SECTION 227000 - NATURAL GAS SYSTEMS

PART I - GENERAL REQUIREMENTS

1 .1 SUMMARY

A. This Section includes distribution piping systems for natural gas, liquid petroleum-gas and manufactured gas within the building and extending from the point of delivery to the connections with gas utilization devices. Piping materials and equipment specified in this Section include:

1. Pipes, fittings, and specialties.
2. Special duty valves.
3. Pressure regulators.
4. Service meters.

B. This Section does not apply to liquid petroleum piping; industrial gas applications using such gases as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen and nitrogen; gas piping, meters, gas pressure regulators and other appurtenances used by the serving gas supplier in distribution of gas.

C. Gas pressures for systems specified in this Section are limited to 5 psig.

D. Products furnished under this Section include gas meters and gas service piping, which will be provided by the utility company to the site. The following is the name and address of the utility company:

Company: Missouri Gas Energy
Address: 223 Gillis, Kansas City, MO 64120
Telephone number: (816) 756-5252

1.2 DEFINITIONS

A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

B. Gas Distribution Piping: A pipe within the building which conveys gas from the point of delivery to the points of usage.

C. Gas Service Piping: The pipe from the gas main or other source of supply including the meter, regulating valve, or service valve to the gas distribution system of the building served.

D. Point of Delivery: The outlet of the service meter assembly, or the outlet of the service regulator (service shutoff valve when no meter is provided).

1.3 SUBMITTALS

A. Product data for each gas piping specialty and special duty valves. Include rated capacities of selected models, furnished specialties and accessories, and installation instructions.

B. Shop drawings detailing dimensions, required clearances, for connections to gas meter.

C. Welders' qualification certificates, certifying that welders comply with the quality requirements specified under 'Quality Assurance" below.

D. Test reports specified in Part 3 below.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installation and replacement of gas piping, gas utilization equipment or accessories, and repair and servicing of equipment shall be performed only by a qualified installer. The term qualified is defined as experienced in such work (experienced shall mean having a minimum of 5 previous projects similar in size and scope to this project), familiar with precautions required, and has complied with the requirements of the authority having jurisdiction. Upon request, submit evidence of such qualifications to the Architect.

B. Qualifications for Welding Processes and Operators: Comply with the requirements of ASME Boiler and Pressure Vessel Code, "Welding and Brazing Qualification. "

C. Regulatory Requirements: Comply with the requirements of the following codes:

l. NFPA 54 - National Fuel Gas Code, for gas piping materials and components, gas piping installation and inspections, testing, and purging of gas piping systems.

2. 2012 International Fuel Gas Code

D. Local Gas Utility Requirements: Comply with local gas utility installation rules and regulations.

Pipe, pipe fittings and pipe specialties shall be manufactured in plants located in the United States or certified to meet the specified ASTM and ANSI standards.

1.5 SPARE PARTS

A. Valve Wrenches: Furnish to Owner, with receipt, 2 valve wrenches for each type of gas valve installed, requiring same.

PART 2 - PRODUCTS AND MATERIALS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide gas piping system products from one of the following:

1. Gas Cocks — 2" and Smaller:

a. Homestead # 601

b. Milliken #200M

c. RM Energy Systems # DI 25

2. Gas Cocks — 2-1/2" and Larger:

a. Homestead # 602

b. Milliken #200MF

c. RM Energy Systems "Hercules" # DI 26

2.2 PIPE AND TUBING MATERIALS

A. General: Refer to Part 3, Article "PIPE APPLICATIONS" for identification of systems where the specified pipe and fitting materials listed below are used.

B. Steel Pipe: ASTM A 53, Grade B, Schedule 40, Type E electric-resistance welded or Type S seamless, black steel pipe, beveled ends.

2.3 FITTINGS

A. Malleable-Iron Threaded Fittings: ANSI Bl 6.3, Class 1 50, standard pattern, for threaded joints. Threads shall conform to ANSI Bl .20. l .

B. Steel Fittings: ASTM A 234, seamless or welded, for welded joints.

1 1-1/4" and smaller shall be socket type

2 1-1/2" and larger shall be butt weld type.

C. Forged Steel Flanges and Flanged Fittings: ASME B 16.5, Class 150, standard pattern.

D. Steel Flanges and Flanged Fittings: ANSI B 16.5, including bolts, nuts, and gaskets of the following material group, end connection and facing:

1. Material Group: 1.1

2. End Connections: Butt Welding.

3. Facings: Raised face.

2.4 JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8, Classification BAg-l (Silver).

B. Joint Compound: Suitable for the gas being handled.

C. Gasket Material: Thickness, material, and type suitable for gas to be handled, and for design temperatures and pressures.

2.5 PIPING SPECIALTIES

A. Prime pipe and fittings with a compatible primer prior to application of tape.

B. Strike Plates: 16 gauge carbon steel, tested and listed by CSA International.

2.6 VALVES

A. Gas Cocks 2 Inch and Smaller: 175 psi, lubricated plug type, ASTM Al 26 Grade B semi-steel body, brass or semi-steel plug with full area rectangular port, straightaway pattern, square head, threaded ends.

B. Gas Cocks 2-1/2 Inch and Larger: 175 psi, lubricated plug type, ASTM Al 26 Grade B semi-steel body and plug with full area rectangular port, straightaway pattern, single gland, wrench operated, flanged ends.

C. Laboratory Gas Cocks: As described on the drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Precautions: Before turning off the gas to the premises, or section of piping, turn off all equipment valves. Perform a leakage test as specified in "FIELD QUALITY CONTROL" below, to determine that all equipment is turned off in the piping section to be affected.

B. Conform with the requirements in NFPA 54, for the prevention of accidental ignition.

3.2 PREPARATION FOUNDATION FOR UNDERGROUND GAS SERVICE PIPING

A. Pipe Beds for Pre-sleeved Vent Capable Semi-rigid Corrugated Stainless Steel Tubing, PE Pipe and PVC Pipe Conduit: Support pipe in trench with sand bags level and true to prevent sand, gravel or debris from interfering with the solvent cement or fusion process. After pressure testing is complete, gradually install bedding to maintain continuous pipe slope and prevent pipe deflection and then install subbase. For bedding and subbase materials, excavation, trenching, backfill and compaction requirements refer to ASTM D2321 "Underground Installation of Thermoplastic Pipe for Sewers and Gravity-flow Applications" for additional requirements.

3.3 PIPE APPLICATIONS

A. Install steel pipe with threaded joints and fittings for 2 inch and smaller, and with welded joints for 2-1/2 inch and larger.

3.4 PIPING INSTALLATION

A. General: Conform to the requirements of NFPA 54 - National Fuel Gas Code.

B. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. Design locations and arrangements of piping take into consideration pipe sizing, flow direction, slope of pipe, expansion, and other design considerations. So far as practical, install piping as indicated.

C. Concealed Locations: As specified below:

1. Inaccessible Above-Ceiling Locations: Install concealed gas piping in inaccessible above-ceiling spaces without valves or unions.
2. Accessible Above-Ceiling Locations: Gas piping may be installed in accessible above-ceiling spaces (subject to the approval of the authority having jurisdiction), whether or not such spaces are used as a plenum. Valves and unions shall not be located in such spaces used as a plenum.
3. In Floors: Install concealed gas piping in concrete floor slabs in an air-tight conduit constructed of Schedule 40 PVC with socket weld joints two pipe sizes larger than the gas pipe served. Extend conduit a minimum of 12" above finish floor and cap air tight at both ends. Vent conduit to the outside with a minimum 2" pipe and terminate with a screened vent cap.
4. Piping In Partitions: Install concealed gas piping in hollow partitions with welded joint (subject to the approval of the authority having jurisdiction) and protect gas piping against physical damage. Install gas piping passing through partitions with no joints or unions inside the partition.
5. Concrete or Masonry Walls: Do not install gas piping in masonry or concrete walls.
6. Prohibited Locations: Do not install gas piping in or through a circulating air duct, clothes chute, chimney or gas vent, ventilating duct, dumbwaiter or elevator shaft. This does not apply to accessible above-ceiling space specified above.

D. Fire Barrier Penetrations: Where pipes pass though fire-rated walls, partitions, ceilings, and floors, maintain the fire-rated integrity.

E. Elevated Floor Penetrations of Waterproof Membrane, Interior Penetrations of No-Fire Rated Walls and Concrete Slab on Grade Penetrations: Provide sleeves and seal pipes that pass through waterproof floors, non-fire rated walls, partitions and ceilings or concrete slab on grade.

F. Exterior Wall Penetrations: Seal pipe penetrations through exterior wall constructions with sleeves, packing, and sealant.

G. Underground Exterior Wall Penetrations: Seal pipe penetrations through underground exterior walls with sleeves and mechanical sleeve seals.

H. Dirt legs and Sediment Traps: Install a dirt leg at points where condensate and impurities may collect, at the outlet of the gas meter, as close to the inlet of each gas appliance or equipment as possible, and in a location readily accessible to permit cleaning and emptying.

1. Construct dirt legs and sediment traps using a tee fitting with the bottom outlet plugged or capped. Provide a 3" length of pipe and screwed cap for the dirt leg. Use line size pipe for dirt leg, refer to the drawings for sizes. Enter the tee with flow from the top and exit the tee from the side outlet. Install the dirt leg a minimum of 3-1/2" above the roof or floor readily accessible to permit cleaning and emptying.

2. Install line size gas cock, union and dirt leg at each equipment connection; refer to the drawings for sizes. Provide reducers at the equipment connection as required. Unions are specified in Division 22 section "Basic Piping Materials and Methods".

I. Use fittings for all changes in direction and all branch connections.

J. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

K. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

L. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

M. Install horizontal piping as high as possible allowing for specified slope and coordination with other components. Install vertical piping tight to columns or walls. Allow sufficient space above removable ceiling panels to allow for panel removal.

N. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

O. Install gas piping at a uniform grade of 1/4 inch in 15 feet, upward to risers, and from the risers to the meter, or service regulator when meter is not provided, or the equipment.

P. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.

Q. Connect branch outlet pipes from the top or sides of horizontal fines, not from the bottom.

R. Install unions in pipes 2 inch and smaller, adjacent to each valve, and elsewhere as indicated. Unions are not required on flanged devices.

S. Joints Containing Dissimilar Metals: Provide dielectric unions for 2" and smaller and dielectric flanges for piping 2-1/2" and larger. Dielectric unions and flanges are specified in Section "Basic Piping Materials and Methods".

T. Install flanges on valves, apparatus, and equipment having 2-1/2 inch and larger connections.

U. Install strainers on the supply side of each control valve, pressure reducing valve, pressure regulating valve, solenoid valve, and elsewhere as indicated.

V. Anchor piping to ensure proper direction of expansion and contraction. Install expansion loops and joints per industry standards.

1. Paint Exposed Outdoor Gas Piping

2. Final color per owner

3.5 HANGERS AND SUPPORTS

A. General: Hanger, support, and anchor components and installation procedures shall conform to ANSI/MSS SP-58 and SP•69. The table below lists maximum spacing of supports.

B. Pipe Attachments: Install the following:

1. Adjustable clevis hangers, MSS SP-69 Type l , for steel pipe 2-1/2" and larger for individual horizontal runs

2. Riser clamps, MSS SP-69 Type 8, for individual vertical runs.

3. Extension split ring pipe clamp, MSS SP-69 Type 12, for individual exposed runs on walls.

4. Engineered strut support system may be provided, at the contractor's option, in lieu of individual hangers for horizontal pipes. Provide two piece straps for uninsulated pipe secured to the bare pipe and provide plastic galvanic isolators for bare copper tube.

5. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

SIZE (NPS)	SPACING IN FEET	MIN. ROD SIZE IN INCHES
1/2" to 1"	7	3/8
1-1/4"	8	3/8
1-1/2"	9	3/8
2"	10	3/8
2-1/2"	11	1/2
3"	12	1/2
4"	14	5/8
6"	16	3/4

C. Support vertical piping at every floor.

D. Support gas piping within 12" of each elbow or tee and for gas piping 2-1/2" and larger at each valve or pressure regulator.

E. Support gas piping located on roof with pre-engineered roof supports. Conform to the table above for maximum spacing of supports. Support pipe at a minimum 7" above the roof.

3.6 PIPE JOINT CONSTRUCTION

A. Welded Joints: Comply with the requirements in ASME Boiler and Pressure Vessel Code, Section IX.

B. Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe, fittings, and valves as follows:

1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint. Refer to NFPA 54, for guide for number and length of threads for field threading steel pipe.

2 Align threads at point of assembly.

3 Apply appropriate tape or thread compound to the external pipe threads.

4 Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.

5 Damaged Threads: Do not use pipe with threads which are corroded, or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

C. Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.

3.7 VALVE APPLICATIONS

A. General: The Drawings indicate valve types, locations, and arrangements.

B. Shut-off duty: Use gas cocks specified in Part 2 above.

3.8 VALVE INSTALLATIONS

A. Install valves in accessible locations, protected from physical damage. Tag valves with a metal tag attached with a metal chain indicating the piping systems supplied.

B. Install a gas cock 10 pipe diameters upstream of each gas pressure regulator. Where two gas pressure regulators are installed in series in a single gas line, a manual valve is not required at the second regulator.

C. Install line pressure regulators a minimum of 10 pipe diameters upstream of each atmospheric or power burner equipment connection.

D. Install line pressure regulators a minimum of 10'-0" upstream of each condensing boiler or water heater connection.

E. Install the emergency natural gas shutoff valve furnished by the Food Service Equipment Contractor with exhaust hood fire extinguishing system. The valve shall have a clearly marked open/closed indicator and shall shutoff the fuel source to cooking equipment upon detection of fire. Locate the valve in an accessible location in accordance with the authority having jurisdiction's requirements. Refer to the drawings for the recommended valve location.

F. Install laboratory gas cocks with inlet sized all thread shank and backing nut. Tighten backing nut to secured gas turret or gas cock to casework or wall. For wall mounted laboratory gas cocks, provide wood block backing in wall.

G. Install line size gas cock at the outlet of the gas meter set or gas riser and install a line size union downstream of the gas cock outside of the building.

3.9 TERMINAL EQUIPMENT CONNECTIONS

A. Install line size gas cock upstream and within 6 feet of gas appliance. Install a fine size union or flanged connection downstream from the gas cock to permit removal of controls. Install reducer at the gas appliance connection, if required.

B. Install stainless steel flexible gas pipe connector, of size and length as required to complete equipment hookup of foodservice equipment. appropriate length of flexible gas pipe connector for movement of the foodservice equipment for cleaning.

3.10 ELECTRICAL BONDING AND GROUNDING

A. Install above ground portions of gas piping systems, upstream from equipment shutoff valves electrically continuous and bonded to a grounding electrode in accordance with NFPA 70 - "National Electrical Code."

B. Do not use gas piping as a grounding electrode.

C. Conform to NFPA 70 - "National Electrical Code," for electrical connections between wiring and electrically operated control devices.

3.11 FIELD QUALITY CONTROL

A. Piping Tests: Inspect, test, and purge natural gas systems in accordance with NFPA 54, and local utility requirements.

END OF SECTION 227000