STAINLESS STEEL PIPE HANGERS AND SUPPORTS

B. Conform to ASME B31.9.

C. All individual pipes shall be supported with adjustable stainless steel clevis hangers, where required size to encompass insulated pipe.
   1. Anvil Fig. 260SS, or approved equal.

D. Hanger Rods: Mild stainless steel continuous threaded rod, with stainless steel heavy washers and hex nuts.

2.02 ATTACHMENTS TO STRUCTURE

B. Masonry
   1. Precast - Tapered wedge with locking sleeve: Quick Bolt.

C. Wood
   1. Drill and use through stainless steel eye bolts with nuts and washers on both sides of joist.

2.03 SHEET METAL SHIELDS

B. Sheet metal shields shall be 18 gauge stainless steel.

2.04 ACCEPTABLE MANUFACTURER:

B. Anvil

C. Felker

D. Hycon

E. Piping Tech.

F. Unistrut

G. B-Line

H. Superstrut

I. Michigan\Erico

J. Holdrite

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL REQUIREMENTS

A. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220719.

B. Provide all hangers and supports as required.

3.02 PIPE HANGERS AND SUPPORTS

A. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Whenever copper piping comes directly in contact with steel support system, it shall be this Contractor's responsibility to wrap the pipe with two layers of 3M's #33 electrolytic tape. The length of tape shall be such to provide 2" overlap on each side of support
   7. Supports shall be sized for weights and pipe sizes encountered.
   8. Supports shall properly compensate for all thermal expansion and contraction.

B. Horizontal Hanger Spacing Schedule

1. Copper Pipe

Pipe or Tube Size	Hanger Spacing	Minimum Rod Diameter
1/2"	6'	3/8"
3/4"	6'	3/8"
1"	6'	3/8"
1-1/4"	6'	3/8"

3.03 BRACKETS, BRACES AND SUPPORTS

A. Provide stainless steel brackets, braces or reinforcing angles as may be required in all partitions, not sufficient in themselves to support fixtures or other wall mounted equipment included in this specification.

B. Pipe shall be supported from the building structure independently or from a separate support, no pipe line shall be supported from another pipe line or piece of equipment.

C. No equipment shall be supported by the piping system itself. All units shall be supported in a manner to allow service without removing large piping segments or valves. Provide structural members as required.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Labels.

1.02 RELATED DOCUMENTS

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

B. Section 221005 – Plumbing Piping.

C. Section 221006 – Plumbing Piping Specialties.

D. Section 223000 – Plumbing Equipment.

1.03 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturer’s catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Brady Corporation.

B. Champion America, Inc.

C. Seton Identification Products.

2.02 IDENTIFICATION – EQUIPMENT NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/2 inch.
   3. Background Color: Black.

2.03 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 IDENTIFICATION - PIPE

A. Color: Conform to ASME A13.1.

B. Plastic Tape Pipe Labels: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

C. Pipe: Labels shall describe the contents and direction of flow. Labels shall be secured to pipe with full self-adhesive banding around pipe at each end of label. Labels shall be per the schedule in Part 3.

2.05 IDENTIFICATION – VALVES

A. Colored plastic with 1/2" white letters such as Bakelite attached with a brass chain.

B. Control valves shall be tagged as to service and normal position.

C. Other valves tagged as to service and function.

D. Control valve tags shall have black background, other valves tags shall have colors corresponding to service described above.

2.06 IDENTIFICATION - EQUIPMENT

A. Black plastic with 1" white letters such as Bakelite attached with screws to equipment for its labeling.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion-resistant chain.

C. Install pipe labels in accordance with manufacturer's instructions.

D. Install pipe labels complete around pipe in accordance with manufacturer's instructions.

E. Identify valves in main and branch piping with tags. Valve list shall be included in Operation and Maintenance Manual.

F. Identify piping, concealed or exposed, with pipe labels. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 50 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

3.03 PIPE IDENTIFICATION SCHEDULE

DOMESTIC COLD WATER	G/W
NON POTABLE WATER	Y/B
Y/B =YELLOW BACKGROUND/ BLACK LETTERS	
G/W = GREEN BACKGROUND/ WHITE LETTERS	

Pipe Size	Band Width	Letter Height
1/2" - 1-1/4"	8"	1/2"
1-1/2" - 2"	8"	3/4"

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 Section Includes

A. Piping insulation.

B. Jackets and accessories.

1.02 Related Documents

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

B. Section 220529 – Hangers and Supports for Plumbing Piping and Equipment.

C. Section 221005 - Plumbing Piping.

1.03 References

A. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2004.

B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.

C. ASTM C 534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2005.

D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2007.

E. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

F. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; 2003.

1.04 Submittals

A. Comply with requirements of Division 1.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 Delivery, Storage, and Protection

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2 PRODUCTS

2.01 Requirements for all Products of This Section

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.02 TYPE 3 - ELASTOMERIC CLOSED-CELL FOAM INSULATION

A. Flexible elastomeric material designed for varied services at temperatures between -40 degrees F and 220 degrees F.

B. Fittings for piping shall be insulated with mitered segments which match the material used. All butt joints shall be joined by sealing with a waterproof vapor barrier adhesive as recommended by the insulation manufacturer.

C. When applying sheet insulation to metal surfaces, brush on a coat of adhesive to the clean, dry metal, covering an area to the size of one sheet. Apply a brush coat of adhesive to the back of the sheet, except for 1/2" wide border around the edges. After adhesive is on the metal surface and the sheet has dried to a nonstick state, position sheet so that the edges overlap the previously installed sheets by 1/8". Apply light pressure to adhere a spot in the center of the sheet only and compress butt edges into place. Bond sheet by pressing firmly into place. Spread joints and coat with adhesive. Do not fill joint with adhesive.

D. For outdoor application, apply two coats of finish as recommended by the insulation manufacturer.

E. Acceptable manufacturers:
   1. Based on AP / Aramaflex – Armacell
   2. Rubatex

2.03 TYPE 4 - PIPING JACKETS

A. Jacket: One piece molded type fitting covers and sheet material, off-white color.
   1. Minimum Service Temperature: 0 degrees F.
   2. Maximum Service Temperature: 150 degrees F.
   3. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96.
   4. Thickness: 10 mil.
   5. Connections: Brush on welding adhesive.

B. Covering Adhesive Mastic:
   1. Compatible with insulation.

PART 3 EXECUTION

3.01 Examination

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 Installation

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, and reverse pressure zone backflow preventers. Provide removable covers for reverse pressure zone backflow preventers and devices that have ports and other features that require access.

E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

3.03 Schedules

A. Domestic Cold Water, Non Potable Water
   1. All piping & fittings shall be insulated with 1" thick elastomeric closed-cell foam as described by Type 3 in Part 2 - Products.

B. Piping Jacket
   1. All exposed piping shall be covered with piping jacket as described by Type 4 in Part 2- Products.

END OF SECTION

SECTION 22 10 00

PLUMBING PIPING

PART 1 - GENERAL

1.01 Section Includes

A. Drain, waste, and vent piping.

B. Water distribution piping.

C. Plumbing specialties.

1.02 References

A. ASME B16.3 - Malleable Iron Threaded Fittings.

B. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.

C. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.

D. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.

E. ASTM A74 - Cast Iron Soil Pipe and Fittings.

F. ASTM A888 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

G. ASTM B88 - Seamless Copper Water Tube.

H. ASTM C12 - Standard Test Method for Vitrified Clay Pipe.

I. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

J. ASTM D2321 - Underground Installation of Flexible Thermoplastic Sewer Pipe.

K. ASTM D2487 - Clarification of Soils for Engineering Purposes.

L. ASTM D2665 - Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.

M. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

N. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

O. ASTM D4068 - Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane.

P. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

Q. AWWA C111- Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.

R. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

1.03 Submittals

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.04 Project Record Documents

A. Provide asbuilt measurements and location on a clean copy of the construction drawings of all plumbing lines including locations of valves and other equipment and appurtenances

1.05 Quality Assurance

A. Products listed on the Drawings and in the specifications by manufacturer describe the minimum quality requirements.

B. All materials and equipment shall be new and the standard products of manufacturers regularly engaged in the supply of plumbing materials and equipment.

C. Valves: Manufacturer's name and pressure rating marked on valve body.

1.06 Qualifications

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing the work of this section licensed in the State of Wisconsin.

1.07 Regulatory Requirements

A. Perform work and supply materials in accordance with Wisconsin Administrative Code Comm 82 - Design, Construction, Installation, Supervision, and Inspection of Plumbing an and Comm 84 - Plumbing Products.

B. Meet applicable local codes. Obtain and pay for any required local permits.

1.08 Delivery, Storage, and Handling

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.01 Sanitary Building Sewer Pipe

A. PVC Pipe: ASTM D3034, SDR 35.
   1. Joints: Elastomeric, ASTM F477.
   2. Fittings: PVC.

B. PVC Pipe: ASTM D2665, Sch. 40.
   1. Joints: Solvent weld.
   2. Fittings: PVC.

C. Cast Iron Pipe: ASTM A74, service weight.
   1. Joints: Elastomeric, ASTM C564.
   2. Fittings: Cast Iron.

2.02 Underground Drain and Vent Pipe

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Joints: Elastomeric, ASTM C564.
   2. Fittings: Cast iron.

B. PVC Pipe: ASTM D2665, Sch. 40.
   1. Joints: Solvent weld.
   2. Fittings: PVC.

2.03 Above Ground Drain and Vent Pipe

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Joints: Elastomeric, ASTM C564.
   2. Fittings: Cast iron.

B. Cast Iron Pipe: ASTM A888, hubless, service weight.
   1. Couplings: Mechanical sleeve with stainless steel band and clamps.
   2. Fittings: Cast iron.

E. PVC Pipe: ASTM D2665, Sch. 40.
   1. Joints: ASTM D2855, solvent weld
   2. Fittings: PVC.

2.04 Water Service Pipe

A. Copper Tubing: ASTM B88, Type K, soft temper.
   1. No joints below grade.

B. Ductile Iron Pipe: AWWA C151, Class 52; cement-mortar lining, AWWA C104.
   1. Joints: Mechanical joint or push-on, AWWA C111.
   2. Fittings: Ductile Iron, AWWA C110 or AWWA C153.
   3. Electrical Conductivity: Factory applied terminals with copper straps or cables capable of carrying 600 amps.

C. PVC Pipe: AWWA C900, Class 150 (DR-18) with cast iron O.D. (If indicated on Drawings).
   1. Joints: Elastomeric.
   2. Fittings: Ductile Iron, mechanical joint, AWWA C110 or AWWA C153.

2.05 Water Distribution Pipe - Above Ground

A. Copper Tubing: ASTM B88, Type L, hard temper.
   1. Fittings: Wrought solder joint pressure fittings, ANSI B16.22.

2.06 Water Distribution Pipe - Below Ground

A. Copper Tubing: ASTM B88, Type K, soft temper.
   1. No below grade joints.
   2. Above Grade Connections: Wrought solder joint pressure fittings, ANSI B16.22.

2.07 Valves

A. Buried Gate Valves (3” and larger water service): Ductile iron, resilient seated; AWWA C515, 250 psi working pressure. Kennedy, Model KS-RW; American Flow Control, Series 2500; or equal.

B. Building Control Valve: Two-piece bronze body ball valve, full port, rated for 600 PSI WOG, NIBCO Model S-585-70 or equal. (Gate valves will not be allowed).

C. Distribution, Isolation and Service Valves: Two-piece bronze body ball valve, full port, rated for 600 PSI WOG, NIBCO model S-585-70 or equal. (Gate valves will not be allowed.)

D. Check Valves: Nibco Model T-480 (or S-480), bronze body, two-piece body with spring actuated TFE seat, 250 PSI WOG.

2.08 Water Hammer Arrestors

A. Water Hammer Arrestors.
   1. Final branch to flush valve water closets and urinals: Sioux Chief Model 653-B.
   2. Kitchen sink: Sioux Chief Model 652-A

2.09 Backflow Preventor

A. Vacuum breaker-backflow preventor, Nidel or equal.

2.10 Drains and Cleanouts

A. Cleanouts:
   1. Wall: PVC cleanout fitting with threaded brass plug. Provide 6" (minimum) to 10" (maximum) diameter stainless steel access cover.
   2. Floor: PVC glue-on cleanout fitting with threaded plug and polished metal ring and cover. Metal ring shall be flush with finished floor material.

B. Floor Drains: Cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

C. Hub Drains: Construct hub drains with pipe size noted through finish floor. Install reducer inverted on vertical drainage piping. Reducer shall be one size larger than the drainage piping with a minimum size of 3 inches.

2.11 Floor Drain Safing

A. Safing:
   1. Chlorinated polyethylene sheeting, 40 mils thick, ASTM D4048 with CPE solvent or 3 lb/ft^2 sheet lead.
   2. Install safing at floor drains above grade. Extend 12 inches beyond drain in all directions. Seal all joints and connect to drain body clamp. Safing is subject to standing water leak test.
   3. Oatey, Noble Company, or equal.

B. Ceilings: Prime coated steel face plate.

C. Floors: Aluminum or nickel-bronze non-skid top..

4.12 Piping Insulation

A. Flexible elastomeric insulation, ARMACELL AP/Armaflex or equal. Fittings shall be fabricated with mitered and glued.

B. Thickness:
   1. Cold water piping: 3/4" (except 1/2" on 1/2" piping).
   2. Hot water piping: 1" (except 1/2" on 1/2" piping).

2.12 Hydrants

A. Wall Hydrant: Automatic draining, freezeless wall hydrant with vacuum breaker-backflow preventer and ¾ inch hose thread nozzle and loose key. Woodford Model 65 or equal.

B. Wall Faucet (Interior): Wall faucet with vacuum breaker-backflow preventer and ¾ inch hose thread nozzle. Woodford Model 24 or equal.

C. Wall Faucet (Exterior): Automatic draining, freezeless wall faucet with vacuum breaker-backflow preventer and ¾ inch hose thread nozzle. Woodford Model 25 or equal

D. Yard Hydrant: Freezeless yard hydrant with ¾ inch hose thread nozzle, one inch inlet, and vacuum breaker-backflow preventer. Woodford Iowa Model Y1 or equal.

2.13 Sleeves

A. Interior Walls, Partitions, Ceilings, and Floor: Steel pipe, schedule 40.

B. Exterior Walls: Galvanized steel or non-ferrous rigid pipe. Provide aluminum collar on exterior and aluminum or SM collar on interior

2.14 Pipe Supports

A. Pipe hangers shall be rated for the load to be carried. Include all supplemental angles, channels, plates, etc. of adequate size and design, where supports shall be required between building structural members. Water distribution piping may be grouped on trapeze hangers.

B. No dissimilar support shall come in contact with copper piping; use rubber or fabric isolator between plastic or copper pipe and steel clamp.

C. Horizontal steel pipe shall be supported as below:

Pipe Size	Rod Diameter	Maximum Spacing
½ thru 1 inch	3/8 inch	5 feet
1-1/4 thru 2 inch	3/8 inch	10 feet
2-1/2 thru 3 inch	½ inch	10 feet
4-5 inch	5/8 inch	10 feet
6 thru 8 inch	¾ inch	10 feet

D. Horizontal lines of copper tubing shall be supported as below:

Nom. Tubing Size	Rod Diameter	Maximum Spacing
Up to 1-1/4 inch	3/8 inch	5 feet
1-1/2 and 2 inch	3/8 inch	10 feet
2-1/2 and 3 inch	½ inch	10 feet

E. Horizontal PVC piping (polyvinyl chloride) shall be supported on plastic supports and hangers or on steel padded split ring or clevis hangers as follows:

Maximum Spacing (feet)		
Pipe Size	Sch. 40	Sch. 80
½ thru 1-1/4	3	3
1-1/2 thru 2	3	4
3 and over	4	4

F. Cast iron piping shall be secured and supported at sufficiently close intervals to keep the system in alignment and to adequately support the weight of the pipe and its contents.

G. For horizontal cast iron piping using stainless steel bands, hangers or supports shall be provided for at least every other joint except that when the developed lengths between supports exceeds four feet, they shall be provided at each joint. Supports shall also be provided at each horizontal branch connection.

2.15 Flashing

A. Lead: 5 lb/sq ft sheet lead.

B. Metal Flashing: 26 gauge galvanized steel

C. Metal Counterflashing: 22 gauge galvanized steel.

D. Flexible Flashing: 47 mil sheet butyl.

2.16 Bedding and Cover Material - Rigid Pipe (DI, CI, Steel & Copper)

A. Bedding
1. Class B - Crushed Stone: Hard durable particles of crushed stone or gravel, free from shale and lumps of clay or loam, meeting the following gradation:

Sieve Size	% Passing By Weight
1/2”	100
3/8”	90 -100
No. 8	0 - 5
No. 30	0 - 3

2. Class C - Excavated soils listed in ASTM D2487 as the following are acceptable:
   GW - Well-graded gravels, gravel-sand mixtures, little or no fines.
   GP - Poorly-graded gravels, gravel-sand mixtures, little or no fines.
   GM - Silty gravels, gravel-sand-silt mixtures.
   GC - Clayey gravels, gravel-sand-clay mixtures.
   SW - Well-graded sands, gravelly sands, little or no fines.
   SP - Poorly-graded sands, gravelly sands, little or no fines.
   SM - Silty sands, sand-silt mixture.
   SC - Clayey sands, sand-clay mixtures.

3. If excavated material is unsuitable, use Class B material.

B. Cover: Cover material shall be finely divided material free of debris, organic material and large stones.

2.17 Bedding and Cover Material - Flexible Pipe (PVC)

A. Bedding and Cover: Provide offsite bedding and cover material meeting the requirements of ASTM D2321, Class I, II, or III material, which materials are described as follows:
   1. Class I - Angular, 1/4" to 1-1/2" graded stone including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone and crushed shells.
   2. Class II - Coarse sands and gravels with maximum particle size of 1-1/2" including various grades sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. ASTM D2487 Soil Types GW, GP, SW and SP are included in this class.
   3. Class III - Fine sand and clay gravels, including fine sands, sand-clay mixtures, and gravel clay mixtures, ASTM D2487 Soils Types GM, GC, SM and SC, are included in this class.
   4. If the excavated material conforms to one of the bedding classes, it may be used for bedding.

PART 3 - EXECUTION

3.01 Preparation

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 Installation - General

A. Install drain, waste, and vent piping and water distribution piping in accordance with Wisconsin Administrative Code Comm 82.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Conceal drain, waste and vent lines within walls unless indicated otherwise on Drawings.

E. Establish elevations of buried piping outside the building to ensure not less than 4 ft of cover.

3.03 Installation - Drain, Waste, and Vent Piping

A. Install bell and spigot pipe with bell end upstream.

B. Rigid Pipe Bedding and Cover:
   1. Pipe bedding and cover shall conform to Classes B or C as described in ASTM C12.
   2. Unless otherwise indicated in the bidding documents or on the plans, the Contractor shall use Class C bedding.
   3. Bedding material shall be spaded or shovel sliced so that the material fills and supports the haunch area of the pipe.
   4. Cover material shall be placed by hand.

C. Flexible Pipe Bedding and Cover:
   1. Pipe bedding and cover shall be as described in ASTM D2321 using Class I, II or III materials.
   2. Bedding material shall be placed below and around pipe to the spring line to provide side support and to prevent lateral and vertical movement of the pipe.
   3. Cover material shall be placed in two stages: one to the top of the pipe and the second 6" above the pipe. Each stage shall be compacted by hand or mechanical tamping to the percent of the maximum dry density in accordance with ASTM D698 indicated below:

Material	Density
Class I	None
Class II	85%
Class III	90%

3.04 Installation - Water Distribution Piping

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

C. Provide clearance for installation of insulation and access to valves and fittings.

D. Provide access where valves and fittings are not exposed.

E. Provide support for utility meters in accordance with requirements of utility companies.

F. Install valves with stems upright or horizontal, not inverted.

G. Slope water distribution piping 1 inch in 40 feet. Slope sanitary and storm piping a minimum of 1/8 inch per foot unless indicated otherwise on Drawings.

3.05 Flashing Installation

A. Provide flexible flashing and metal counterflashing where piping penetrates weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting above roof surface with lead.

3.06 Sleeves

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction and for any insulation.

C. Center piping in sleeve. Do not support pipe on sleeve.

D. Extend sleeves through floors one inch above finished floor elevation. Trim other sleeves flush with finished surface.

E. Caulk annular space with a noncombustible, permanently plastic, waterproof, non-staining compound or pack with asbestos cotton or fiberglass to within ½ inch of finished surface and caulk with above described compound.

F. Provide chrome or nickel plated escutcheons on all pipes exposed to view.

3.07 Cutting and Patching

A. Keep cutting to a minimum. Whenever possible, set sleeves as construction progresses.

B. Cutting shall be done under supervision of the General Contractor.

C. Patching shall be performed by the trade responsible for the original material cut. Contractor responsible for cutting shall be responsible for the cost of patching.

3.08 Piping Insulation

A. Insulate cold and hot water piping.

B. Apply in accordance with manufacturer's instruction.

3.09 Disinfection of Domestic Water Piping

A. Upon completion of the water distribution system, test all valves to insure their full opening and flush out the system progressively by opening building outlets and permitting the flow to continue from each until the water runs clear.

B. At completion of all piping, fill system with sanitizing solution per Wisconsin Department of Commerce requirements and circulate for a minimum of 24 hours. Rinse thoroughly after sanitizing solution with clean water. Certify system has been cleaned and submit certificate to Owner. Obtain water test for coliform bacteria from an independent testing laboratory and submit test report to Owner.

3.10 Testing

A. Test piping in accordance with Comm 82.21.

END OF SECTION

SECTION 22 10 06

PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backflow Preventers

B. Hose Bibbs

C. Braided Hose

1.02 RELATED DOCUMENTS

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

B. Section 221005 - Plumbing Piping.

1.03 REFERENCES

A. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; 2004 (ANSI/ASSE 1019).

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

E. Project Record Documents: Record actual locations of equipment and backflow preventers.

F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Accept specialties on site in original factory packaging. Inspect for damage.

1.06 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

PART 2 PRODUCTS

2.01 REDUCED PRESSURE ZONE BACKFLOW PREVENTER

A. Backflow preventer designed for connections to high hazard equipment with continuous line pressure or backpressure. Reduced pressure principal style with two independent check valves with intermediate relief valve, shut-off valves and ball type test cocks, and air gap.

B. Acceptable Manufacturers:
   1. Based on Watts #957
   2. Febco
   3. Wilkins
   4. Conbraco Industries

PART 3 EXECUTION

3.01 REDUCED PRESSURE ZONE BACKFLOW PREVENTERS

A. All installations shall comply with code requirements.

B. Install on potable water connections to the hot water heating, chilled water, condenser water, or similar pressurized systems where toxic chemicals may be introduced. Install at all additional locations indicated on the drawings.

C. Mount at 42” above finished floor.

D. Pipe drain and discharge with air gap to nearest floor drain.

E. Provide isolation valves on the inlet and discharge side of the backflow preventer to allow for servicing.

F. The installing contractor shall notify the owner of the following: The installation of reduced pressure zone backflow preventers is permitted only when periodic testing is done by a trained backflow preventer tester acceptable to the administrative authority. Testing intervals shall not exceed one year, and records must be kept. All devices must be tested after initial installation to assure that debris from the piping installation has not interfered with the functioning of the device. The devices shall be overhauled at least once every five years.

END OF SECTION