

The following standard specification is intended to be edited according to the specifics of the project. Brackets [] and areas shaded in gray [e.g. format] indicate requirements that are optional depending upon the type of system being provided or per instructions associated with the [] and project requirements. Consult with University's Representative and campus stakeholders.

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SECTION 33 05 13 NATURAL GAS PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipes, fittings and valves.

1.2 RELATED SECTIONS

- A. Section 01 14 00 Work Restrictions
- B. Section 01 33 23 Shop Drawings, Product Data and Samples
- C. Section 31 23 33 Trenching and Backfilling

1.3 REFERENCES

- A. American Pipe Institute (API) 5L – Steel pipe, APE Specification for Line Pipe”.
- B. API 1104 – Welding by a Qualified Welder and Welding Procedures:
- C. ASME Boiler and Pressure Vessel Code, Section IX – “Welding and Brazing Qualifications”.
- D. NACE SPO185-2007 – “Extruded Polyolefin Resin Coating Systems with Soft Adhesives for Underground or Submerged Pipe.”
- E. ASTM D2513 – Thermoplastic pipe and tubing, “Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings”.
- F. ASTM D2517 – Thermosetting plastic pipe and tubing, “Standard Specification for Reinforced Epoxy Resin Gas Pressure Pipe and Fittings”
- G. ASTM F1290 – Standard Practice for Electro-fusion Joining Polyolefin Pipe and Fittings
- H. ASTM F1924 – Standard Specification for Plastic Mechanical Fittings for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing
- I. ASTM D638 – Standard Test Method for Tensile Properties of Plastics
- J. Uniform Plumbing Code (UPC) Chapter 12, Section 1212 – Material for Gas Piping
- K. UPC Chapter 12, Section 1213 – Installation of Gas Piping
- L. API 6D – Valves
- M. ANSI B16.5 – Flange or Flange Accessory

1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Operating Pressure Ratings:
 - 1. Piping, Valves and Fittings: 100 psig minimum unless otherwise indicated.

1.5 SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Piping.
 - 2. Valves.

3. Fittings.

- B. Coordinate with Specification Section 01 33 23 – Shop Drawings, Produce Data and Samples.
- C. Shop Drawings: For facility natural gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe, and miscellaneous components for the underground site utilities (domestic water and natural gas). Detail location of tie-in points, valve assemblies, steel to gas transition, gas service risers. Shop Drawing Scale shall be 1/4 inch per foot (1:50)
- D. Coordination Drawings: Plans and details, drawn to scale, on which natural gas piping is showing and coordinated with other installations, using input from installers of the items involved.
- E. Site Survey: Plans, drawn to scale, on which natural gas piping is shown and coordinated with other services and utilities.
- F. Qualification Data: For qualified Professional Engineer.
- G. Welding and Fusion certificates.
- H. Field quality control reports.
- I. Operation and Maintenance Data: For gas valves to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Pipe Welding Qualifications: Qualify procedures according to ASME Boiler and Pressure Vessel Code.
- B. Pipe Fusion Qualifications: Qualify procedures according to ASTM.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.
- C. Protect stored Poly-Ethylene (PE) pipes and valves from direct sunlight.

1.8 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
 - 1. Interruption of existing natural gas service: Do not interrupt natural gas service to facilities occupied by University or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural gas supply according to requirements indicated:
 - a. Notify University's Representative no fewer than seven business days in advance of proposed interruption of natural gas service. Shut down request must be in accordance with Section 01 14 00 Work Restrictions.
 - b. Do not proceed with interruption of natural gas service without University's Representative's written permission (fully signed and executed Exhibit 33).

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

- A. Steel Pipe: API 5L, Schedule 40, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt-welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded or butt welding to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
 - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. Dielectric Unions:

Note to Specifier: List basis of design product first as that is the only product Contractor may use without a substitution request.

1. Manufacturers:
 - a. Central Plastics Company.
 - b. EPCO
 - c. Eclipse
 - d. Or equal.
2. Minimum Operating-Pressure Rating: 150 psig.
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed joint, plain, or welded end connections that match piping system material.

C. Dielectric-Flange Kits:

1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
 - e. Or equal.
2. Minimum Operating-Pressure Rating: 150 psig.
3. Companion-flange assembly for field assembly.
4. Include flanges, full-face or ring-type neoprene or phenolic gasket, phenolic or PE bolt sleeves, phenolic washers, and steel backing washers.
5. Insulating materials suitable for natural gas.
6. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.2 PE PIPE AND FITTINGS

A. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.

2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with API 5L, Schedule 40, Grade B.

See evaluations for discussion of service-line risers. Retain one of first two subparagraphs below for anodeless or transition service-line risers for PE pipe.

3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet. PE transition fitting on underground portion of the riser.
 - b. Casing: Steel pipe complying with API 5L, Schedule 40, Grade B, with corrosion-protective coating covering. Vent casing aboveground.
 - c. Outlet shall be threaded or flanged or suitable for welded connection.
 - d. Tracer wire connection.
 - e. Ultraviolet shield.
 - f. Stake supports with factory finish to match steel pipe casing or carrier pipe.
4. Plastic Mechanical Couplings, NPS 1-1/2 (DN 40) and Smaller: Capable of joining PE pipe to PE pipe.
 - a. Manufacturers:
 - 1) Met-Fit
 - 2) Permasert
 - 3) Continental
 - 4) Perfection Corporation;
 - 5) Or equal
 - b. PE body with molded-in, stainless steel support ring.
 - c. Buna-nitrile seals.
 - d. Acetal collets.
 - e. Electro-zinc-plated steel stiffener.
5. Plastic Mechanical Couplings, NPS 2 (DN 50) and Larger: Capable of joining PE pipe to PE pipe.
 - a. Manufacturers:
 - 1) MetaFit
 - 2) Permasert
 - 3) Continental
 - 4) Perfection
 - 5) Or equal.
 - b. PE body with molded-in, stainless steel support ring.
 - c. Buna-nitrile seals.
 - d. Acetal collets.
 - e. Stainless-steel bolts, nuts, and washers.

2.3 PLUG VALVE – STEEL

A. Plug Valves (Steel)

1. Valve will comply with API 6D – Valves, and be ANSI 150 rated (200 psig maximum working pressure), lubricated type with standard port opening, cast iron or semi-steel body, sealed lubrication system with lubricant fitting and dial indicator, cylindrical plug or teflon tapered plug, lubricant grooves in body or plug, threaded or flanged ends depending on size, and capable of lubrication with valve under pressure and plug in any position.
 - a. Manufactures: (1-1/4 through 6-inch)
 - 1) Nordstom
 - 2) Walworth
 - 3) Serck Audco
 - 4) Or equal
 - b. Operators:

- 1) 6 inch size and less: Valve shall be wrench operated with 14 turn full opening/close.

2.4 BALL VALVE – STEEL

A. Ball Valves (Steel)

1. Valve will comply with API 6D- Valves, and be ANSI 150 rated (200 psig maximum working pressure) (2 piece bronze body, solid blow-out proof stem, teflon seats, chrome plated brass ball, teflon seals, corrosion resistant steel lever handles with vinyl grips, balancing stop, and threaded or solder ends.
 - a. 1/4-int to 2-inch Manufacturers:
 - 1) Apollo
 - 2) WKM
 - 3) Marpac
 - 4) Or equal.
 - b. 4 and 6-inch Manufactures:
 - 1) Grove
 - 2) Cameron
 - 3) KF Valves
 - 4) KeroTest
 - 5) Or equal
 - c. Operators:
 - 1) 6-inch size and less: Valve shall be wrench operated with 1/4 turn full opening/close.

2.5 BALL VALVE – PLASTIC

A. Underground Only:

1. Polyethylene (PE) pipe:
 - a. 1 inch – 2 inch, valve shall be socket fusion. Manufactures:
 - 1) Nordstrum
 - 2) Perfection
 - 3) Or equal
 - b. 4 inch – 6 inch, valve shall be butt fusion. Manufactures:
 - 1) Nordstrum
 - 2) Perfection
 - 3) Or equal
 - c. PE valve extension shall be used to all for valve operation.
 - d. When installing PE valves, do not twist the PE pipe. The valve stem must remain vertical and the valve must not be under strain.
 - e. Provide good backfill support under the valve and around the PE pipe at both ends. Take special care to ensure that the valve box does not rest or settle on the PE pipe or valve.
- B. Identify the PE gas valves by attaching a tag to the valve box with the valve identification number. Tag to include words “ 1/4 - turn and Do not over torque.”

2.6 OTHER ITEMS

- A. Valve Boxes – Valve Boxes – Valve boxes shall be precast concrete with cast iron traffic covers. Traffic box shall be circular with the work GAS embossed on the top surface.
- B. Locating Wire – Locating wire shall be installed with all plastic main and service installations, and shall be AWG #10 copper wire, HMWPE yellow. Both ends of the tracer wire shall be accessible at all utility valve boxes or as services risers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with the International Fuel Gas Code requirements for prevention of accidental ignition.

3.2 OUTDOOR PIPING INSTALLATION

- A. Comply with the International Fuel Gas Code for installation and purging of natural gas piping.
 - 1. Install underground, natural gas piping buried at least 36 inches below finished grade. Comply with requirements in Section 31 23 33 Trenching and Backfilling.
- B. If natural gas piping is installed less than 36 inches below finished grade, provide for protection of piping by utilizing the following measures:
 - 1. Change material to steel, schedule 40, grade B if PE is being utilized, in accordance with paragraph 2.1 – Steel Pipe and Fittings, located in this section.
 - 2. Provide 2 inch cover of concrete the width of the trench and 2 inches above piping, with warning tape provided on top of concrete cap.
- C. Install underground, PE, natural gas piping according to ASTM D 2774.
- D. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
 - 3. Replace pipe having damaged PE coating with new pipe.
- E. Install fittings for changes in direction and branch connections.
- F. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- G. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- H. Connect branch piping from top or side of horizontal piping.
- I. Do not use natural gas piping as grounding electrode.

3.3 VALVE INSTALLATION

- A. Install underground valves with valve boxes.
- B. Install anode for metallic valves in underground PE piping.

3.4 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Welded Joints:
 - 1. Construct joints according to API 1104, using qualified processes and welding operators
 - 2. Bevel plain ends of steel pipe.
 - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- D. Brazed Joints: Construct joints according to ASME Boiler and Pressure Vessel Code, Section IX.
- E. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural gas service. Install gasket concentrically positioned.
- F. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

PROJECT TITLE
CONTRACT TITLE
UNIVERSITY OF CALIFORNIA, DAVIS
CITY, CALIFORNIA

PROJECT NO: 000000
GRANT NO: 000000

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.5 LABELING AND IDENTIFYING

- A. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- B. PE pipe shall be marked "Natural Gas" in white lettering. Lettering shall be 4 inches in height. Maximum spacing between markings shall be 20 feet

3.6 FIELD QUALITY CONTROL

- A. The newly installed gas facilities shall be tested with air for 4 hours at 150 psig. A recording clock shall be used to verify the pressure and time.
- B. Natural gas piping will be considered defective if it does not pass tests and inspections.

3.7 OUTDOOR PIPING SCHEDULE

- A. Underground natural gas piping shall be the following:
 1. PE pipe and fittings joined by heat fusion, or mechanical couplings; service-line risers with tracer wire terminated in an accessible location.
 2. Steel pipe with wrought-steel fittings and welded joints, or mechanical couplings. Coat pipe and fittings with protective coating for steel piping.
- B. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

END OF SECTION 33 51 13