

SECTION 221413 – STORM WATER PIPING SYSTEM AND SPECIALTIES

Latest Update: 08-05-2024 See Underlined Text for Edits

(Engineer shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specifications and adding any additional specifications that may be required by the project. Also turn off all “Underlines”.)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section and all other sections of Division 22.

1.2 SUMMARY

- A. This section includes the requirements for storm water piping and specialties as follows:
 - <Edit for particular project>
 - 1. Cast iron hub and spigot pipe and fittings.
 - 2. Hubless cast iron pipe and fittings.
 - 3. Galvanized pipe and fittings.
 - 4. Perforated PVC pipe and fittings.
 - 5. Specialty pipe fittings.
 - 6. Roof drains.
 - 7. Area drains.
 - 8. Trench drains.
 - 9. Drainage piping specialties.
 - 10. Cleanouts.
 - 11. Backwater valves,
 - 12. Encasement for underground metal piping.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Storm Drainage Piping: Ten (10) foot head of water.
- B. Seismic Performance: Storm drainage piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.4 ACTION SUBMITTALS

- A. Product Data: For each specified product, include manufacturers cut sheets, dimensional data, performance data, installation instructions, specified options, and warranty information.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For controlled-flow roof drainage system. Include calculations, plans, and details.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For storm drainage piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include a copy of each approved submittal along with any applicable maintenance data in the project operation and maintenance manual.

1.7 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Storm-Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two (2) days in advance of proposed interruption of storm-drainage service.

2. Do not proceed with interruption of storm-drainage service without Owner's written permission.

1.9 WARRANTY/GUARENTEE

- A. See Division 22, Specification Section “Basic Mechanical Requirements – Plumbing” for warranty and guarantee requirements.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. Material Design and Selection: Storm water pipe, fittings, and specialties shall be designed and selected, for the intended use, in accordance with the sizes on the drawings and the requirements of this specification.
- B. Acceptable Manufacturers:
 1. Cast Iron Piping Systems: The basic of design is Charlotte Pipe. Other acceptable manufacturers are:
 - a. Tyler Pipe Company.
 - b. MIFAB Inc.
 2. Hubless Cast Iron Piping Systems: The basic of design is Charlotte Pipe. Other acceptable manufacturers are:
 - a. Tyler Pipe Company.
 - b. MIFAB Inc.
 3. Roof Drains, Trench Drains, Cleanouts and Back Water Valves: The basis of design is Zurn Plumbing Products. Other acceptable manufacturers are:
 - a. Josam Company
 - b. J.R. Smith Manufacturing Company
 - c. MIFAB Inc.
 4. Specialty Pipe Fittings: The basis of design is Watts Plumbing Products. Other acceptable manufacturers are:
 - a. Wilkins.
 - b. Capitol Manufacturing Company
 - c. Fernco Inc.

2.2 STORM WATER PIPE APPLICATION

A. General Application: All pipe, fittings and joint methods shall be as specified below.

| Pipe System | Pipe Material | Fitting Material | Joint Material |
|--|---|--|---|
| Storm Water Systems Below Grade to 5 feet beyond the building. | Cast Iron: Service Weight, Hub and Spigot, ASTM A74 | Cast Iron: Service Weight, Hub and Spigot, ASTM A74 | Neoprene rubber gaskets and lubricant, ASME B16.4 |
| | All Cast Iron Soil Pipe and Fittings shall be marked with the Collective Trade Mark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International. | | |
| Storm Water Systems above ground within the building | Cast Iron: Service Weight, No Hub, C15P1-301. | Cast Iron: Service Weight, No Hub, C15P1-301 | Couplings: Husky SD 4000 Heavy Duty Type 304 Stainless Steel, Couplings |
| | All Cast Iron Soil Pipe and Fittings shall be marked with the Collective Trade Mark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International. | | |
| Storm Water Systems above ground in Garage Structures | 2 inch and up; ASTM A53-97 Grade B, Schedule 40 Galvanized Steel Pipe | 2 inch and up; Galvanized Drainage Fittings ASTM 53-97, ANSI B16.14-1991 | All joints shall be Threaded: American Standard for Pipe Threads ANSI B2.1 |
| Foundation Drainage Pipe (Tile) | Rigid Perforated Polyvinyl Chloride Pipe (PVC), ASTM D 2729 | Rigid Non Perforated Polyvinyl Chloride Pipe (PVC) Fittings, ASTM D 2729 | Joints: Joint material to match pipe material. Solvent Cemented Joints, ASTM D 2235, ASTM F 402 |

2.3 COUPLINGS FOR STORM WATER SYSTEMS

- A. General: All couplings shall be a Husky SD 4000 heavy-duty, all stainless steel coupling to join No-Hub pipe and fittings as engineered by Anaco. Each coupling shall include a super-duty corrugated shield of sufficient width to accommodate additional surface-bearing sealing clamps. All SD 4000 couplings shall be designed to be installed with a pre-set torque wrench calibrated at eighty (80) inch pounds to accommodate the 305 stainless steel three eights (3/8) inch Hex Head screws.
- B. Storm Water Pipe Sizes One and One Half (1-1/2) Inch Through Four (4) Inch: The one and one half (1-1/2) inch through four (4) inch diameter couplings shall consist of three (3)

inch wide corrugated 304 stainless steel shield in conjunction with four (4) stainless steel clamps, secured in place by means of an affixed and “floating” eyelet to allow clamp “travel” during tightening.

- C. Storm Water Pipe Sizes Five (5) Inch Through Ten (10) Inch: The five (5) inch through ten (10) inch diameter couplings shall consist of four (4) inch wide corrugated 304 stainless steel shield in conjunction with six (6) stainless steel clamps, secured in place by means of an affixed and “floating” eyelet to allow clamp “travel” during tightening.

- D. Material Specifications:

1. Clamp: Type 304 AISI stainless steel
2. Screw: Type 305 AISI stainless steel 3/8 inch screws
3. Shield: Type 304 AISI stainless steel, corrugated. Shield thickness 0.015
4. Gasket: The gasket shall be manufactured from a properly vulcanized virgin compound in which the primary elastomer is polychloroprene (neoprene) conforming to ASTM C 564. Oil Immersion test: 80% max. Volume Change after immersion in IRM 903 for seventy (70) hours at 212° F.

- E. Certifications & Standards: Tested & Certified to:

1. ASTM C1540
2. ASTM C564
3. FM 1680 Class 1

2.4 ROOF DRAINS <Edit or Delete if not required in particular project>

- A. Cast Iron General Purpose Primary Roof Drain - RD – 1:

1. Model: Zurn Z100.
2. Standard: ASME A112.6.4.
3. Pattern: Roof Drain.
4. Body Material: Cast Iron.
5. Body Dimension: Fifteen (15) inches.
6. Combination Flashing Ring & Gravel Stop: Required.
7. Flow Control Weirs: Not Required.
8. Outlet: Bottom, Threaded, Spigot or No Hub.
9. Extension Collars: Required.
10. Under Deck Clamp: Required.
11. Expansion Joint: Not Required.
12. Sump Receiver: Required.
13. Dome Material: Cast Iron.
14. Wire Mesh: Not Required.
15. Perforated Gravel Stop: Not Required.
16. Vandal Proof Dome: Required.

17. Water Dam: Not Required.

B. Cast Iron General Purpose Overflow Roof Drain - RD – 2:

1. Model: Zurn Z100.
2. Standard: ASME A112.6.4.
3. Pattern: Roof Drain.
4. Body Material: Cast Iron.
5. Body Dimension: Fifteen (15) inches.
6. Combination Flashing Ring & Gravel Stop: Required.
7. Flow Control Weirs: Not Required.
8. Outlet: Bottom, Threaded, Spigot or No Hub. Bottom.
9. Extension Collars: Required.
10. Under Deck Clamp: Required.
11. Expansion Joint: Not Required.
12. Sump Receiver: Required.
13. Dome Material: Cast Iron.
14. Wire Mesh: Not Required.
15. Perforated Gravel Stop: Not Required.
16. Vandal Proof Dome: Required.
17. Water Dam: Two (2) inches high.

C. Cast Iron Green Roof Primary Roof Drain - RD – 3:

1. Model: Zurn Z100.
2. Standard: ASME A112.6.4.
3. Pattern: Roof Drain.
4. Body Material: Cast Iron.
5. Body Dimension: Fifteen (15) inches.
6. Combination Flashing Ring & Gravel Stop: Required.
7. Flow Control Weirs: Not Required.
8. Outlet: Bottom, Threaded, Spigot or No Hub.
9. Extension Collars: Required.
10. Under Deck Clamp: Required.
11. Expansion Joint: Not Required.
12. Sump Receiver: Required.
13. Dome Material: Aluminum.
14. Wire Mesh: Stainless Steel over dome, twelve (12) inches high..
15. Perforated Gravel Stop: Not Required.
16. Vandal Proof Dome: Required.
17. Water Dam: Not Required.

D. Cast Iron Green Roof Overflow Roof Drain - RD – 4:

1. Model: Zurn Z100.

2. Standard: ASME A112.6.4.
3. Pattern: Roof Drain.
4. Body Material: Cast Iron.
5. Body Dimension: Fifteen (15) inches.
6. Combination Flashing Ring & Gravel Stop: Required.
7. Flow Control Weirs: Not Required.
8. Outlet: Bottom, Threaded, Spigot or No Hub.
9. Extension Collars: Required.
10. Under Deck Clamp: Required.
11. Expansion Joint: Not Required.
12. Sump Receiver: Required.
13. Dome Material: Cast Iron.
14. Wire Mesh: Not Required.
15. Perforated Gravel Stop: Not Required.
16. Vandal Proof Dome: Required.
17. Water Dam: Two (2) inches high.

2.5 AREA DRAINS

A. Cast Iron Area Drain - AD – 1 and AD – 2:

1. Model: Zurn Z525
2. Standard: ASME A112.6.3.
3. Pattern: Floor Drain.
4. Body Material: Cast Iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom, Threaded, Spigot or No Hub.
9. Backwater Valve: Not Required.
10. Coating – Interior and Exterior Exposed Surfaces: Acid resistant enamel.
11. Sediment Bucket: Not Required.
12. Top of Strainer Material: Nickle Bronze.
13. Top of Strainer Finish: Nickle Bronze.
14. Top Shape: Round.
15. Strainer Dimension: Eight (8) inches.
16. Top Loading Classification: Light Duty.
17. Funnel: Not Required.
18. Inlet Fitting: Gray Iron.
19. Trap Material: Not Required.
20. Trap Pattern: Not Required.
21. Trap Feature: Not Required.

2.6 TRENCH DRAINS <Delete if not required in particular project>

A. Trench Drains TD – 1:

1. Standard: ASME A112.6.3, for trench drains.
2. Body Material: Cast iron.
3. Flange: Anchor.
4. Clamping Device: Not required.
5. Outlet: [Bottom] [End] [Side] <Edit for particular project>.
6. Grate Material: gray iron.
7. Grate Finish: Not required.
8. Dimensions of Frame and Grate: <Edit for particular project>.
9. Top-Loading Classification: Heavy Duty.

2.7 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES <Delete if not required in particular project>

A. Downspout Adaptors:

1. Description: Manufactured, gray-iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior, sheet metal downspout.
2. Size: Inlet size to match parapet drain outlet.

B. Downspout Boots:

1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 outlet; and shop-applied bituminous coating.
2. Size: Inlet size to match downspout and NPS 4 outlet.

2.8 CLEANOUTS

A. Exposed Metal Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts with straight threads and gasket seal or taper threads for plug flashing flange and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring:
2. Cleanouts in concrete floors:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Model No. Z-1400 style to suit floor finish with round scoriated top or comparable product by one of the following:
3. Cleanouts in Finished Floors:

- a. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Model No. ZN-1400 style to suit floor finish with recessed top for tile or carpet, or comparable product.
4. Cleanouts in Piping:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Model No. ZN-1450-7 with bronze plug, or comparable product.
 5. Cleanouts in Walls:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Model No. ZN-1440-1 style to suit all finishes with vandal proof screws, or comparable product.

2.9 BACKWATER VALVES

A. Cast-Iron, Horizontal Backwater Valves:

1. Standard: ASME A112.14.1, for backwater valves.
2. Size: Same as connected piping.
3. Body Material: Cast iron.
4. Cover: Cast iron with bolted access check valve.
5. End Connections: Hub and spigot.
6. Check Valve: Removable, bronze, swing check, factory assembled, or field modified to hang closed.
7. Extension: ASTM A 74, Service class; full-size, cast-iron soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

2.10 ENCASUREMENT FOR UNDERGROUND METAL PIPING <Delete if not required in particular project>

- A. Standard: ASTM A 674 or AWWA C105.
- B. Material: High-density, cross laminated PE film of 0.004-inch or LLDPE film of 0.008-inch minimum thickness.
- C. Form: Sheet or tube.
- D. Color: Black or natural.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31 Specification Section "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 22 Specification Section "Vibration and Seismic Controls for Plumbing Systems." <Delete if not required in particular project>
- K. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- L. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub

ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

- M. Install storm drainage piping at the following minimum slopes unless otherwise indicated:
1. Building Storm Drain: 1% downward in direction of flow for piping of all sizes.
 2. Horizontal Storm-Drainage Piping: 1% downward in direction of flow.
- N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
- O. Install steel piping according to applicable plumbing code.
- P. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- Q. Install underground PVC piping according to ASTM D 2321.
- R. Install underground, ductile-iron, force-main piping according to AWWA C600. Install buried piping inside building between wall and floor penetrations and connection to storm sewer piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
1. Install encasement on piping according to ASTM A 674 or AWWA C105.
- S. Plumbing Specialties: <Edit for particular project>
1. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
 2. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 3. Install expansion joints, if indicated, in roof drain outlets.
 4. Position roof drains for easy access and maintenance.
 5. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.
 6. Install downspout boots at grade with top twelve (12) inches above grade. Secure to building wall.
 7. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.
 8. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

- a. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - b. Locate cleanouts at each change in direction of piping greater than 45 degrees.
 - c. Locate cleanouts at minimum intervals of fifty (50) feet for piping NPS 4 and smaller and one hundred (100) feet for larger piping.
 - d. Locate cleanouts at base of each vertical soil and waste stack.
9. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
 10. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
 11. Install horizontal backwater valves in floor with cover flush with floor.
 12. Install drain-outlet backwater valves in outlet of drains.
 13. Install test tees in vertical conductors and near floor.
 14. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.
- T. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface unless otherwise indicated.
- U. Install through-penetration firestop assemblies in plastic conductors at concrete floor penetrations.
- V. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.
1. Install backwater valves in storm drainage gravity-flow piping.
 2. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
 3. Install drains in storm drainage gravity-flow piping.
- W. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- X. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Specification Section "Sleeves, Sleeve Seals, and Escutcheons for Plumbing."
- Y. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Specification Section "Sleeves, Sleeve Seals and Escutcheons for Plumbing Piping."

- Z. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Specification Section "Sleeves, Sleeve Seals, and Escutcheons for Plumbing."

3.3 JOINT CONSTRUCTION <Edit for particular project>

- A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Hubless, Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Join copper tube and fittings with soldered joints according to ASTM B 828 procedure. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- E. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Shielded, nonpressure transition couplings.
- B. Dielectric Fittings:
 - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - 2. Dielectric Fittings for and Smaller: Use dielectric unions.
 - 3. Dielectric Fittings for NPS 2-1/2 and larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

- A. General valve installation requirements are specified in Division 22 Specification Section "Valves for Plumbing Piping Systems."
- B. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.
- C. Backwater Valves: Install backwater valves in piping subject to backflow.
 - 1. Install backwater valves in accessible locations.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Division 22 Specification Section "Vibration and Seismic Controls for Plumbing Systems."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Specification Section "Hangers and Supports for Plumbing Piping Systems."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
 - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 - 5. Vertical Piping: MSS Type 8 or Type 42 clamps.
 - 6. Individual, Straight, Horizontal Piping Runs:
 - a. One hundred (100) Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than One hundred (100) Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than One hundred (100) Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 7. Multiple, Straight, Horizontal Piping Runs One hundred (100) Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within twelve (12) inches of each fitting and coupling.

- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: Sixty (60) inches with 3/8-inch rod.
 - 2. NPS 3: Sixty (60) inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: Sixty (60) inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: Sixty (60) inches with 3/4-inch rod.
 - 5. NPS 10 and NPS 12: Sixty (60) inches with 7/8-inch rod.
 - 6. Spacing for ten (10) foot pipe lengths may be increased to ten (10) feet. Spacing for fittings is limited to sixty (60) inches.
- G. Install supports for vertical cast-iron soil piping every fifteen (15) feet.
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: Eighty four (84) inches with 3/8-inch rod.
 - 2. NPS 1-1/2: One hundred eight (108) inches with 3/8-inch rod.
 - 3. NPS 2: Ten (10) feet with 3/8-inch rod.
 - 4. NPS 2-1/2: Eleven (11) feet with 1/2-inch rod.
 - 5. NPS 3: Twelve (12) feet with 1/2-inch rod.
 - 6. NPS 4 and NPS 5: Twelve (12) feet with 5/8-inch rod.
 - 7. NPS 6 and NPS 8: Twelve (12) feet with 3/4-inch rod.
 - 8. NPS 10 and NPS 12: Twelve (12) feet with 7/8-inch rod.
- I. Install supports for vertical steel piping every fifteen (15) feet.
- J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
 2. Install horizontal backwater valves with cleanout cover flush with floor or with finished grade.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

- A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Division 22 Specification Section "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least twenty four (24) hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than ten (10) foot head of water. From fifteen (15) minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.10 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.11 LEAK TEST PIPING SYSTEMS:

- A. See Division 22 Specification Section “Leak Test Plumbing Piping Systems” for testing requirements.

END OF SECTION 221413