# Campus Design Standards

## Division 33-5100 – Natural Gas Distribution

![University of San Diego logo](image)

## Signature Sheet

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Introduction
The system consists of a buried natural gas distribution system including service connections to a point 6 inches inside of the building. The system is designed for an operating pressure of 100 psig.

Contacts

1. The Project Manager (Planning, Design and Construction)

Index of References

1. USD Master Plan Design Guidelines

Code/Sustainability References

1. California Building Code
2. LEED Silver
3. Building Energy Efficiency Standards
4. California Fire Code
5. ANSI Z223.1
6. NFPA 54 National Fuel Gas Code

Natural Gas Distribution Guidelines

1.1 Manufacturers
A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

1.2 Pipes and Fittings
A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.
B. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B; Schedule 40, black.
   2. Steel Fittings: ASME B16.9, wrought-steel butt-welding type; and ASME B16.11, forged steel.
   4. Unions: ASME B16.39, Class 150, black malleable iron; female pattern; brass-to-iron seat; ground joint.
C. PE Pipe: ASTM D 1248, Type II, Grade 1.
   1. PE Fittings: ASTM D 2683, socket type or ASTM D 3261, butt type with dimensions matching ASTM D 1248, Type II, Grade 1, PE pipe.
D. Transition Fittings: Manufactured pipe fitting with one PE pipe end for heat-fusion connection to PE pipe and with one ASTM A 53/A 53M, Schedule 40, steel pipe end for threaded connection to steel pipe.

E. Service-Line Risers: Manufactured PE pipe fitting with PE pipe inlet for heat-fusion connection to underground PE pipe; PE pipe riser section with protective-coated, anodeless, steel casing and threaded outlet for threaded connection to above ground steel piping.

1.3 Joining Materials
A. Components, Tapes, Gaskets, and Bolts and Nuts: Suitable for natural gas and as recommended by piping manufacturer.

1.4 Shutoff Valves
A. Shutoff Valves, General: Manual operation, suitable for natural gas service, and with 100-psig minimum working-pressure rating.

B. Threaded Valves, NPS 1 and Smaller: Include listing by agency acceptable to authorities having jurisdiction.

C. Lubricated, Tapered Plug Valves: Cast-iron body, with lubricated, brass tapered plug; lever operation; and complying with ASME B16.33, MSS SP-78, UL 842. Include lever and locking device.
   1. Manufacturers:
      c. Nordstrom Valves, Inc.

D. Lubricated Plug Valves: Cast-iron body, with lubricated, tapered, or cylindrical plug; lever operation; and complying with ASME B16.38, MSS SP-78, UL 842. Include locking device.
   1. Manufacturers:
      d. Milliken Valve Co., Inc.
      e. Nordstrom Valves, Inc.
      f. Olson Technologies, Inc.; Homestead Valve Div.
      g. R & M Energy Systems; Flow Control Div.
      h. Walworth Company (The).

E. PE Valves: Made for gas distribution, with nut or flat head for key operation; and complying with ASME B16.40, UL 842.
   1. Manufacturers:
      i. Kerotest Manufacturing Corp.
      k. Nordstrom Valves, Inc.
      l. Perfection Corporation; Gas Products Div.

F. Valve Boxes: Cast-iron, two-section box. Include top section with cover with "GAS" lettering, bottom section with base to fit over valve and barrel 5" in diameter, and adjustable cast-iron extension of length required for depth of bury. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head and with stem of length required to operate valve.
1.5 Service Regulators
A. Description: Natural gas service regulator complying with ANSI B109.4 or DIR 006.3-listed for service regulators.
   2. Pipe Connections:
      m. NPS 2 and Smaller: Threaded.
      n. NPS 2½ and Larger: Flanged.
   3. Manufacturers:
      o. American Meter Co.
      q. Invensys Energy Metering.
      r. National Meter.
      s. Schlumberger Limited.

1.6 Concrete Bases
A. Description: Precast concrete made of 3000-psi minimum, 28-day compressive strength reinforced concrete; at least 4" thick and 4" larger in each dimension than supported item, unless otherwise indicated.

1.7 Natural Gas Distribution System Design
A. Natural gas distribution systems shall be designed in accordance with American Society of Plumbing Engineers (ASPE) Standards and applicable Codes to provide efficient and easily maintained systems. System designs shall consider life cycle owning and operating costs as well as first costs to provide the University with the best value system.

B. Design Pressures: The University contains several natural gas connections to SDG&E’s main service. Underground systems downstream of the utility meter are typically set at nominal 5 psi medium pressure or less than 2 psi low pressure. For applications which include significant runs of underground natural gas piping, coordinate a 5 psi natural gas service with SDG&E. Provide pressure regulators adjacent to the facility served. Route only low pressure natural gas within the facility unless specific permission is received from the University.

C. Distribution Pipe Sizing: Size distribution piping so that the minimum resultant available pressure at the building pressure regulator exceeds 2.5 psi.
D. Include a natural gas system distribution schematic indicating information required to clearly illustrate the intent of system design including, but not limited to, supply source, piping mains, risers, pressure regulating valves, all shut-off valves, branch and individual connection piping to equipment and outlets. Calculated flow rates and developed piping lengths used for system design shall be noted at supply entrance, base of risers, sectional floor valves, branch piping to equipment and outlets, and at each connection to equipment and outlets.
1.8 Metering
   A. Provide natural gas meters at each facility, compliant with the University's energy metering standard. Provide meter with communication capability or a pulse output and route the signal to the University’s building automation system.

1.9 Preparation
   B. Close equipment shutoff valves before turning off gas to premises or piping section.
   C. Inspect natural gas piping according to fuel gas code to determine that natural gas utilization devices are turned off in piping section affected.
   D. Comply with fuel gas code requirements for prevention of accidental ignition.

1.10 Piping Applications
   A. Flanges, unions, and transition and special fittings with pressure ratings same as or higher than system pressure rating may be used, unless otherwise indicated.
   B. Above Ground Piping:
      1. NPS 2 and Smaller: Steel pipe, malleable-iron fittings, and threaded joints.
      2. NPS 2½ and Larger: Steel pipe, butt-welding-type fittings, and welded joints. Joints for connection to service regulators, service meters, and valves with flanged connections may be flanged. Joints for connection to service regulators, service meters, and valves with threaded connections NPS 2½ to NPS 4 may be threaded.
   C. Underground Piping: PE pipe, PE fittings, and heat-fusion joints.
   D. Protective Conduit for Underground Piping: Steel pipe and threaded- or welding-type fittings.
   F. PE-to-Steel Piping Connections: Transition fitting.

1.11 Valve Applications
   A. Drawings indicate types of shutoff valves to be used. If specific types are not indicated, the following requirements apply:
      1. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping gas mains.
      3. Aboveground, NPS 2 and Smaller: Lubricated tapered plug valves.

1.12 Piping Installation
   A. Install underground, natural gas distribution piping buried at least 36" below finished grade.
   B. Install underground, PE, natural gas distribution piping according to ASTM D 2774.
   C. Install underground, PE, natural gas distribution piping at entrance to and under part of building in steel piping protective conduit that is vented to outside.
   D. Install underground, PE, natural gas distribution piping with continuous tracer wire, providing exposed end of wire at above ground transition.
   E. Provide natural gas pressure regulators upstream of the natural gas service to each building.
Figure 2. Requirements for Natural Gas Pressure Regulators

F. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3” long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

G. Terminate service-regulator horizontal vents or horizontal vent piping with reducing-elbow fittings with large end as outlet. Install fitting outlet turned down with corrosion-resistant insect screen in outlet.

1.13 Valve Installation

A. Install PE shutoff valves on branch connections to existing underground, natural gas distribution piping. Install valves with valve boxes.

B. Install metal shutoff valves on aboveground, natural gas distribution piping.
1.14 Connections
A. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Connect gas distribution piping to natural gas source and extend to service-meter assemblies and points indicated. Connect to building's natural gas piping if it is installed; otherwise, terminate piping with caps, plugs, or flanges, as required for piping material. Refer to Division 15 Section "Fuel Gas Piping" for natural gas piping inside the building.
C. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment having threaded pipe connection.
D. Install flanges, in piping NPS 2½ and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
E. Connect to utility gas main according to utility's procedures and requirements.
F. Install above ground, natural gas distribution piping upstream from equipment shutoff valves, electrically continuous, and bonded to grounding electrode according to NFPA 70.
G. Do not use natural gas distribution piping as grounding electrode.

1.15 Labeling and Identifying
A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on or near each service regulator.
   1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
B. Warning Tapes: Arrange for installation of continuous, underground, detectable magnetic backing warning tape over natural gas distribution piping during backfilling of trenches for piping.
C. Identify the work of each welder with an assigned number, letter, or symbol.

1.16 Painting
A. Paint exposed metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties except units with factory-applied paint or protective coating.
B. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

1.17 Field Quality Control
A. Test, inspect, and purge natural gas distribution according to requirements of fuel gas code and utility.
B. Repair leaks and defective valves and specialties and retest system until no leaks exist.
C. Report results in writing.
D. Verify correct pressure settings for service regulators.

1.18 Requirements for As-built Drawings
A. Submit as-built documentation in accordance with the University’s procedures.

Requirements for As-Built Drawings

Prior to the completion of construction and occupancy, the subcontractor is required to provide the Project Manager a detailed schedule of materials used in each space of the project, including the manufacturer, supplier, color name and number, pattern and size applied. An electronic version of the final room schedule is to be provided as part of the “as-built” documentation for the project. See Appendix 1.2 for Documentation and Archiving

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