SECTION 231116 - FACILITY GASOLINE PIPING

This Section includes pipe materials, fittings, valves, and piping specialties normally encountered in gasoline piping systems.

Piping, valves, fittings, joints, accessories, and other appurtenances should be indicated on the pipe schedule.

Manufacturers found in SpecAgent for this Section were identified as representative and not as an endorsement for meeting requirements of this Specification.

This Section includes performance, proprietary, and descriptive specifications. Edit to avoid conflicting requirements.

This Section may include term "Architect/Engineer." "Architect" is used in AIA contract documents; "Engineer" is used in EJCDC contract documents. Retain appropriate term.

See Drawing Coordination Checklist and Evaluations for information needed to coordinate this Specification Section with Drawings.

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes:

Gasoline piping, belowground.

Gasoline piping, aboveground.

Gasoline underground containment system.

Unions and flanges.

Valves.

Pipe hangers and supports.

Relief valves.

Back pressure regulating valves.

Strainers.

Flexible connectors.

Leak detection and location system.

Underground pipe markers.

Bedding and cover materials.

* + - * 1. Related Requirements:

List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.

Section 051200 - Structural Steel Framing: Welding of pipe support members to structural building framing.

Section 052100 - Steel Joist Framing: Welding of pipe support members to structural building framing.

Section 078413 – Penetration Firestopping: Firestopping at fire-rated construction perimeters and openings containing penetrating sleeves and piping.

Section 083113 - Access Doors and Frames: Coordination of size and location of access doors.

Section 099114 – Exterior Painting: Execution requirements for painting insulation jackets and covering specified by this section.

Section 099123 – Interior Painting: Execution requirements for painting insulation jackets and covering specified by this section.

Section 230516 - Expansion Fittings and Loops for HVAC Piping: Expansion fittings and loops as required by this Section.

Section 230529 - Hangers and Supports for HVAC Piping and Equipment: Hangers and supports for piping and equipment specified in this Section.

Section 230553 - Identification for HVAC Piping and Equipment: Piping identification.

Section 231216 - Facility Gasoline Dispensing Pumps: Gasoline dispensers and accessories.

Section 231300 - Facility Fuel-Storage Tanks: Underground and aboveground fuel storage tanks, aboveground steel secondary containment dike tanks, and leak detection and location systems.

Section 310000 - Earthwork

Section 310001 – Earthwork Materials

Section 312316.26 – Rock Removal: Product and execution requirements for excavation and backfill required by this Section.

Section 315000 – Excavation Support and Protection: Execution requirements for trenching required by this Section.

* + - 1. DEFINITIONS
				1. Bedding: Fill placed under, beside, and directly over pipe, prior to subsequent backfill operations.
			2. REFERENCE STANDARDS

List reference standards included within text of this Section, with designations, numbers, and complete document titles.

* + - * 1. American Association of State Highway and Transportation Officials:

AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a (18-in.) Drop.

* + - * 1. American Petroleum Institute:

API Spec 5L - Specification for Line Pipe.

* + - * 1. American Society of Mechanical Engineers:

ASME - Boiler and Pressure Vessel Code (BPVC), Section VIII: Rules for Construction of Pressure Vessels Division 1.

ASME - BPVC, Section IX: Welding and Brazing Qualifications.

ASME B16.9 - Factory Made Wrought Buttwelding Fittings.

ASME B16.11 - Forged Fittings, Socket-Welding and Threaded.

ASME B31.1 - Power Piping.

ASME B31.4 - Pipeline Transportation Systems for Liquids and Slurries.

ASME B31.9 - Building Services Piping.

* + - * 1. ASTM International:

ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

ASTM A135 - Standard Specification for Electric-Resistance-Welded Steel Pipe.

ASTM A139 - Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over).

ASTM A182 - Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.

ASTM A234 - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

ASTM A312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

ASTM A358 - Standard Specification for Electric-Fusion-Welded Austenitic Chromium-Nickel Stainless Steel Pipe for High-Temperature Service and General Applications.

ASTM A403 - Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings.

ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.

ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3.

ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3.

ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

* + - * 1. American Welding Society:

AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

AWS D1.1 - Structural Welding Code - Steel.

* + - * 1. FM Global:

FM Global - Approval Guide.

* + - * 1. Manufacturers Standardization Society:

MSS SP 58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

MSS SP 69 - Pipe Hangers and Supports - Selection and Application.

MSS SP 70 - Gray Iron Gate Valves, Flanged and Threaded Ends.

MSS SP 71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends.

MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.

MSS SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.

MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

* + - * 1. NACE International:

NACE SP0169 - Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

* + - * 1. National Fire Protection Association:

NFPA 30 - Flammable and Combustible Liquids Code.

* + - * 1. The Society for Protective Coatings:

SSPC SP 7 - Brush-Off Blast Cleaning.

* + - * 1. UL:

UL - Certifications Directory.

UL 536 - Standard for Flexible Metallic Hose.

UL 842 - Standard for Valves for Flammable Fluids.

UL 913 - Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations.

* + - 1. COORDINATION
				1. Section 013000 - Administrative Requirements: Requirements for coordination.
				2. Coordinate Work of this Section with Work of other Sections.
			2. PREINSTALLATION MEETINGS
				1. Section 013000 - Administrative Requirements: Requirements for preinstallation meeting.
				2. Convene minimum [**one week] [<\_\_\_\_\_\_\_\_> weeks**] prior to commencing Work of this Section.
			3. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Section 013300 - Submittal Procedures: Requirements for submittals.
				5. Product Data:

Piping: Submit manufacturer's catalog information with data on pipe materials, fittings, and accessories.

Valves: Submit manufacturer's catalog information with valve data and ratings for each service.

Hangers and Supports: Submit manufacturer's catalog information including load capacity.

Fuel Piping Specialties: Submit manufacturer's catalog information including capacity, rough-in requirements, and service sizes.

Leak Detection and Location System: Submit manufacturer's catalog information for controller, alarm unit, cable type [, **and**] <\_\_\_\_\_\_\_\_>.

* + - * 1. Shop Drawings:

Indicate [**layout of each piping system to scale of <\_\_\_\_\_\_\_\_>] [layout of piping system to scale of <\_\_\_\_\_\_\_\_>] [piping layout as designed by piping system manufacturer**].

Indicate piping system routing showing [**pipe lengths,] [fitting locations,] [valve locations,] [manholes,] [expansion joints,] [expansion loop locations,] [anchors,] [field joints,] [field welds,] [and**] <\_\_\_\_\_\_\_\_>.

[**Indicate leak detection and location system routing and controller location**.]

* + - * 1. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
				2. Welders' Certificates: Certify welders and welding procedures employed on the Work[, **verifying AWS qualification within previous 12 months] [according to ASME Section IX**].

Include separate paragraphs for additional certifications.

Include following paragraph when Contractor is responsible for designing products or assemblies. List affected products when Section specifies more than one product.

* + - * 1. Delegated Design Submittal:

Indicate pipe size.

Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

Submit [**stress and movement] [expansion**] analysis for [**each**] piping system.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Delegated Design Submittal:

Submit computer analysis of [**each**] system layout to determine stresses and anticipated movement of piping.

Submit design assumptions.

* + - * 1. Test and Evaluation Reports:

Submit written test results for piping system pressure tests.

Include following subparagraph if requesting written verification of check for voids within injected insulation.

Submit written report results of [**visual check prior to jacketing] [or] [infrared] [x-ray scanning**] of entire length of each piece to ensure that there are no voids in injected insulation.

Include following subparagraph if test results of secondary containment pipe holiday testing are appropriate.

Submit written test results of secondary containment pipe holiday testing.

* + - * 1. Manufacturer's Instructions: Submit [**installation instructions] [instructions for field joint procedures**].
				2. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
				3. Manufacturer Reports: Submit report of each visit of manufacturer's [**personnel] [representative**] <\_\_\_\_\_\_\_\_> to provide technical assistance during installation.
				4. Qualifications Statements:

Coordinate following subparagraphs with requirements specified in Qualifications Article.

Submit qualifications for manufacturer, installer, and licensed professional.

Submit manufacturer's approval of installer.

* + - 1. SUSTAINABLE DESIGN SUBMITTALS
				1. Requirements for sustainable design submittals.
				2. Manufacturer's Certificate: Certify that following products meet or exceed specified sustainable design requirements.

Insert material certifications list to suit products specified in this Section and Project sustainable design requirements. Specific certificate submittal and supporting data requirements are specified in Section 018113.

Materials Resources Certificates:

Certify source and origin for [**salvaged] [and] [reused**] products.

Certify recycled material content for recycled content products.

Certify source for regional materials and distance from Project site.

* + - * 1. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.

Provide cost data for following products:

Edit list of material cost data below to suit products specified in this Section and Project sustainable design requirements. Specific cost data requirements are specified in Section 018113.

Products with recycled material content.

Regional products.

<\_\_\_\_\_\_\_\_>.

* + - 1. CLOSEOUT SUBMITTALS
				1. Requirements for submittals.
				2. Project Record Documents: Record actual locations of piping mains, valves, connections, and [**invert] [centerline**] elevations.
				3. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
			2. MAINTENANCE MATERIAL SUBMITTALS
				1. Requirements for maintenance materials.
				2. Extra Stock Materials:

Furnish [**two**] <\_\_\_\_\_\_\_\_> packing kits for each type and size of valve.

* + - 1. QUALITY ASSURANCE

Include this Article to specify compliance with overall reference standards affecting products and installation included in this Section.

* + - * 1. Welding Materials and Procedures: Conform to ASME Section IX [**and applicable state regulations**].
				2. Installation of Piping Systems: Perform Work according to [**ASME B31.1] [ASME B31.4**].
				3. Perform Work according to NFPA 30 (Flammable and Combustible Liquids Code).
				4. List and label flexible connectors [**and hoses**] in accordance with UL 536 (Flexible Metallic Hose).
				5. Perform Work in accordance with [**applicable code] [<\_\_\_\_\_\_\_\_> code**] [**authority having jurisdiction] [AWS D1.1**] for welding hanger and support attachments to building structure.
				6. Leak Detection and Location Systems:

Evaluate leak detection and location system by independent third party according to Third Party Procedures developed according to USEPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors."

Use evaluation results to verify system manufacturer's claim regarding sensitivity, range, and other performance data.

In following paragraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Perform Work according to <\_\_\_\_\_\_\_\_> standards.

Include following paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain <\_\_\_\_\_\_\_\_> [**copy] [copies**] of each standard affecting the Work of this Section on Site.
			1. QUALIFICATIONS

Coordinate following paragraphs with requirements specified in Submittals Article.

* + - * 1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum [**three**] <\_\_\_\_\_\_\_\_> years' [**documented**] experience.
				2. Leak Detection System: Company specializing in manufacturing products specified in this Section with minimum [**three**] <\_\_\_\_\_\_\_\_> years' [**documented**] experience.
				3. Installer: Company specializing in performing Work of this Section with minimum [**three**] <\_\_\_\_\_\_\_\_> years' [**documented**] experience [**and approved by manufacturer**].

Consider using following paragraph if Contractor is responsible for sizing piping and pipe supports.

* + - * 1. Licensed Professional: [**Professional Engineer**] <\_\_\_\_\_\_\_\_> experienced in design of specified Work and licensed [**at Project location] [in State of <\_\_\_\_\_\_\_\_>**].
			1. DELIVERY, STORAGE, AND HANDLING
				1. Requirements for transporting, handling, storing, and protecting products.
				2. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
				3. Store materials according to manufacturer's instructions.
				4. Protection:

Provide temporary end caps and closures on piping and fittings, and maintain in place until installation.

Protect piping [**system pieces] [systems**] from entry of foreign materials and water by using temporary covers, completing sections of Work, and isolating parts of completed system.

Use wooden shipping braces between layers of stacked pipe.

Stack piping lengths no more than three layers high.

Cover piping system during storage with light colored or opaque tarpaulin to prevent jacket discoloration that may be caused by ultraviolet rays.

Provide additional protection according to manufacturer's instructions.

* + - * 1. Field Joint Materials:

Store field joint materials indoors in dry area in original shipping containers.

Maintain storage temperature of 60 to 85 degrees F.

* + - * 1. Handling: Support each assembly with nylon slings during handling.
			1. EXISTING CONDITIONS
				1. Field Measurements:

Verify field measurements prior to fabrication.

Indicate field measurements on Shop Drawings.

* + - 1. WARRANTY

This Article extends warranty period beyond one year. Extended warranties may increase construction costs and Owner enforcement responsibilities. Specify warranties with caution.

* + - * 1. Requirements for warranties.
				2. Furnish [**five**] <\_\_\_\_\_\_\_\_>-year manufacturer's warranty for valves, excluding packing.
				3. Furnish [**five**] <\_\_\_\_\_\_\_\_>-year manufacturer's warranty for leak detection and location system.
1. PRODUCTS
	* + 1. PERFORMANCE AND DESIGN CRITERIA
				1. Pipe:

Comply with [**ASME B31.1,] [ASME B31.4,] [and] [API Spec 5L**].

Design and lay out system to minimize number of field [**welds] [connections**].

* + - * 1. Connections:

Provide flanges, unions, or couplings at locations requiring servicing.

Use unions, flanges, or couplings downstream of valves and at equipment connections.

Do not use direct-welded or threaded connections for valves and equipment.

Use non-conducting dielectric connections when joining dissimilar metals in systems.

Flexible Connectors: Provide at or near [**pumps**] <\_\_\_\_\_\_\_\_> where piping configuration does not absorb vibration.

Coordinate following paragraph with Fabrication Article.

* + - * 1. Pipe Supports:

Provide pipe hangers and supports according to [**ASME B31.1,] [ASME B31.9,] [ASTM F708,] [MSS SP 58,] [and] [MSS SP 69**].

Design supports to allow continuous airflow and drainage within annular space between service pipe and secondary containment pipe.

Design straight supports to occupy not more than 10 percent of annular air space.

* + - * 1. Valves:

Provide [**gate] [or] [ball**] valves for shut-off and to isolate equipment, part of systems, or vertical risers.

Provide [**globe] [or] [ball**] valves for throttling, bypass, or manual flow control services.

Provide [**spring-loaded**] <\_\_\_\_\_\_\_\_> check valves on discharge of pumps.

Provide 3/4 inch [**gate] [ball**] valves with cap for drains at low points of piping, bases of vertical risers, and equipment.

* + - * 1. Design Conditions:

Service Pipe Fluid Temperature: <\_\_\_\_\_\_\_\_> degrees F.

Service Pipe Pressure: <\_\_\_\_\_\_\_\_> psig.

Secondary Containment Pipe Pressure: <\_\_\_\_\_\_\_\_> psig.

Maximum Allowable Piping Stress: <\_\_\_\_\_\_\_\_> psi.

Furnish [**two] [multiple**] <\_\_\_\_\_\_\_\_> service pipes within secondary containment pipe [**as indicated on Drawings**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Furnish supply and return piping located within a single secondary containment pipe.

* + - 1. FACILITY GASOLINE PIPING
				1. Description:

Factory-fabricated secondary containment piping system, including service pipe protected from exterior environment by secondary containment pipe, straight sections, fittings, anchors, and accessories.

* + - * 1. Stainless Steel Pipe:

Seamless:

Type 304L.

Comply with ASTM A312 (Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes).

Smaller than 8 inches: [**Schedule 40S] [as indicated on Drawings] [as indicated on piping schedule**].

8 inches and Larger: [**Schedule 10S] [as indicated on Drawings] [as indicated on piping schedule**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Longitudinally Welded:

Type 304L.

Comply with ASTM A358 (Standard Specification for Electric-Fusion-Welded Austenitic Chromium-Nickel Stainless Steel Pipe for High-Temperature Service and General Applications), Class 1 or 3.

Minimum Pipe Wall Thickness:

12 inches and Smaller: 1/4 inch.

Larger than 12 inches: 0.312 inch.

* + - * 1. Flexible Connectors:

Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Engineered Flexible Products.

Flexicraft Industries.

Grinnell Corp.; Grinnell Supply Sales Co.

Mercer Rubber Co.

Metraflex Co.

Approved equivalent.

In following subparagraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <\_\_\_\_\_\_\_\_> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

2 inches and Smaller:

Description: Corrugated [**Type 304 stainless steel] [Type 316 stainless steel] [Type 321 stainless steel] [bronze**] inner hose with single layer of [**Type 304 stainless steel**] exterior braiding.

Minimum Length: [**9**] <\_\_\_\_\_\_\_\_> inches.

Furnish copper tube ends.

Maximum Working Pressure: [**200**] <\_\_\_\_\_\_\_\_> psig.

2-1/2 inches and Larger:

Description: Corrugated [**Type 304 stainless steel] [Type 316 stainless steel] [Type 321 stainless steel] [bronze**] inner hose with single layer of [**Type 304 stainless steel**] exterior braiding.

Minimum Length: [**9**] <\_\_\_\_\_\_\_\_> inches.

End Connections: Flanged.

Maximum Working Pressure: [**200**] <\_\_\_\_\_\_\_\_> psig.

* + - * 1. Strainers:

Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Dayton

Mueller

Hayward Flow Control

Approved equivalent.

Substitutions: [**Not permitted**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following subparagraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <\_\_\_\_\_\_\_\_> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

2 inch and Smaller:

Type: Y pattern.

Body: Bronze.

End Connections: Threaded, Class 150.

Screen:

Material: Stainless steel.

[**1/16 inch] [1/32 inch**] perforations.

2 inch and Smaller:

Type: Y pattern.

Body: Cast iron.

End Connections: Threaded, Class 250.

Screen:

Material: Stainless steel.

[**1/16 inch] [1/32 inch**] perforations.

2-1/2 inch and Larger:

Type: Y pattern.

Body: Cast iron.

End Connections: Flanged, Class [125] [250].

Cover: Bolted flange.

Screen:

Material: Stainless steel.

[**3/16 inch] [1/8 inch] [1/16 inch**] perforations.

2-1/2 inch and Larger:

Type: Basket.

Body: Cast iron.

End Connections: Flanged, Class [125] [250].

Cover: Bolted flange.

Screen:

Material: Stainless steel.

[**3/16 inch] [1/8 inch] [1/16 inch**] perforations.

* + - * 1. Valves:

Gate:

Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

American Valve, Inc.

Apollo Valves; a part of Aalberts Integrated Piping Systems.

Crane Fluid Systems; Crane Co.

Jenkins Valves; a Crane Co. brand.

KITZ Corporation.

Lance Valves.

Milwaukee Valve Company.

Powell Valves.

Red-White Valve Corp.

Stockham; a Crane Co. brand.

WATTS; A Watts Water Technologies Company.

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following subparagraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <\_\_\_\_\_\_\_\_> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

2 inches and Smaller:

Comply with MSS SP 80 (Bronze Gate, Globe, Angle, and Check Valves), Class [**125] [150**] <\_\_\_\_\_\_\_\_>.

Body and Trim: Bronze.

Bonnet: [**Threaded] [Union**].

Stem: [**Non-rising] [Rising**].

Operator: [**Lock-shield stem] [Handwheel**].

Furnish inside screw [**with back-seating stem**].

Wedge Disc: [**Solid] [Split**].

[**Rings: Alloy seat**.]

End Connections: [**Solder] [or] [threaded**].

2-1/2 inches and Larger:

Comply with MSS SP 70 (Cast Iron Gate Valves, Flanged and Threaded Ends), Class [**125**] <\_\_\_\_\_\_\_\_>.

Body: Cast iron.

Trim: Bronze.

Bonnet: Bolted.

Stem: [**Rising] [Non-rising**].

Operator: Handwheel; outside screw and yoke (OS&Y); furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

Disc: Solid wedge with bronze seat rings.

End Connections: Flanged.

Ball:

Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

NIBCO INC.

WATTS; A Watts Water Technologies Company.

Approved equivalent.

In following subparagraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <\_\_\_\_\_\_\_\_> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

1/4 inch to 1 inch:

Comply with MSS SP 110 (Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends), Class 125.

Type: Two piece, full port.

End Connections: Threaded.

Body and Ball: Bronze.

Seats: Reinforced PTFE.

Stem: Blowout-proof.

Operator: Lever handle.

UL 842 (Standard for Valves for Flammable Fluids) listed for flammable liquids and liquid petroleum gas (LPG).

1-1/4 inch to 3 inch:

Comply with MSS SP 110 (Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends), Class 125.

Type: Two piece, conventional port.

End Connections: Threaded.

Body: Bronze.

Ball: Chrome-plated bronze.

Seats: Reinforced PTFE.

Stem: Blowout-proof.

Operator: Lever handle.

UL 842 (Standard for Valves for Flammable Fluids) listed for flammable liquids and LPG.

Check, Horizontal Swing:

Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Milwaukee

Nibco

Watts

Approved equivalent.

In following subparagraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <\_\_\_\_\_\_\_\_> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

2 inches and Smaller:

Comply with MSS SP 80 (Bronze Gate, Globe, Angle, and Check Valves), Class [**150**] <\_\_\_\_\_\_\_\_>.

Body, Cap, and Seat: Bronze.

Disc: Buna-N.

End Connections: [**Solder] [or] [threaded**].

2-1/2 inches and Larger:

Comply with MSS SP 71 (Cast Iron Swing Check Valves, Flanged and Threaded Ends), Class [**125**] <\_\_\_\_\_\_\_\_>.

Body: Cast iron.

Cap: Bolted.

Disc: [**Bronze] [or] [cast iron**].

[**Furnish renewable disc seal and seat.**]

End Connections: Flanged.

Check, Spring-Loaded:

Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Milwaukee

Nibco

Stockham

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following subparagraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <\_\_\_\_\_\_\_\_> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

2 inches and Smaller:

Description: In-line spring-lift check, silent closing.

Comply with MSS SP 80 (Bronze Gate, Globe, Angle, and Check Valves), Class [**250**] <\_\_\_\_\_\_\_\_>.

Body: Bronze.

Disc: Buna-N.

Seat: Integral.

End Connections: [**Solder] [or] [threaded**].

2-1/2 inches and Larger:

Comply with MSS SP 71 (Cast Iron Swing Check Valves, Flanged and Threaded Ends), Class [**125**] <\_\_\_\_\_\_\_\_>.

Style: [**Wafer] [Globe**].

Body: Cast iron body.

Seat: Bronze.

Disc: Center guided; bronze.

Spring and screws: Stainless steel.

End Connections: Flanged.

Globe:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

American Valve, Inc.

Crane Fluid Systems; Crane Co.

Hammond Valve.

Milwaukee Valve Company.

NIBCO INC.

WATTS; A Watts Water Technologies Company.

Approved equivalent.

Furnish materials in accordance with [**State**] [**Municipality**]

In following subparagraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

2 inches and Smaller:

Comply with MSS SP 80 (Bronze Gate, Globe, Angle, and Check Valves), Class [**125] [150**] <\_\_\_\_\_\_\_\_>.

Body and Trim: Bronze.

Bonnet: [**Threaded] [Union**].

Operator: Handwheel.

Disc: Buna-N.

End Connections: [**Solder] [or] [threaded**].

2-1/2 inches and Larger:

Comply with MSS SP 85 (Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.), Class [**125**] <\_\_\_\_\_\_\_\_>.

Body: Cast iron.

Trim: Bronze.

Operator: Handwheel; OS&Y; chain wheel for valves 6 inches and larger mounted over 8 feet above floor.

End Connections: Flanged.

Back-Pressure Regulating:

Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Cash Acme

Watts Co.

Zurn Industries

Approved equivalent.

Substitutions: [**Not permitted**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following subparagraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <\_\_\_\_\_\_\_\_> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Body: Iron.

Housing: Spring.

End Connections: Threaded.

Diaphragm: Buna-N.

Disc Seat: Stainless steel.

Body and Seat: Ring.

Maximum Inlet Pressure: 250 psig.

* + - * 1. Fittings:

2-1/2 inches and Larger:

Type: Buttweld.

Material: Type 304L stainless steel, ASTM A403 (Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings).

2 inches and Smaller:

Type: Socket weld.

Comply with ASME B16.11 (Forged Fittings, Socket-Welding And Threaded).

Wall Thickness: Same as adjoining pipe.

Field Joints: Furnish coating materials.

* + - * 1. End Connections:

Smaller than 2-1/2 inches: Forged, socket weld type, complying with ASTM A182 (Standard Specification For Forged Or Rolled Alloy And Stainless Steel Pipe Flanges, Forged Fittings, And Valves And Parts For High-Temperature Service) and ASME B16.11 (Forged Fittings, Socket-Welding And Threaded).

2-1/2 inches and Larger:

Type: Buttweld.

Comply with ASTM A234 (Standard Specification For Piping Fittings Of Wrought Carbon Steel And Alloy Steel For Moderate And High Temperature Service), Grade WPB, and ASME B16.9.

* + - * 1. Secondary Containment Piping:

Size: Allow annular space between service pipe insulation and secondary containment pipe.

Comply with [**ASTM A139] [ASTM A135] [ASTM A53**], Grade B.

Type: Black steel.

Minimum Wall Thickness:

Conduit Size 3 to 5 inches: Schedule 40.

Conduit Size 6 to 26 inches: 10 gage.

Conduit Size 28 to 36 inches: 6 gage.

Conduit Size 38 to 42 inches: 4 gage.

* + - * 1. Secondary Containment Pipe Coating:

Description: Factory-applied fiberglass-reinforced plastic external cladding.

Minimum Thickness: 0.10 inch.

Cladding:

Applied to shot-blasted steel surface meeting SSPC SP 7 (Brush-Off Blast Cleaning) surface finish.

Straight Sections: Factory-applied multiple layers of helical windings of continuous glass reinforcements applied at winding angle of 58 to 62 degrees.

Fittings: Factory-applied, with either chopped spray polyester resin and fiberglass reinforcement composite or glass cloth wrapping fully saturated with two-part catalyst adhesive.

* + - * 1. Pipe Supports:

Insulation:

Thermally isolate service pipe from secondary containment pipe.

Protect insulation surface at support with metal sleeve not less than 12 inches long and fitted with transverse and rotational arresters.

Consider including following subparagraph if Project includes leak detection and location system.

Leak Detection and Location Cable: Furnish supports with flared-end stainless-steel guide tubes to allow cable pulling and to prevent cable damage during pulling operations.

Consider including following paragraph if Project includes leak detection and location system.

* + - * 1. Leak Detection:

Furnish piping system with [**factory] [field**]-installed leak detection cable located in secondary containment pipe.

Consider including following subparagraph for field installed leak detection cable.

Locate containment pull ports at maximum of 500 feet spacing for straight runs and reduced by 150 feet for every 90-degree change in direction.

Operation: Energized alarm station relay de-energizes and breaks control circuit, deactivating control relays for [valves] [and] [pumps] supplying pressure in service pipe.

* + - 1. LEAK DETECTION AND LOCATION SYSTEM
				1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Caldwell Systems Corporation.

Containment Solutions, Inc.

Franklin Fueling Systems.

Gems Sensors & Controls Inc.

Highland Tank & Manufacturing Company, Inc.

In-Situ, Inc.

PermAlert.

Pneumercator Inc.

Veeder-Root Company (The).

Approved equivalent.

In following paragraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Monitoring:

Description: Microprocessor-based panel capable of continuous monitoring of sensor string for leaks or faults.

Construct system to meet requirements of UL 913 (Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations).

Sensing Range: [**2,000] [5,000**] feet for each cable [**with up to eight cables for each panel**].

Alarm Units:

Furnish in NEMA 12 enclosure, with two-line-by-forty-character display, providing status and alarm data.

[**Field-connect] [Factory-mount**] monitoring units to alarm horn.

Operation: Pulsed energy reflection and capable of mapping entire length of sensor cable and storing digitized system map in nonvolatile memory.

Continuous sensor cable indication.

Sensitivity and Accuracy:

After acknowledgment of minor leak, monitor entire sensing string for additional leaks, even if additional leaks are smaller than leak previously acknowledged.

Account for minor installation irregularities, static moisture, and condensation with no loss in accuracy or sensitivity.

Locate point of origin of first leak or fault within either one percent of distance between or 5 feet from last calibration point to leak, whichever is less.

Report and record to nonvolatile memory fault type, distance, and date and time of alarm.

Commonality: Furnish sensor cable, connectors, and jumpers by same manufacturer as monitoring units.

* + - * 1. Security: Furnish system with multi-level security passwords for access to operating functions, with every password entry recorded to nonvolatile memory.
				2. Monitoring Unit:

Listed by UL and approved by FM Global for connections for intrinsically safe sensor circuits for use in Class I, Division I, Groups C and D hazardous locations.

Tested and complied with limits for Class A digital device, pursuant to part 15 of FCC rules, and labeled as such.

Evaluated by independent third party per procedures developed according to EPA/530/UST.

Battery Back-up:

Capable of locating leaks independent of battery backed-up functions.

In event of power failure, store system conditions and parameters in nonvolatile memory allowing unit to automatically resume monitoring without resetting upon restoration of power.

Furnished with RS-232 communication port and common alarm relay for panel and one relay for each cable.

Relays: SPDT and rated for 250 VAC, 10 amps.

* + - * 1. Sensor Cable:

Description: Continuous monitoring while short lengths of cable are in contact with liquids, without altering system's sensitivity or accuracy.

Construction: Fluoropolymer- and polymer-coated wire with no exposed metal parts.

Detect water-based chemical and hydrocarbon liquids.

Capable of being flushed and dried in-place and not requiring replacement after leak of volatile liquid.

Physical Resistance:

Minimum Breaking Strength: 100 lb.

Resistant to corrosion, abrasion, and chemicals as tested according to exposure procedures in ASTM D543 (Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents).

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Physical Resistance:

Designed for direct burial to maximum depth of 20 feet.

Capable of detecting only hydrocarbons while ignoring water and water-based liquids.

Reusable when dried after exposure to gasoline or other volatile hydrocarbon liquid.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Physical Resistance:

No metal exposed to vapors or liquids.

Sensor cable capable of detecting only hydrocarbons while ignoring water and water-based liquids.

Designed for direct burial to maximum depth of 20 feet.

Response time of not more than four minutes to most hydrocarbon liquids.

Reusable when dried after exposure to gasoline or other volatile hydrocarbon liquids, without losing its corrosion resistance.

* + - 1. SUSTAINABILITY CHARACTERISTICS

Insert sustainable design characteristics in this Article to suit content of this Section and Project sustainable design requirements as specified in Section 018113. Following two paragraphs contain examples.

* + - * 1. Requirements for sustainable design compliance.
				2. Material and Resource Characteristics:

Recycled Content Materials: Furnish materials with maximum available recycled content [**including:] [.**]

Insert list of materials specified in this Section required to have recycled content.

<\_\_\_\_\_\_\_\_>.

Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project Site [**including:] [.]**

Insert list of materials specified in this Section required to be regional materials.

<**\_\_\_\_\_\_\_\_**>.

* + - 1. FABRICATION

Generally, piping 2 inches and smaller is provided in 20-foot lengths, and piping 2-1/2 inches and larger is provided in 40-foot lengths.

* + - * 1. Piping:

Furnish factory-fabricated straight sections in [**40**] <\_\_\_\_\_\_\_\_>-foot lengths with 4 inches of piping exposed at each end for field joint fabrication.

Subassemblies:

Furnish factory-designed and factory-fabricated end seals, gland seals, and anchors to prevent ingress of moisture into system.

Design subassemblies to allow for complete draining and drying of systems.

Furnish changes in secondary containment pipe size by using eccentric or concentric fittings as indicated on [**Drawings] [Shop Drawings**].

* + - * 1. Pipe Supports:

Furnish supports between service piping and secondary containment pipe, spaced at maximum 10-foot intervals.

Coordinate following subparagraphs with Performance and Design Criteria Article.

Fabricate supports to allow continuous airflow and drainage within annular space between service pipe and secondary containment pipe.

Fabricate straight supports to occupy not more than 10 percent of annular air space.

* + - 1. ACCESSORIES
				1. Underground Pipe Markers:

Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Craftsmark Identification Systems

Seton Identification Products

W.H. Brady Products

Approved equivalent.

Substitutions: [**Not permitted**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following subparagraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Furnish materials according to <\_\_\_\_\_\_\_\_> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Plastic Ribbon Tape:

Brightly colored, continuously printed.

Minimum Size: 6 inches wide by 4 mil thick.

Manufactured for direct burial service.

Consider following paragraph for non-metallic pipe.

Trace Wire:

Magnetic detectable conductor.

[**Clear] [Brightly colored**] plastic covering imprinted with [**GASOLINE**] <\_\_\_\_\_\_\_\_> in large letters.

1. EXECUTION
	* + 1. EXAMINATION
				1. Requirements for installation examination.
				2. Verify that [**trench cut] [excavation base**] is ready to receive Work.
				3. Verify that excavations, dimensions, and elevations are as indicated on [**Drawings] [layout drawings**].
			2. PREPARATION
				1. Requirements for installation preparation.
				2. Do not install belowground piping if bedding is wet or frozen.
				3. Establish elevations of buried piping to not less than <\_\_\_\_\_\_\_\_> feet of cover.
				4. Establish minimum separation of <\_\_\_\_\_\_\_\_> from [**other services] [sanitary sewer**] <\_\_\_\_\_\_\_\_> piping, according to <\_\_\_\_\_\_\_\_> code.

Edit following paragraph based on piping material being used.

* + - * 1. Remove scale and dirt from inside of piping before assembly.

The type of correcting materials (fine aggregate, coarse aggregate, or lean concrete) depends on type of subsoil, percolation characteristics, and compaction requirements.

* + - * 1. Correct over-excavation with **[fine aggregate] [coarse aggregate] [lean concrete**].
				2. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.
				3. Utilities:

Maintain profiles of utilities.

Coordinate with [**other utilities**] <\_\_\_\_\_\_\_\_> to eliminate interference.

Notify Architect/Director’s Representative if crossing conflicts occur.

* + - 1. INSTALLATION
				1. Inserts:

Provide inserts for placement in concrete forms.

Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.

Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut [**above] [flush with top of] [recessed into and grouted flush with**] slab.

* + - * 1. Pipe Hanger and Supports:

Comply with [**ASME B31.9,] [ASTM F708,] [and] [MSS SP 69**].

Support horizontal piping hangers as scheduled.

Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

Place hangers within 12 inches of each horizontal elbow.

Install hangers to allow 1-1/2 inch minimum vertical adjustment.

Design hangers for pipe movement without disengagement of supported pipe.

Support vertical piping at every [**other**] floor, and support riser piping independently of connected horizontal piping.

Where installing several pipes in parallel and at same elevation, provide multiple pipe or trapeze hangers.

Provide [**copper-plated hangers and supports for copper piping] [sheet-lead packing between hanger or support and piping**].

Manufactured hangers are normally supplied in black steel.

Prime coat and finish paint exposed steel hangers and supports as specified in Section 099000 - Painting and Coating [; **hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed**].

Provide hanger clearance from structure and other equipment to install insulation and provide access to valves and fittings.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Install pipe hangers and supports as specified in Section 230529 - Hangers and Supports for HVAC Piping and Equipment.

* + - * 1. Pipe Cover and Backfilling:

Maintain optimum moisture content of fill material to attain required compaction density.

After hydrostatic test, evenly backfill entire trench width by hand-placing backfill material and hand-tamping in [4] [6]-inch compacted layers to [6] [12] inches minimum cover over top of jacket.

Compact to [95] <\_\_\_\_\_\_\_\_> percent maximum density.

Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.

Do not use wheeled or tracked vehicles for tamping.

* + - * 1. Piping:

Refer to geotechnical report for subsoil capability to support piping and for compaction of fill requirements. Coordinate reference standard and manufacturer's instructions to avoid conflicts.

Install [**gasoline] [and**] <\_\_\_\_\_\_\_\_> piping according to [**ASME B31.1] [ASME B31.4**].

Install pipe to elevation [**as indicated on Drawings**] <\_\_\_\_\_\_\_\_>.

Place bedding material at trench bottom and provide uniform surface for piping.

Level bedding materials in continuous layers not exceeding [**4**] <\_\_\_\_\_\_\_\_> inches [compacted] [loose] depth.

[**Compact to 95 percent maximum density] [Compact to <\_\_\_\_\_\_\_\_> percent maximum density**].

Install pipe on prepared bedding.

Route pipe in straight line.

Install expansion loops [**as indicated on Drawings**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Install expansion joints as specified in Section [**230516 - Expansion Fittings and Loops for HVAC Piping**] <\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_>.

Install pipe anchors within 5 feet of piping penetrations of [**manholes] [and] [building exterior walls**].

Sleeves:

Install [**sleeves] [and] [sleeve seals**] at each [**manhole] [and] [building exterior wall**] penetration.

Install [**sleeves] [and] [sleeve seals**] as specified in Section <\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_>.

Install pipe to allow for expansion and contraction without stressing pipe or joints.

Install [**shutoff] [and] [drain**] valves at locations indicated on Drawings.

Slope water pipe to drain valves at low points [**in manholes**].

After thrust [**restraints] [blocks**] are poured and cured, perform hydrostatic test for service pipe as specified in Field Quality Control Article.

Pipe Markers:

Install [**plastic ribbon tape] [trace wire]** continuous **[over top of pipe] [buried 6 inches below finish grade, above piping] [buried <\_\_\_\_\_\_\_\_> inches below finish grade, above piping**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following subparagraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Installation Standards: Install Work according to <\_\_\_\_\_\_\_\_> standards.

* + - * 1. Field Joints:

Join factory-fabricated sections of straight pipe or elbows.

Insulate service pipe with factory-furnished insulation pieces.

Install field-applied insulation only in straight sections; field insulation of fittings is not acceptable.

Install secondary containment pipe sleeve and weld into place.

* + - * 1. Aboveground Piping:

Comply with NFPA 30.

Install non-conducting dielectric connections wherever jointing dissimilar metals according to NACE SP0169.

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

Group piping whenever practical at common elevations.

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

Sleeve pipe passing through partitions, walls, and floors, as specified in Section 230529 - Hangers and Supports for HVAC Piping and Equipment.

Install firestopping at fire-rated construction perimeters and openings containing penetrating sleeves and piping as specified in Section [**078413 – Penetration Firestopping**] [**230529 - Hangers and Supports for HVAC Piping and Equipment**] <\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_>.

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

Provide access where valves and fittings are not exposed.

[**Coordinate size and location of access doors as specified in Section 083113 - Access Doors and Frames**.]

Where pipe supports are welded to structural building framing, scrape, brush clean, weld, and apply one coat of zinc-rich primer as specified in Section [**051200 - Structural Steel Framing] [052100 - Steel Joist Framing**].

Prepare non-pre-finished pipe, fittings, supports, and accessories for finish painting as specified in Section[s] [**099114 and ][099123**].

Install identification on piping systems including underground piping as specified in Section 230553 - Identification for HVAC Piping and Equipment.

Install valves with stems upright or horizontal, not inverted.

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

* + - * 1. Leak Detection and Lubrication System:

Install cable in interstitial space in piping system.

Install cable on flat surfaces with hold down clips every 8 feet and cable tags every 50 feet.

Graphic Locator Map:

Provide location map with system reflecting actual installation and showing system configuration and sensing string layout.

Furnish length along cable as references to locate leaks.

Base footage on calibration points.

Calibration Points:

Record calibration points along sensing string in accordance with manufacturer's procedures.

Provide sensor cables not in containment piping with cable tags every 50 feet.

Direct Burial of Hydrocarbon Sensing Cable:

Replace cable damaged during installation.

Seal cable ends to prevent moisture ingress.

Install cable such that connectors are accessible in junction boxes at grade or in manholes, valve pits, or other locations.

Install cable from underground to grade using PVC pipe.

Install on prepared bedding.

Backfill cable with 6 inches of [**sand] [material Fill**] <\_\_\_\_\_\_\_\_> placed on top of cable and compacted prior to pipe installation.

Where cable is to be covered by concrete or other structures, install sensor cable in slotted PVC pipe.

Install with access points spaced <\_\_\_\_\_\_\_\_> feet apart to allow for replacing and servicing.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following subparagraph insert "State of \_\_\_\_\_\_\_\_ Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

Installation Standards: Install Work according to <\_\_\_\_\_\_\_\_> standards.

* + - 1. FIELD QUALITY CONTROL
				1. Requirements for inspecting and testing.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Requirements for testing, adjusting, and balancing.
				2. Pipe Testing:

Service Piping Hydrostatic Tests:

Test Pressure: [**150 psig**] **[<\_\_\_\_\_\_\_\_> psig**] [**or] [1-1/2 <\_\_\_\_\_\_\_\_> times operating pressure**].

After test pressures have been applied for [**one hour] [four**] <\_\_\_\_\_\_\_\_> hours, examine system for leakage.

Eliminate leaks by tightening, repairing, or replacing components and repeat hydrostatic testing until no leaks are observed.

Secondary Containment Piping Air Tests:

Test Pressure: [**15**] <\_\_\_\_\_\_\_\_> psig.

After air test pressures have been applied for one hour, examine system for leakage.

Eliminate leaks by repairing or replacing components and repeat air testing until no leaks are observed.

After testing has been completed, flush service pipe with <\_\_\_\_\_\_\_\_>.

* + - * 1. Leak Detection System Testing:

Perform tests to demonstrate ability of system to detect and locate breaks, shorts, and probes on sensor string.

Perform leak testing according to following procedure to verify operation and ability to work with condensation pools or other static moisture:

Wet sensor cable near start of sensor string, acknowledge detection or location alarm, and recheck system.

Wet sensor cable near end of sensor string with first location still wetted, acknowledge detection or location alarm, and recheck system.

Wet sensor cable in [three] <\_\_\_\_\_\_\_\_> additional locations between first and second leak locations, with each detection or location alarm being acknowledged and prior leak locations still wetted.

Retain last sentence in following subparagraph for direct-buried systems only.

Report:

Prepare and submit report verifying each leak location and detection accuracy.

Furnish history print out of test results from panel.

[**Submit TDR traces for each test run to allow verification of wet locations**.]

Select test standards referenced in following paragraph appropriate for fill materials and Project requirements. Consult geotechnical report.

Select compaction test method appropriate to fill materials being used and Project requirements.

AASHTO T 180, in paragraph below, is similar to ASTM D1557.

* + - * 1. Compaction Testing:

Comply with [**AASHTO T 180] [ASTM D698] [ASTM D1557] [ASTM D6938**].

Testing Frequency: [**At intervals not exceeding 250 feet on each lift] [At intervals not exceeding 125 feet on each lift**] <\_\_\_\_\_\_\_\_>.

* + - * 1. If tests indicate Work does not meet specified requirements, remove work, replace, and retest.
				2. Manufacturer Services:

Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than <\_\_\_\_\_\_\_\_> [days] [hours] on Site for:

Unloading of piping materials and components.

Field joint instruction prior to making first field joint.

Inspection.

Field testing.

Pressure testing of piping system.

Instructing Director’s Representative's personnel in maintenance of equipment.

Consider including following subparagraph if leak detection and location systems are included in this Section.

Furnish [**Factory Trained Representative**] <\_\_\_\_\_\_\_\_> of piping system supplier for [**8] [16**] <\_\_\_\_\_\_\_\_> hours on Site during leak detection and location system sensor and electronics installation, and an additional [**8] [16**] <\_\_\_\_\_\_\_\_> hours on Site during final checkout of leak detection and location system.

* + - * 1. Equipment Acceptance:

Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.

Make final adjustments to equipment under direction of manufacturer's representative.

* + - * 1. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.
			1. PROTECTION
				1. Requirements for protecting finished Work.
				2. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 231116