HAUSMANN construction

# PCO #015

Hausmann Construction, Inc.
2108 Taylor Ave. #850
Norfolk, Nebraska 68701
Phone: (402) 371-8650
Fax: (402) 438-3235

**Project:** 21-068 - Woodbury County - Law Enforcement Center
3701 28th Street
Sioux City, Iowa 51104

## Prime Contract Potential Change Order #015: PCO 015 - PR 010

| | | | |
|---|---|---|---|
| **TO:** | Woodbury County Law Enforcement<br>620 Douglas Street<br>Sioux City, Iowa 51105 | **FROM:** | Hausmann Construction, Inc.<br>8885 Executive Woods Drive<br>Lincoln, Nebraska 68512 |
| **PCO NUMBER/REVISION:** | 015 / 0 | **CONTRACT:** | 21-068 - Woodbury County - Law Enforcement Center |
| **REQUEST RECEIVED FROM:** | | **CREATED BY:** | Klay Kasik **(Hausmann Construction, Inc.)** |
| **STATUS:** | Pending - In Review | **CREATED DATE:** | 3/30/2022 |
| **REFERENCE:** | | **PRIME CONTRACT CHANGE ORDER:** | None |
| **FIELD CHANGE:** | No | | |
| **LOCATION:** | | **ACCOUNTING METHOD:** | Amount Based |
| **SCHEDULE IMPACT:** | | **PAID IN FULL:** | No |
| **EXECUTED:** | No | **SIGNED CHANGE ORDER RECEIVED DATE:** | |
| | | **TOTAL AMOUNT:** | ($159,263.00) |

**POTENTIAL CHANGE ORDER TITLE:** PCO 015 - PR 010

**CHANGE REASON:** Change Proposal Request

**POTENTIAL CHANGE ORDER DESCRIPTION:** *(The Contract Is Changed As Follows)*
CE #PCO 015 - PR 010
PCO 015 is created to incorporate costs associated with PR 010 as itemized within. Please provide approval of pricing no later than 3/7/2022.

**ATTACHMENTS:**
21-068 - CO BACK UP 2.2.22.pdf , _PR#10R Pricing Breakdown.pdf , _Woodbury Co PR 10R.pdf

| # | Description | Amount |
|---|---|---|
| 1 | CW Suter | $(156,140.00) |
| 2 | Fee | $(3,123.00) |
| | **Grand Total:** | **$(159,263.00)** |

**Kevin Rost (Goldberg Group Architects)**
520 Francis Street Suite 200C
St. Joseph, Missouri 64501
DocuSigned by: Kevin Rost B8A4BCDF8BED4D9... 3/31/2022
SIGNATURE DATE

**Woodbury County Law Enforcement**
620 Douglas Street
Sioux City, Iowa 51105
DocuSigned by: Ron Wieck 7AD68DE5E3CE459... 4/28/2022
SIGNATURE DATE

**Hausmann Construction, Inc.**
8885 Executive Woods Drive
Lincoln, Nebraska 68512
DocuSigned by: Steve Thiele 380334A8122A46C... 3/31/2022
SIGNATURE DATE

# Approved By:

DocuSigned by:
Klay Kasik
B96656CE885642A...

DocuSigned by:
Jesse Volpp
3DF7F6E8C1E544E...

DocuSigned by:
Steve Thiele
380334A8122A46C...

HAUSMANN construction

**Woodbury LEC**

**PR 010R**

Cost Item: PR 010R

21-062 DATE: 03/30/22

| ITEM DESCRIPTION | | QUANTITY | UNIT | MATERIAL COST Rate | MATERIAL COST TOTAL | LABOR COSTS RATE | LABOR COSTS TOTAL | EQUIPMENT COSTS Rate | EQUIPMENT COSTS TOTAL | SUBCONTRACTOR Rate | SUBCONTRACTOR TOTAL | SUBTOTALS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Self Perform** | | | | | | | | | | | | $ - |
| | | | hours | | $ - | | $ - | | $ - | | $ - | $ - |
| | | | xx | | $ - | | $ - | | $ - | | $ - | $ - |
| | | | xx | | $ - | | $ - | | $ - | | $ - | $ - |
| | | | xx | | $ - | | $ - | | $ - | | $ - | $ - |
| | | | xx | | $ - | | $ - | | $ - | | $ - | $ - |
| | | | xx | | $ - | | $ - | | $ - | | $ - | $ - |
| | | | xx | | $ - | | $ - | | $ - | | $ - | $ - |
| | | | xx | | $ - | | $ - | | $ - | | $ - | $ - |
| **Subcontracts** | | | | | | | | | | | | $ (156,140.00) |
| CW Suter | | 1 | lsum | | $ - | | $ - | | $ - | $ (156,140.00) | $ (156,140.00) | $ (156,140.00) |
| | | | lsum | | $ - | | $ - | | $ - | | $ - | $ - |
| | | | lsum | | $ - | | $ - | | $ - | | $ - | $ - |
| | | | lsum | | $ - | | $ - | | $ - | | $ - | $ - |
| | | | lsum | | $ - | | $ - | | $ - | | $ - | $ - |
| | | 1 | lsum | | $ - | | $ - | | $ - | $ - | $ - | $ - |
| | | 1 | lsum | | $ - | | $ - | | $ - | $ - | $ - | $ - |
| | | | Subtotals | | $ - | | $ - | | $ - | | $ (156,140.00) | $ (156,140.00) |

| | | | |
|---|---|---|---|
| **Subtotal** | | $ | (156,140.00) |
| **Self-Perform Fee** | 10.0% | $ | - |
| **Sub Fee** | 2.0% | $ | (3,123.00) |
| **Bond & Insurance** | 0.0% | $ | - |
| **Grand Total** | | $ | (159,263.00) |

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| | |
|---|---|
| Project | Woodbury County LEC |
| Date | 2/18/2022 |
| CO# | PR #10 R |

| **Labor** | Rate | | Hours | | Total |
|---|---|---|---|---|---|
| No Hub to PVC | $ 65.00 | x | -387 | = | $ (25,155.00) |
| | $ 65.00 | x | | = | $ - |
| Copper to PEX | $ 65.00 | x | -422 | = | $ (27,430.00) |
| | $ 65.00 | x | | = | $ - |
| Other _____ | | x | | = | $ - |
| Other _____ | | x | | = | $ - |
| Other _____ | | x | | = | $ - |
| | | | **Sub-total** | | **$ (52,585.00)** |

| **Material** | |
|---|---|
| Deduct for No Hub to PVC pipe & fittings | $ (56,800.00) |
| Copper to Pex water piping | $ (41,560.00) |
| | |
| | |
| **Sub-total** | **$ (98,360.00)** |

| **Equipment** | |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| **Sub-total** | **$ -** |

| **Subcontractors** | |
|---|---|
| Insulation add to work on PEX | $ 9,000.00 |
| | |
| | |
| | |
| | |
| | |
| **Sub-total** | **$ 9,000.00** |

| | | | | | |
|---|---|---|---|---|---|
| **Overhead & Profit** | $ (141,945.00) | x | 10% | = | $ (14,195.00) |
| **Taxes** | | | | | |
| **Bond/Insurance** | | | | | |
| **Permit** | | | | | |

**Proposal Total** **$(156,140.00)**

Included in this price for PR10R

To change the DWV in the chase ways behind the jail cells to PVC instead of NO Hub Cast Iron.
To change the 2” & smaller water piping in the chase ways behind the jail cells to PEX instead of Copper.

This would be a deduct of $156,140.00

This is how we read and understood the PR. We only altered piping in the chases for the jail cells. The rest of the building will remain in copper and No Hub.

Sorry for the delay on this and if there is any questions, please let us know.

**Colton Jacobs**
**Plumbing Estimator**

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520 Francis Street, Suite 200C
Saint Joseph, Missouri, 64501
806-344-9879 | info@gga-pc.com
GoldbergArchitects.com

# *Work Changes Proposal Request*

**PROJECT** *(Name and address):*
**Woodbury County Law Enforcement Center**
**3701 28th Street**
**Sioux City, Iowa 51105**

**OWNER** *(Name and address):*
**Woodbury County Law Enforcement Authority**
**620 Douglas Street**
**Sioux City, Iowa 51101**

**FROM ARCHITECT** *(Name and address):*
**Goldberg Group Architects, PC**
**520 Francis Street, Suite 200C**
**St. Joseph, Missouri 64501**

**TO CONTRACTOR** *(Name and address):*
**Hausmann Construction, Inc.**
**2108 Taylor Avenue #850**
**Norfolk, Nebraska 68701**

**PROPOSAL REQUEST NUMBER: 10R**

**DATE OF ISSUANCE: 02.08.22**

**CONTRACT FOR: Woodbury County Law Enforcement Center**

**CONTRACT DATE: 06.28.2021**

**ARCHITECT'S PROJECT NUMBER: 16003-06**

OWNER ☒
ARCHITECT ☒
CONSULTANT ☐
CONTRACTOR ☒
FIELD ☐
OTHER ☐

Please submit an itemized proposal for changes in the Contract Sum and Contract Time for proposed modifications to the Contract Documents described herein. Within ten (10) days, the Contractor must submit this proposal or notify the Architect, in writing, of the date on which proposal submission is anticipated.

**THIS IS NOT A CHANGE ORDER, A CONSTRUCTION CHANGE DIRECTIVE OR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED IN THE PROPOSED MODIFICATIONS.**

**DESCRIPTION** *(Insert a written description of the Work):*

Item No. 1 – Specification Revisions:

Section 22 11 16 – Domestic Water Piping

- Added specification language allowing for PEX piping for domestic systems.
- Added language for providing compliance with smoke/flame spread.
- Modified pipe schedules.

Section 22 13 16 – Sanitary Waste and Vent Piping

- Modified pipe schedule to allow PVC piping for back of cell areas.

**ATTACHMENTS** *(List attached documents that support description)*:

Specification Sections 22 11 16 and 22 13 16

**REQUESTED BY THE ARCHITECT:**

*(Signature)*

**Carole Cline, Associate**
*(Printed name and title)*

# SECTION 22 11 16
# DOMESTIC WATER PIPING

## PART 1 - GENERAL

### 1.01 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 20 08 00 “Seismic Protection,” Section 22 01 00 “Basic Plumbing Requirements,” and Section 22 05 00 “Basic Plumbing Materials and Methods” all apply to the work of this Section as if fully repeated herein.

### 1.02 SUMMARY

A. Section Includes:
1. Copper tube and fittings.
2. Ductile-iron pipe and fittings.
3. Stainless-steel piping
4. Piping joining materials.
5. Encasement for piping.
6. Transition fittings.
7. Dielectric fittings.

### 1.03 ACTION SUBMITTALS

A. Product Data: For Pipe, fittings, joining material, encasement, transition fittings and dielectric fittings.

B. Sustainable Design Submittals:
1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

### 1.04 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

### 1.05 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
1. Notify Construction Manager and Owner no fewer than fourteen days in advance of proposed interruption of water service.
2. Do not interrupt water service without Owner’s written permission.

### 1.06 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, “Structural Welding Code – Steel.”

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX, “Welding and Brazing Qualifications.”

## PART 2 - PRODUCTS

### 2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

C. Comply with NSF Standard 372 for low lead.

**2.02 COPPER TUBE AND FITTINGS**

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

E. Copper Unions:
1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

**2.03 DUCTILE-IRON PIPE AND FITTINGS**

A. Mechanical-Joint, Ductile-Iron Pipe:
1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:
1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:
1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

**2.04 STAINLESS-STEEL PIPING**

A. Potable-water piping and components shall comply with NSF 61 Annex G.

B. Stainless-Steel Pipe: ASTM A 312/A 312M, Schedule 10.

C. Stainless-Steel Pipe Fittings: ASTM A 815/A 815M.

D. Appurtenances for Grooved-End, Stainless-Steel Pipe:
1. Fittings for Grooved-End, Stainless-Steel Pipe: Stainless-steel casting with dimensions matching stainless-steel pipe.
2. Mechanical Couplings for Grooved-End, Stainless-Steel Pipe:
   a. AWWA C606 for stainless-steel-pipe dimensions.
   b. Stainless-steel housing sections.
   c. Stainless-steel bolts and nuts.
   d. EPDM-rubber gaskets suitable for hot and cold water.
   e. Minimum Pressure Rating:
      1) NPS 6 (DN150) and NPS 8 (DN 200) and Smaller: 600psig (4137 kPa).

**2.05 PIPING JOINING MATERIALS**

A. Pipe-Flange Gasket Materials:
1. AWWA C110/A21.10, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

## 2.06 *PEX TUBE AND FITTINGS*

**A.** ***Tube Material: PEX-a (engel-method crosslinked polyethylene), ASTM F 876 and ASTM F 877. SRD 9, CTS ½" (16mm) through 2" (50mm) nominal pipe size.***

**B.** ***Fittings: ASTM F 1807, metal insert and copper crimp rings or ASTM F 1960, cold expansion fittings and reinforcing rings.***

**1. Third-party certified to NSF 14 and ASTM F1960 cold-expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 2 inch nominal pipe size fittings manufactured from the following material types:**

**2. Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked "F1960".**

**C.** ***Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 876; multiport tees and elbows: Multiple-outlet fitting complying with ASTM F877 (CAN/CSA B137.5); with ASTM F1960 inlets and outlets.***

**1. Type L copper branch manifold with lead-free brass valve outlets.**

**2. Type L copper branch manifold without valves, with lead-free brass outlets.**

## 2.07 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Form: tube.

C. Color: Black or natural.

## 2.08 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

## 2.09 DIELECTRIC FITTINGS

A. See Section 22 05 00 "Basic Plumbing Materials and Methods".

## 2.10 *SMOKE AND FIRE RATINGS*

**A.** ***Entire building requires Plenum-rated Piping System installed above ceilings. Pipe shall be wrapped and/or insulated with standard fiberglass or mineral wool pipe insulation, field installed.***

**B.** ***For domestic hot water fittings may be left bare.***

C. ***For domestic cold water systems the entire piping system must be wrapped or insulated to prevent condensation.***

D. ***The pipe, wrap or insulation as a system shall meet the requirements of CAN/ULC-S102.2-03, ASTM E84 or UL 2846.***

E. ***The system shall have a Flame Spread Classification of less than 25 and Smoke Development rating of less than 50.***

## PART 3 - EXECUTION

### 3.01 EARTHWORK

A. Comply with requirements in Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

### 3.02 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."

H. Install domestic water piping with 0.25 percent slope downward toward drain or level without pitch and plumb.

I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint in Section 20 08 00 "Seismic Protection."

K. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

L. 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.

M. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

N. Install piping to permit valve servicing.

O. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

P. Install piping free of sags and bends.

Q. Install fittings for changes in direction and branch connections.

R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

S. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping."

T. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 22 11 23 "Domestic Water Pumps."

U. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 22 05 19 "Meters and Gages for Plumbing Piping."

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 00 "Basic Plumbing Materials and Methods”."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 00 "Basic Plumbing Materials and Methods "

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 00 "Basic Plumbing Materials and Methods."

***Install PEX tubing with loop at each change of direction of more than 90 degrees.***

**3.03 JOINT CONSTRUCTION**

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

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.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

**I.** ***Joints for PEX Tubing: Join according to ASTM F 1807 for metal insert and copper crimp ring fittings and ASTM F 1960 for cold expansion fittings and reinforcing rings.***

**J.** ***Joints for PEX Tubing: Join according to ASSE 1061 for push-fit fittings.***

K. ***Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.***

## 3.04 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:
   1. Fittings for NPS 1-1/2 (DN 40) and Smaller: Fitting-type coupling.
   2. Fittings for NPS 2 (DN 50) and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition unions.

## 3.05 DIELECTRIC FITTING INSTALLATION

A. See section 22 05 00 “Basic Plumbing Material and Methods”.

## 3.06 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 22 05 00 "Seismic."

B. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Vertical Piping: MSS Type 8 or 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs:
      a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.
   3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
   2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
   3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
   4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
   5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
   6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
   7. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.

F. Install supports for vertical copper tubing every 10 feet (3 m).

G. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/4 (DN 32) and Smaller: 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
   2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
   3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.
   4. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.
   5. NPS 3 and NPS 3-1/2 (DN 80 and DN 90): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.

6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.
7. NPS 6 (DN 150): 12 feet (3.7 m) with 3/4-inch (19-mm) rod.
8. NPS 8 to NPS 12 (DN 200 to DN 300): 12 feet (3.7 m) with 7/8-inch (22-mm) rod.

H. Install supports for vertical stainless-steel piping every 15 feet (4.5 m).

***I. Install vinyl-coated hangers for PEX tubing with the following maximum horizontal spacing and minimum rod diameters:***

***1. NPS 2 (DN 50) and Smaller: 32 inches (815 mm) with 3/8-inch (10-mm) rod.***

***J. Install hangers for vertical PEX tubing every 48 inches (1200 mm).***

K. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

## 3.07 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

## 3.08 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 00 "Basic Plumbing Materials and Methods."

B. Label pressure piping with system operating pressure.

## 3.09 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Piping Inspections:
   a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
   b. During installation, notify authorities having jurisdiction at least one day 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 and before setting fixtures.
      2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
   c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:
   a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
   b. 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 a separate report for each test, complete with diagram of portion of piping tested.
   c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
   e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
   f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

## 3.10 ADJUSTING

A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
   b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

## 3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
   b. Fill and isolate system according to either of the following:
      1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
      2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
   c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

## 3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 (DN 100 to DN 200) and larger, shall be one of the following:
1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
2. Mechanical-joint, ductile-iron pipe; standard- or compact-pattern, mechanical-joint fittings; and mechanical joints.
***3. PP-R, SDR 11 socket fittings; and fusion-welded joints.***

D. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.
***2. PEX-a tube, NPS 2 (DN 50) and smaller.***

***a. Fittings for PEX tube:***

***1) ASTM F 1807, metal insert and copper crimp rings.***
***2) ASTM F 1960, cold expansion fittings and reinforcing rings.***
***3) ASSE 1061, push-fit fittings.***

E. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.
***.***

F. Aboveground domestic water piping, NPS 5 to NPS 8 (DN 125 to DN 200), shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.
2. Stainless-steel Schedule 10 pipe, grooved-joint fittings, and grooved joints.

## 3.13 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use ball valves for piping NPS 2 (DN 50) and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
   2. Throttling Duty: Use ball valves for piping NPS 2 (DN 50) and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
   3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
   4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

**END OF SECTION**

# SECTION 22 13 16
# SANITARY WASTE AND VENT PIPING

## PART 1 - GENERAL

### 1.01 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 20 08 00 “Seismic Protection,” Section 22 01 00 “Basic Plumbing Requirements,” and Section 22 05 00 “Basic Plumbing Materials and Methods” all apply to the work of this Section as if fully repeated herein.

### 1.02 SUMMARY

A. Section Includes:
   1. Pipe, tube, and fittings.
   2. Specialty pipe fittings.
   3. Encasement for underground metal piping.

B. Related Requirements:
   1. Section 22 13 13 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.

### 1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data for Credit IEQ 4.1: For solvent cements and adhesives, and 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 for 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 hub-less, single-stack drainage system. Include plans, elevations, sections, and details.

### 1.04 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent 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 piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

### 1.05 FIELD CONDITIONS

A. Interruption of Existing Sanitary Waste 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 Construction Manager and Owner no fewer than two weeks in advance of proposed interruption of sanitary waste service.
   2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

## PART 2 - PRODUCTS

### 2.01 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.
2. Waste, Force-Main Piping: 50 psig.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

**2.02 PIPING MATERIALS**

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

**2.03 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS**

A. Marked with CISPI collective trademark and NSF certification mark.

B. Pipe and fittings in this article are available in NPS 2 to NPS 15 (DN 50 to DN 375).

C. Pipe and Fittings: ASTM A 74, Service class(es).

D. Gaskets: ASTM C 564, rubber.

**2.04 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS**

A. Marked with CISPI collective trademark and NSF certification mark.

B. Pipe in "Pipe and Fittings" Paragraph below is available in NPS 2 to NPS 15.

C. Pipe and Fittings: ASTM A 888 and CISPI 301.

D. CISPI, Hub-less-Piping Couplings:

1. Standards: ASTM C 1277 and CISPI 310.
2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

E. Heavy-Duty, Hub-less-Piping Couplings:

1. Standards: ASTM C 1277 and ASTM C 1540.
2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

**2.05 COPPER TUBE AND FITTINGS**

A. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Hard Copper Tube: ASTM B 88, Type L and Type M (ASTM B 88M, Type B and Type C), water tube, drawn temper.

D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

**2.06 PVC PIPE AND FITTINGS**

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-DWV" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall 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.”

E. Solvent Cement: ASTM D 2564.

1. Adhesive primer shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Adhesive primer shall 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.”

## 2.07 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
   1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
   2. Unshielded, Non-pressure Transition Couplings:
      a. Acceptable manufacturers; Fernco, Anaco-Huskey, and Joints Coupling.
      b. Standard: ASTM C 1173.
      c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
      d. End Connections: Same size as and compatible with pipes to be joined.
      e. Sleeve Materials:
         1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
         2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
         3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
   3. Shielded, Non-pressure Transition Couplings:
      a. Acceptable manufacturers; Mission, MIFAB, or CREMCO.
      b. Standard: ASTM C 1460.
      c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
      d. End Connections: Same size as and compatible with pipes to be joined.

B. Dielectric Fittings:
   1. See Section 22 05 00 “Basic Plumbing Materials and Methods”.

## 2.08 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105/A 21.5.
B. Material: high-density, cross-laminated polyethylene film of 0.004-inch (0.10-mm) minimum thickness.
C. Form: Sheet or tube.
D. Color: Black or natural.

# PART 3 - EXECUTION

## 3.01 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 31 20 00 "Earth Moving."

## 3.02 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
   1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
   2. Install piping as indicated unless deviations to 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 Section 22 08 00. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
    1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
    2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drainpipe.
        a. Straight tees, elbows, and crosses may be used on vent lines.
    3. Do not change direction of flow more than 90 degrees.
    4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
        a. Reducing size of waste piping in direction of flow is prohibited.
K. Lay buried building waste piping beginning at low point of each system.
    1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
    2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
    3. Maintain swab in piping and pull past each joint as completed.
L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
    1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
    2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
    3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
M. 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/A 21.5.
N. Install steel piping according to applicable plumbing code.
O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
P. Install underground PVC piping according to ASTM D 2321.
Q. Install engineered soil and waste and vent piping systems as follows:
    1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
    2. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
R. Install underground, ductile-iron, force-main piping according to AWWA C600.
    1. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints.
    2. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
    3. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.
S. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."
    1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.
T. Install force mains at elevations indicated.
U. Plumbing Specialties:
    1. Install backwater valves in sanitary waster gravity-flow piping.

a. Comply with requirements for backwater valves specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
   a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
   b. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
3. Install drains in sanitary waste gravity-flow piping.
   a. Comply with requirements for drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

V. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

W. Install sleeves for piping penetrations of walls, ceilings, and floors.
1. Comply with requirements for sleeves specified in Section 22 05 00 “Basic Plumbing Material and Methods."

X. Install sleeve seals for piping penetrations of concrete walls and slabs.
1. Comply with requirements for sleeve seals specified in Section 22 05 00 “Basic Plumbing Material and Methods."

Y. Install escutcheons for piping penetrations of walls, ceilings, and floors.
1. Comply with requirements for escutcheons specified in Section 22 05 00 “Basic Plumbing Material and Methods."

**3.03 JOINT CONSTRUCTION**

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. Join hub-less, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hub-less-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1.
1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
   c. Do not use pipe sections that have cracked or open welds.

E. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

F. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

G. Plastic, Non-pressure-Piping, Solvent-Cement 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.

**3.04 SPECIALTY PIPE FITTING INSTALLATION**

A. Transition Couplings:
1. Install transition couplings at joints of piping with small differences in ODs.

2. In Waste Drainage Piping: Unshielded, non-pressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.
4. In Underground Force Main Piping:
   a. NPS 2(DN 50) and Smaller: Fitting-type transition couplings.

B. Dielectric Fittings:
1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges and flange kits.
4. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

**3.05 VALVE INSTALLATION**

A. Comply with requirements in Section 22 05 23 "Valves," for general-duty valve installation requirements.
B. Shutoff Valves:
1. Install gate or full-port ball valve for piping NPS 3 and smaller.
C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

**3.06 HANGER AND SUPPORT INSTALLATION**

A. Comply with requirements for seismic-restraint devices specified in Section 22 08 00.
B. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
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. Install individual, straight, horizontal piping runs:
   a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.
7. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) 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 12 inches (300 mm) of each fitting, valve, 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 (10-mm) 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 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 and NPS 8 (DN 150 and DN 200): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
5. NPS 10 and NPS 12 (DN 250 and DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.
6. Spacing for 10-foot (3-m) lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).

G. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).
H. Install supports for vertical steel piping every 15 feet (4.5 m).
I. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
    1. NPS 1-1/4 (DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
    2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
    3. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
    4. NPS 3 and NPS 5 (DN 80 and DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
    5. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
    6. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.
J. Install supports for vertical copper tubing every 10 feet (3 m).
K. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

**3.07 CONNECTIONS**

A. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
C. Connect waste and vent piping to the following:
    1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
    2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
    3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
    4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
    5. Comply with requirements for cleanouts and drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
    6. Equipment: Connect waste piping as indicated.
        a. Provide shutoff valve if indicated and union for each connection.
        b. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.
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 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
    2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.

**3.08 IDENTIFICATION**

A. Identify exposed sanitary waste and vent piping.
B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

**3.09 FIELD QUALITY CONTROL**

A. During installation, notify authorities having jurisdiction at least 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 and before setting fixtures.
    2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
D. Test sanitary waste and vent 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.
        a. 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 waste and vent piping until it has been tested and approved.
        a. Expose work that was covered or concealed before it was tested.
    3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
        a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa).
        b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
        c. Inspect joints for leaks.
    4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
        a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa).
        b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
        c. Air pressure must remain constant without introducing additional air throughout period of inspection.
        d. Inspect plumbing fixture connections for gas and water leaks.
    5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
    6. Prepare reports for tests and required corrective action.
E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
    1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.
        a. Expose work that was covered or concealed before it was tested.
    2. Cap and subject piping to static-water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials.
        a. Isolate test source and allow to stand for four hours.
        b. Leaks and loss in test pressure constitute defects that must be repaired.
    3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
    4. Prepare reports for tests and required corrective action.

## 3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.
B. Protect sanitary waste and vent piping 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.
D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.
E. Repair damage to adjacent materials caused by waste and vent piping installation.

## 3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil, waste and vent piping NPS 8 (DN 200) and smaller shall be any of the following:

1. Hub-less, cast-iron soil pipe and fittings and hub-less; heavy-duty hub-less-piping couplings; and coupled joints.
2. Copper Type DWV tube, copper drainage fittings, and soldered joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, non-pressure transition couplings.
4. ***Behind Cell areas mechanical spaces at contractor option may be solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.***

C. Underground, soil, waste, and vent piping (includes inmate waste (IWS) and Grease Waste (GW)) NPS 8 (DN 200) and smaller shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, non-pressure transition couplings.

**END OF SECTION**