PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. This section provides specifications for natural gas piping from the utility meter connection to the building and for piping inside buildings. The section does not include natural gas piping for laboratory service.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.3 PERFORMANCE REQUIREMENTS

A. Follow applicable code requirements from local authority having jurisdiction.

B. Comply with Stanford FDG Drawing MM-05

C. Stanford University does not permit the installation of natural gas piping above 0.5 PSI inside buildings. Exceptions can be made for special building types or equipment.

D. Earthquake valves are required for all buildings.

E. Minimum Operating-Pressure Ratings:
   1. Piping and Valves Pressure Rating: 100 psig minimum unless otherwise indicated.
   2. Minimum Operating Pressure of Service Meter: 5 psig.

F. Natural-Gas System Pressures: Two pressure ranges. Primary pressure at utility connection is more than 0.5 psig but not more than 2 psig, and is reduced to secondary pressure of 0.5 psig or less.
G. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.4 SUBMITTALS

A. In addition to the requirements of Section 01 33 00 Submittal Procedures, a complete schedule of valves installed, together with drawings that identify the locations of numbered valves and the service which each controls, shall be submitted to the Project Manager.

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: 1/8 inch per foot.

C. Welding certificates.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Steel Support 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.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. 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.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.
1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
   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:
      b. End Connections: Threaded or butt welding to match pipe.
      c. Lapped Face: Not permitted underground.
      e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
      a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:
   4. Corrugated stainless-steel tubing with polymer coating.
   5. Operating-Pressure Rating: 0.5 psig.
8. Maximum Length: 36 inches except for connections to ranges or dryers which may be up to 72 inches maximum.

B. Y-Pattern Strainers:
1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.

C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.


2.4 MANUAL GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
1. CWP Rating: 125 psig.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
5. Valves shall be line size or larger
6. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
7. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.
1. CWP Rating: 125 psig.

2. Flanged Ends: Comply with ASME B16.5 for steel flanges.


4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

C. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Red and White valve company

2. Body: Cast iron, complying with ASTM A 126, Class B.

3. Plug: Bronze or nickel-plated cast iron.

4. Seat: Coated with thermoplastic.

5. Stem Seal: Compatible with natural gas.


7. Operator: Square head or lug type with tamperproof feature where indicated.

8. Pressure Class: 125 psig.

9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 EARTHQUAKE VALVES

A. Earthquake Valves: Valves shall be listed by the California Division of the State Architects (DSA) as certified earthquake sensitive valves. The earthquake valve shall meet ASCE 25.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Pacific Seismic Products
   b. Seismic Safety Products
   c. Earthquake Safety Systems Inc.

2. Sizing: Size valve in accordance with applicable local plumbing code.
3. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
4. Maximum Operating Pressure: 5 psig.
5. Cast-aluminum body with nickel-plated chrome steel internal parts.
7. Sight windows for visual indication of valve position.
8. Threaded end connections complying with ASME B1.20.1.
9. Wall mounting bracket with bubble level indicator.

2.6 PRESSURE REGULATORS

A. General Requirements:
   1. Single stage and suitable for natural gas.
   2. Steel jacket and corrosion-resistant components.
   3. Elevation compensator.
   4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Fisher-Rosemount
   2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
   5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
   6. Orifice: Aluminum; interchangeable.
   8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
   9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
  10. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
  11. Maximum Inlet Pressure: 5 psig.
C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

2.7 DIELECTRIC FITTINGS

A. Dielectric Unions:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      b. Central Plastics Company.
      e. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
      f. Wilkins; Zurn Plumbing Products Group.
   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 materials.

2.8 SLEEVES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.9 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Advance Products & Systems, Inc.
      b. Calpico Inc.
      c. Metraflex Company (The).
      d. Pipeline Seal and Insulator, Inc.
      e. Link Seal.
2. Sealing Elements: [EPDM] interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.

3. Pressure Plates: Carbon steel.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

**PART 3 - EXECUTION**

1.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 requirements for prevention of accidental ignition.

1.3 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. 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.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. 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.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
G. Locate valves for easy access.

H. Install piping free of sags and bends.

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

J. Install escutcheons at penetrations of interior walls, ceilings, and floors.
   1. New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      c. Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      d. Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      e. Piping in Equipment Rooms: One-piece, cast-brass type.

K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

L. Verify final equipment locations for roughing-in.

M. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

N. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying.
   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 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

O. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

P. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

Q. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
1. **Above Accessible Ceilings:** Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.

2. **Prohibited Locations:**
   a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
   b. Do not install natural-gas piping in solid walls or partitions.

R. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

S. Connect branch piping from top or side of horizontal piping.

T. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

U. Gas piping shall be bonded to building grounding system per NEC. Do not use natural-gas piping as grounding electrode.

V. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

W. Install pressure gage downstream from each line regulator. Pressure gages are specified in Section 22 05 19 – Meter and Gauges for Plumbing.”

1.4 **VALVE INSTALLATION**

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

C. Install earthquake valves aboveground outside buildings according to listing. Install valve downstream of the pressure regulator and in accordance with the manufacturer’s instruction and in a manner such that the valve sensing device responds to earthquake ground motions and not to motions that may result from the dynamic response of structures, equipment or their accessories. Attach valves and sensing means to rigid mountings only.

1.5 **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. Threaded Joints:
   1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
   2. Cut threads full and clean using sharp dies.
   3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
   4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
   5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:
   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.

E. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

1.6 HANGER AND SUPPORT INSTALLATION
A. Install hangers for horizontal steel piping per Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment.

1.7 CONNECTIONS
A. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
B. Install piping adjacent to appliances to allow service and maintenance of appliances.
C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

1.8 LABELING AND IDENTIFYING
A. Comply with requirements in Section 22 05 53 – Identification of Plumbing, Piping and Equipment” for piping and valve identification. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
1.9 TESTING

A. Comply with requirements of the local Authority Having Jurisdiction and the California Plumbing Code.

B. Minimum test pressure shall be 10 psi and test shall show no drop in pressure. Test duration shall not be less than 30 minutes in duration.

C. Record test pressure over the duration of the test with an automatic recording/printing gauge.

END OF SECTION