Case 14-G-0357

Exhibit B to the 11/6/14 Statement of the Master Plumbers Council of the City of New York, Inc.

CHAPTER 4
GAS PIPING INSTALLATIONS

SECTION FGC 401
GENERAL

401.1 Scope. This chapter shall govern the design, installation, modification and maintenance of fuel-gas piping systems. The scope covered by this chapter includes piping systems from the point of delivery to the connections with the appliances and includes the design, materials, components, fabrication, assembly, installation, testing, inspection, operation and maintenance of such piping systems.

401.1.1 Meters and service piping. Service piping includes the fuel-gas piping up to the point of delivery. Meters and service piping shall comply with the requirements of Appendix E of this code. In addition, service piping located within buildings shall be designed and installed in accordance with the structural integrity, firestopping, and fire protection provisions of the *New York City Building Code*.

401.1.2 Reserved.

401.2 Reserved.

401.3 Modifications to existing systems. In modifying or adding to existing piping systems, sizes shall be maintained in accordance with this chapter.

401.4 Additional appliances. Where an additional appliance is to be served, the existing piping shall be checked to determine if it has adequate capacity for all appliances served. If inadequate, the existing system shall be enlarged as required or separate piping of adequate capacity shall be provided.

401.5 Identification. All piping installed in new construction and all new piping installed in existing buildings, whether or not the piping is intended to be enclosed when construction is completed, shall be identified by a yellow label marked "Gas" in black letters. Where the installation requires a gas test, such labeling shall be completed prior to such test. Labels shall be provided in accordance with ASME A13.1 and the marking shall be spaced at intervals not exceeding 5 feet (1524 mm). The marking shall not be required on pipe located in the same room as the appliance served.

401.6 Interconnections. Where two or more meters are installed on the same premises but supply separate consumers, the piping systems shall not be interconnected on the outlet side of the meters.

401.7 Piping meter identification. Piping from multiple meter installations shall be marked with an approved permanent identification by the installer so that the piping system supplied by each meter is readily identifiable.

401.8 Minimum sizes. All pipe utilized for the installation, extension and alteration of any piping system shall be sized to supply the full number of outlets for the intended purpose and shall be sized in accordance with Section 402.

SECTION FGC 402
PIPE SIZING

402.1 General considerations. Piping systems shall be of such size and so installed as to provide a supply of gas sufficient to meet the maximum demand and supply gas to each appliance inlet at not less than the minimum supply pressure required by the appliance.

402.2 Maximum gas demand. The volume of gas to be provided, in cubic feet per hour, shall be determined directly from the manufacturer's input ratings of the appliance served. Where an input rating is not indicated, the gas supplier, appliance manufacturer or a qualified agency shall be contacted, or the rating from Table 402.2 shall be used for estimating the volume of gas to be supplied. The total connected hourly load shall be used as the basis for pipe sizing, appliances that all equipment could be operating at full capacity simultaneously. Where a diversity of load can be established, pipe sizing shall be permitted to be based on such loads.

402.3 Sizing. Gas piping shall be sized in accordance with one of the following:

1. Pipe sizing tables or sizing equations in accordance with Section 402.4.
2. The sizing tables included in a listed piping system's manufacturer's installation instructions.
3. Other approved engineering methods.
4. Individual outlets to gas ranges shall not be less than $^3/_4$ inches (19 mm) NPS.

402.5 Allowable pressure drop. The design pressure loss in any piping system under maximum probable flow conditions, from the point of delivery to the inlet connection of the appliance, shall be such that the supply pressure at the appliance is greater than or equal to the minimum pressure required by appliance.

402.6 Gas distribution pressures. No gas distribution piping containing gas at a pressure in excess of $^1/_2$ psig (3.5 kPa gauge) shall be run within a building.

Exceptions:

1. Pressure not exceeding 5 psig (34.5 kPa gauge) is permitted for: ‡commercial and industrial occupancies where fuel requirements for appliances exceed 4,000 cubic feet per hour (113.2 m^3/h) and such large volume use is supplied through separate gas distribution piping.
2. Gas pressure not exceeding 15 psig (100 kPa gauge) is permitted for appliances in excess of 100,000 cubic feet per hour (2830 m^3/h) provided the gas distribution piping is installed as provided for in Section 404. The use of pressure in excess of 15 psig (100 kPa gauge) shall be permitted for distribution piping provided all of the requirements of Section 406 and Appendix G are met.

SECTION FGC 403
PIPING MATERIALS

403.1 General. Materials used for piping systems shall be new and comply with the requirements of this chapter or shall be approved.

403.1.1 Pipe size and pressure limitations.

1. All requirements for installation of gas distribution piping with operating pressures at $^1/_2$ psig (3.5 kPa gauge) or less and above $^1/_2$ psig (3.5 kPa gauge) shall be in accordance with Chapter 4 of this code.
2. Gas distribution piping operating at a pressure of over $^1/_2$ psig (3.5 kPa gauge) to 5 psig (34.5 kPa gauge) and size 4 inches (102 mm) or larger shall be welded.

   Exception: Manufactured and listed gas trains provided with the appliance may be threaded.
3. All gas distribution piping operating at a pressure above 5 psig (34.5 kPa gauge) shall be welded.
4. All welding of gas distribution piping shall be subject to special inspection as set forth in Section 406.
5. All piping 4 inches (102 mm) and greater operating at pressure exceeding 5 psig (34.5 kPa gauge) must be butt welded, subject to special inspection and radiographed.
6. Threaded piping may be used up to 4 inches (102 mm) at pressure no greater than $^1/_2$ psig (3.5 kPa gauge).

403.2 Used materials. Used pipe, fittings, valves and other materials shall not be reused.

403.3 Other materials. Material not covered by the standards specifications listed herein shall be investigated and tested to determine that it is safe and suitable for the proposed service, and, in addition, shall be recommended for that service by the manufacturer subject to approval by the commissioner.

403.4 Metallic pipe. Metallic pipe shall comply with Sections 403.4.1 through 403.4.4.

403.4.1 Cast iron. Cast-iron pipe shall not be used.

403.4.2 Steel. Carbon steel and wrought-iron pipe shall be at least of standard weight and shall comply with one of the following standards:

1. ASME B36.10, 10M
2. ASTM A 53/A 53M; or
3. ASTM A 106.

403.4.3 Copper and brass. Copper and brass pipe shall not be used.

403.4.4 Aluminum. Aluminum-alloy pipe shall not be used.

403.5 Metallic tubing. Metallic tubing shall not be used except as provided in Section 405.5.

403.5.1 Standards. Stainless steel flexible multiple leg hose assemblies shall be designed in accordance with the requirements of this code and the manufacturer's recommendation.

403.5.2 Seismic requirements. Stainless steel flexible multiple leg hose assemblies shall be designed to withstand seismic force and displacement in accordance with Section 1613 of the *New York City Building Code*.

403.5.3 Special inspection required. The installation of stainless steel flexible multiple leg hose assemblies shall be subject to special inspection in accordance with Section 1707.7 of the *New York City Building Code* and Section 406 of this code.

403.6 Reserved.

403.7 Workmanship and defects. Pipe and fittings shall be clear and free from cutting burrs and defects in structure or threading, and shall be thoroughly brushed, and chip and scale blown.

Defects in pipe and fittings shall not be repaired. Defective pipe and fittings shall be replaced (see Section 406.1.2).

403.8 Protective coating. Where in contact with material or atmosphere exerting a corrosive action, metallic piping and fittings coated with a corrosion-resistant material shall be used. External coatings or linings used on piping or components shall not be considered as adding strength.

403.9 Metallic pipe threads. Metallic pipe and fitting threads shall be taper pipe threads and shall comply with ASME B1.20.1.

403.9.1 Damaged threads. Pipe with threads that are stripped, chipped, corroded or otherwise damaged shall not be used. Where a weld opens during the operation of cutting or threading, that portion of the pipe shall not be used.

403.9.2 Number of threads. Field threading of metallic pipe shall be in accordance with Table 403.9.2.

TABLE 403.9.2
SPECIFICATIONS FOR THREADING METALLIC PIPE

IRON PIPE SIZE (inches)	APPROXIMATE LENGTH OF THREADED PORTION (inches)	APPROXIMATE NUMBER OF THREADS TO BE CUT
1/2	3/4	10
3/4	3/4	10
1	1/8	10
1 1/4	1	11
1 1/2	1	11
2	1	11
2 1/2	1 1/2	12
3	1 1/2	12
4	1 5/8	13

For SI: 1 inch = 25.4 mm.

403.9.3 Thread compounds. Thread (joint) compounds (pipe dope) shall be resistant to the action of liquefied petroleum gas or to any other chemical constituents of the gases to be conducted through the piping. Use of cotton thread (lamp wick) is prohibited.

403.10 Metallic piping joints and fittings. The type of piping joint used shall be suitable for the pressure-temperature conditions and shall be selected giving consideration to joint tightness and mechanical strength under the service conditions. The joint shall be able to sustain the maximum end force caused by the internal pressure and any additional forces caused by temperature expansion or contraction, vibration, fatigue or the weight of the pipe and its contents.

403.10.1 Pipe joints. Pipe joints shall be threaded, flanged, or welded.

403.10.2 Tubing joints. Tubing joints shall not be used.

403.10.3 Flared joints. Flared joints shall not be used.

403.10.4 Metallic fittings. Metallic fittings shall comply with the following:

1. Threaded fittings in sizes larger than 4 inches (102 mm) shall not be used.
2. Fittings used with steel or wrought-iron pipe shall be steel or malleable iron.
3. Bushings shall not be used.

403.11 Reserved.

403.12 Flanges. All flanges shall comply with ASME B16.1, ASME B16.20, or MSS SP-6. The pressure-temperature ratings shall equal or exceed that required by the application.

403.12.1 Flange facings. Standard facings shall be permitted for use under this code. Where 150-pound (1034 kPa) pressure-rated steel flanges are bolted to Class 125 cast-iron flanges, the raised face on the steel flange shall be removed.

403.13 Flange gaskets. Material for gaskets shall be capable of withstanding the design temperature and pressure of the piping system, and the chemical constituents of the gas being conducted, without change to its chemical and physical properties. The effects of fire exposure to the joint shall be considered in choosing material. Acceptable materials include metal or nonasbestos fiber and aluminum "O" rings and spiral wound metal gaskets. When a flanged joint is opened, the gasket shall be replaced. Full-face gaskets shall be used with all cast-iron flanges.

SECTION FGC 404
PIPING SYSTEM INSTALLATION

404.1 Prohibited locations. Piping shall not be installed in or through a ducted supply, return or exhaust duct, or a trash or clothes chute, chimney or gas vent, ventilating duct, dumbwaiter or elevator shaft. Piping installed downstream of the point of delivery shall not extend through any townhouse unit other than the unit served by such piping. Piping, fixtures, or equipment shall be located so as not to interfere with the normal operation of windows or doors and other exit openings. The following installation limitations shall apply:

1. **Stair enclosures.** Gas piping shall not be installed within a stair enclosure or required exit or exit way.
2. **Fire standpipe riser.** Gas piping shall not be installed in any shaft containing standpipe risers.
3. **Fire pump and fire pump rooms.** Gas piping, gas consumption devices or any other gas equipment shall not be installed within any space housing a fire pump. Access to gas meter rooms shall not be permitted through‡ rooms housing a fire pump.
4. **Fire-rated construction.** Gas piping shall not be installed within fire-rated assemblies.
5. **Public corridor.** Gas piping shall not be installed in public corridors and exit enclosures.

   Exception: Gas piping may be installed in public corridors in residential buildings that do not have floors below grade or in multiuse buildings that have a residential occupancy in accordance with the following:

   1. Gas piping shall be permitted to be installed within a public corridor at the lowest level of the building or the lowest residential level of the building.
   2. All gas valves located within the public corridor shall be accessible for maintenance and inspection.
   3. Gas pressure within the public corridor piping shall not exceed 1/2 psi (14 inch w.c.). The completed piping within the public corridor is to be tested and proven tight at 10 psig (69 kPa gauge) for a minimum of 30 minutes.

the building, the space between the conduit and the gas piping shall be sealed to prevent the possible entrance of any gas leakage. The conduit shall extend not less than 2 inches (51 mm) beyond the point where the pipe emerges from the floor. Where the end sealing is capable of withstanding the full pressure of the gas pipe, the conduit shall be designed for the same pressure as the pipe. Such conduit shall extend not less than 4 inches (102 mm) outside of the building, shall be vented above grade to the outdoors and shall be installed so as to prevent the entrance of water and insects.

404.12.2 Conduit with both ends terminating indoors. Where the conduit originates and terminates within the same building, the conduit shall originate and terminate in an accessible portion of the building and shall not be sealed. The conduit shall extend not less than 2 inches (51 mm) beyond the point where the pipe emerges from the floor.

404.13 Outlet closures. Gas outlets shall be permitted only under the following conditions:

1. Valved and capped gas tight outlets for single appliance outlets as approved.
2. Valved and capped outlets on each floor in nonproduction laboratory buildings for future laboratories.
3. Listed and labeled flush-mounted-type quick disconnect devices and listed and labeled gas convenience outlets installed in accordance with the manufacturer's installation instructions.

404.14 Location of outlets. The unthreaded portion of piping outlets shall extend not less than 1 inch (25 mm) through finished ceilings and walls and where extending through floors or outdoor patios and slabs, shall not be less than 2 inches (51 mm) above them. The outlet fitting or piping shall be securely supported. Outlets shall not be placed behind doors. Outlets shall be located in the room or space where the appliance is installed.

Exception: Listed and labeled flush-mounted-type quick disconnect devices and listed and labeled gas convenience outlets shall be installed in accordance with the manufacturer's installation instructions.

404.15 Reserved.

404.16 Prohibited devices. A device shall not be placed inside the piping or fittings that will reduce the cross-sectional area or otherwise obstruct the free flow of gas.

Exceptions:

1. Approved gas filters.
2. An approved fitting or device where the gas piping system has been sized to accommodate the pressure drop of the fitting or device.‡

404.17 Testing of piping. Before any system of piping is put in service or concealed, it shall be tested to ensure that it is gas tight. Testing, inspection and purging of piping systems shall comply with Section 406.

SECTION FGC 405
PIPING BENDS AND CHANGES IN DIRECTION‡

405.1 General. Changes in direction of pipe shall be permitted to be made by the use of fittings.

405.2 Reserved.‡

405.3 Reserved.‡

405.4 Elbows. Factory-made welding elbows or transverse segments cut therefrom shall have an arc length measured along the crotch at least 1 inch (25 mm) in pipe sizes 2 inches (51 mm) and larger.

405.5 Pipe movement. Stainless steel flexible multiple leg hose assemblies listed and labeled as an assembly per UL 536 shall be installed for low pressure flammable and combustible gas piping systems where pipe movement resulting from thermal changes and random seismic shifts can occur in the piping systems.

405.5.1 Seismic requirements. Stainless steel flexible multiple leg hose assemblies shall be designed to withstand seismic force and displacement in accordance with Section 1613 of the *New York City Building Code.*

405.5.2 Inspection. The installation of stainless steel flexible multiple leg hose assemblies shall be subject to special inspections in accordance with Chapter 17 of the *New York City Building Code.*

SECTION FGC 406
INSPECTION, TESTING AND PURGING

406.1 General. Prior to acceptance and initial operation, all piping installations shall be inspected and pressure tested to determine that the materials, design, fabrication, and installation practices comply with the requirements of this code.

406.1.1 Inspections. Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly, or pressure tests as appropriate. Supplementary types of nondestructive inspection techniques, such as magnetic-particle, radiographic, ultrasonic, etc., shall not be required unless specifically listed herein or in the engineering design.

406.1.1.1 Welder's qualifications. Welders installing gas piping within buildings at any pressure shall comply with the following:

1. Welders shall be qualified for all pipe sizes, wall thicknesses and all positions in accordance with the *ASME Boiler and Pressure Vessel Code,* Section IX. Requalification of welders is required on an annual basis and when requested by the commissioner.
2. Welder qualification testing shall be performed by an approved agency and the inspector witnessing the test shall be an authorized AWS Certified Welding Inspector. Radiographic test specimens shall be evaluated by a radiographic inspector having a minimum radiography qualification of Level II in accordance with the ASNT, Document No. SNT-TC-1A, Supplement A.

3. Copies of the certified welder qualification reports shall be maintained by both the approved agency and the licensed master plumber employing the welder(s) for at least six years and shall be made available to the department upon request.

4. The approved agency shall submit certified welder qualification reports to the department upon successful qualification of a welder and when requested by the commissioner.

5. The licensed master plumber employing the welder(s) shall submit a statement to the department including who welded the gas piping along with a copy(s) of the certified welder qualification report(s) witnessed by a representative of the licensed master plumber, at the time of the first roughing inspection.

406.1.1.2 Welding requirements. All welded gas distribution and meter piping main and branch supplies to customer equipment operating in excess of 5 psig (34.5 kPa gauge) inside buildings shall be welded; and shall be subject to special inspection in accordance with Chapter 17 of the *New York City Building Code*. All piping $2^1/_2$ inches (63.5 mm) or greater in diameter shall be butt-welded, and piping less than $2^1/_2$ inches (63.5 mm) in diameter may be socket-welded or butt-welded.

Radiographic testing shall be performed on all butt welds in gas meter and gas distribution piping operating at pressures exceeding 5 psig (34.5 kPa gauge) within buildings, in accordance with *ASME Boiler and Pressure Vessel Code*, Section IX.

406.1.1.3 Welding records. The licensed master plumber employing the welder(s) shall assign to each welder an identification symbol or number to identify the welds performed by that particular welder. The welder shall identify all welds with his or her symbol or number. The licensed master plumber shall maintain records identifying the weld(s) made by each welder for at least six years and shall make such records available to the department upon request.

406.1.2 Repairs and additions. In the event repairs or additions are made after the pressure test, the affected piping shall be tested.

406.1.3 New branches. A piping system shall be tested as a complete unit.

406.1.4 System testing. A piping system shall be tested as a complete unit.

406.1.5 Regulators and valve assemblies. Regulator and valve assemblies fabricated independently of the piping system in which they are to be installed shall be permitted to be tested with inert gas or air at the time of fabrication.

406.2 Test medium. The test medium shall be air, nitrogen, carbon dioxide or an inert gas. Oxygen shall not be used. Fresh water may be used as the test medium only where the required test pressure exceeds 100 psig (689 kPa).

406.3 Test preparation. Pipe joints, including welds, shall be left exposed for examination during the test.

Exception: Covered or concealed pipe end joints that have been previously tested in accordance with this code.

406.3.1 Expansion joints. Expansion joints shall be provided with temporary restraints, if required, for the additional thrust load under test.

406.3.2 Appliance and equipment isolation. Appliances and equipment that are not to be included in the test shall be either disconnected from the piping or isolated by blanks, blind flanges, or caps. Flanged joints at which blinds are inserted to blank off other equipment during the test shall not be required to be tested.

406.3.3 Appliance and equipment disconnection. Where the piping system is connected to appliances or equipment designed for operating pressures of less than the test pressure, such appliances or equipment shall be isolated from the piping system by disconnecting them and capping the outlet(s).

406.3.4 Valve isolation. Where the piping system is connected to appliances or equipment designed for operating pressures equal to or greater than the test pressure, such appliances or equipment shall be isolated from the piping system by closing the individual appliance or equipment shutoff valve(s).

406.3.5 Testing precautions. All testing of piping systems shall be done with due regard for the safety of employees and the public during the test. Bulkheads, anchorage, and bracing suitably designed to resist test pressures shall be installed if necessary. Prior to testing, the interior of the pipe shall be purged to flush out all foreign material, including weld splatter, dirt, rags, and other debris left inside the pipe during welding operations and piping installation.

406.4 Test pressure measurement. Upon completion of the installation of a section of a gas system or of the entire gas system, and before appliances are connected thereto, the completed section or system shall be verified as to materials, and tested and proven tight as follows:

1. Gas distribution piping shall comply with the following:

   1.1. Distribution pressures up to $^1/_2$ psig (3.5 kPa gauge). The completed piping is to be tested with a nonmercury gauge at a pressure of 3 psig (20 kPa gauge) for a minimum of 30 minutes.

   1.2. Distribution pressures over $^1/_2$ psig (3.5 kPa gauge) through 5 psig (34.5 kPa gauge). The completed piping is to be tested at 50 psig (340 kPa gauge) for a minimum of 30 minutes.

   1.3. Distribution pressures over 5 psig (34.5 kPa gauge) through 15 psig (100 kPa gauge). The completed piping is to be tested at 100 psig (689 kPa gauge) for a minimum of 1 hour.

   1.4. Distribution pressures above 15 psig (100 kPa gauge). The completed piping is to be tested to

approved agencies. The department shall prescribe qualifications for individuals who are authorized to witness such tests on behalf of approved agencies, including but not limited to the requirement that such individuals shall be licensed master plumbers or registered design professionals with not less than 5 years' experience in the inspection and testing of gas piping systems. Such tests may be conducted without any verifying inspection of tests by the department, provided that verified statements and supporting inspectorial and test reports are filed with the department within one working day of such tests.

406.4.6 Notification. The holder of the plumbing permit shall give at least 2 days prior written notice to the commissioner that the plumbing work covered by the permit is ready for inspections and test.

406.5 Detection of leaks and defects. The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects. Any reduction of test pressures as indicated by pressure gauges shall be deemed to indicate the presence of a leak unless such reduction can be readily attributed to some other cause.

406.5.1 Detection methods. The leakage shall be located by means of an approved gas detector, a noncorrosive leak detection fluid, or other approved leak detection methods. Matches, candles, open flames, or other methods that could provide a source of ignition shall not be used.

406.5.2 Corrections. Where leakage or other defects are located, the affected portion of the piping system shall be repaired or replaced and retested.

406.6 Piping system and equipment leakage check. Leakage checking of systems and equipment shall be in accordance with Sections 406.6.1 through 406.6.4.

406.6.1 Check gases. Leak checks using fuel gas shall be permitted in piping systems that have been pressure tested in accordance with Section 406.

406.6.2 Before turning gas on. During the process of turning gas on into a system of new gas piping, the entire system shall be inspected to determine that there are no open fittings or ends and that all valves at unused outlets are closed and plugged or capped.

406.6.2.1 Establishing gas supply. It shall be unlawful for any utility company to supply gas to a building, place or premises in which new meters other than replacement are required until a certificate of approval of gas installation from the department is filed with such utility company. When new gas service piping has been installed it shall be locked-off by the utility either by locking the gas service line valve or by installing a locking device on the outside gas service line valve. The lock shall not be removed until the gas meter piping (other than utility-owned) and gas distribution piping has been inspected and certified as required by the department as being ready for service.

406.6.2.2 Alterations to gas piping systems. When alterations, extensions or repairs to existing gas meter piping or gas distribution piping requires the shutoff of gas flow to a building, the utility shall be notified by the owner or his or her authorized representative.

406.6.3 Leak check. Immediately after the gas is turned on into a new system or into a system that has been initially restored after an interruption of service, the piping system shall be checked for leakage. Where leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.

406.6.4 Placing appliances and equipment in operation. Gas utilization appliances and equipment shall be permitted to be placed in operation after the piping system has been checked for leakage in accordance with Section 406.6.3 and determined to be free of leakage and purged in accordance with Section 406.7.2.

406.6.4.1 Requirements for placing equipment in operation. The following will be required prior to placing equipment in operation as applicable:

1. Required fire protection system (sprinkler or standpipe) are completed, inspected and ready for service.
2. Such equipment and related gas piping are inspected by the department or authorized inspector.
3. Associated fire suppression system is inspected and approved by the Fire Department.

406.7 Purging. The purging of piping shall be in accordance with Sections 406.7.1 through 406.7.3.

406.7.1 Piping systems required to be purged outdoors. The purging of piping systems shall be in accordance with the provisions of Sections 406.7.1.1 through 406.7.1.4 where the piping system meets either of the following:

1. The design operating gas pressure is greater than 2 psig (13.79 kPa).
2. The piping being purged contains one or more sections of pipe or tubing that meet(s) the size and length criteria of Table 406.7.1.1.

406.7.1.1 Removal from service. Where existing gas piping is opened, the section that is opened shall be isolated from the gas supply and the line pressure vented in accordance with Section 406.7.1.3. Where gas piping meeting the criteria of Table 406.7.1.1 is removed from service, the residual fuel gas in the piping shall be displaced with an inert gas.

TABLE 406.7.1.1
SIZE AND LENGTH OF PIPING

NOMINAL PIPE SIZE (inches)	LENGTH OF PIPING (feet)
≥ 2 ½ < 3	< 50
≥ 3 < 4	< 30
≥ 4 < 6	< 15
≥ 6 < 8	< 10
≥ 8	Any length

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

406.7.1.2 Placing in operation. Where gas piping containing air and meeting the criteria of Table 406.7.1.1 is

twice the maximum allowable operating pressure, but not less than 100 psig (689 kPa gauge), for a minimum of 1 hour.

1.5. Where the test pressure exceeds 125 psig (862 kPa gauge), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe.

2. Meter piping shall be pressure tested in accordance with the requirements of the serving utility. These requirements shall be either the same as those for testing distribution piping in numbered paragraph 1 of this section or, if different, the piping shall be certified by the local utility as being tested in compliance with their requirements.

3. Notwithstanding the above, all factory applied coated and wrapped pipe shall be pressure tested at a minimum of 90 psig (621 kPa gauge). For testing, the piping shall be filled with air or an inert gas, and the source of pressure shall be isolated before the pressure readings are made. All test duration time periods are to be measured after stabilization of testing medium. Fresh water may be used as the test medium only where the required test pressure exceeds 100 psig (689 kPa gauge).

406.4.1 Minimum standards for nonmercury gauges.

1. This section establishes minimum standards for nonmercury gauges to test gas piping, drainage and vent systems.

2. Each gauge shall meet the following requirements:

2.1. The gauge shall be manufactured and used in accordance with ASME B40.100, which incorporates ASME B40.1 and ASME B40.7, and the manufacturer shall provide with the gauge a written statement that the gauge is manufactured in accordance with such ASME standard;

2.2. The gauge shall be labeled with the name of the manufacturer;

2.3. The gauge shall be kept in a padded separate rigid box and the manufacturer's instructions for use and protection of the gauge shall be complied with;

2.4. The units of measurement "psig" shall appear on the face of the gauge; and

2.5. The gauge shall be kept in good working order.

406.4.2 Analog gauges used to measure pressure in the magnitude of 3 psig (20 kPa gauge). Each analog gauge used to measure pressure in the magnitude of 3 psig (20 kPa gauge) shall meet the following requirements in addition to satisfying the minimum requirements set forth in Section‡ 406.4.1:

1. The face of the gauge shall not be smaller than $2^1/_4$ inches (57 mm) in diameter;

2. The gauge shall have a minimum of 270 degree (5 rad) dial arc;

3. The gauge shall be calibrated in increments of not greater than one-tenth of a pound;

4. The range of the gauge shall not exceed 5 psig (34.5 kPa gauge) when a $2^1/_4$-inch (57 mm) diameter gauge is used;

5. The 1/10 psig (0.69 kPa gauge) interval on the gauge shall not be smaller than one-tenth of an inch (2.5 mm) of arc;

6. The gauge shall be provided with an effective stop for the indicating pointer at the zero point;

7. The gauge shall be protected from excessive pressure with a shutoff valve and prior to using the 5 psig (34.5 kPa gauge) the snifter valve shall be tested with a tire gauge to determine the magnitude of pressure; and

8. The gauge shall have a calibration screw.

406.4.3 Analog gauges used to measure pressure in the magnitude of 5 psig (34.5 kPa gauge). Each analog gauge used to measure pressure in the magnitude of 5 psig (34.5 kPa gauge) shall meet the following requirements in addition to satisfying the minimum requirements set forth in Section 406.4.1:

1. The face of the gauge shall not be smaller than $2^1/_4$ inches (57 mm) in diameter;

2. The gauge shall have a minimum of 270 degree (5 rad) dial arc;

3. The gauge shall be calibrated in increments not greater than one-fifth of a pound;

4. The range of the gauge shall not exceed 10 psig (69 kPa gauge) when a $2^1/_4$ inch (57 mm) diameter gauge is used;

5. The one-fifth interval on the gauge shall not be smaller than one-tenth of an inch (2.5 mm) of arc;

6. The gauge shall be provided with an effective stop for the indicating pointer at the zero point;

7. The gauge shall be protected from excessive pressure with a shutoff valve and prior to using the 10 psig (69 kPa gauge) the snifter valve shall be tested with a tire gauge to determine the magnitude of pressure; and

8. The gauge shall have a calibration screw.

406.4.4 Digital gauges used to measure pressure in the magnitude of 3 psig (20 kPa gauge) and higher. Each digital gauge used to measure pressure in the magnitude of 3 psig (20 kPa gauge) and higher shall meet the following requirements in addition to satisfying the minimum requirements set forth in Section 406.4.1:

1. The gauge shall have a minimum reading of 1/100 of a psig (69 Pa), and

2. An extra charged battery shall be readily available for immediate use with the gauge.

406.4.5 Witnessing tests of gas-piping systems. Tests of gas piping systems in accordance with this code shall be witnessed by department plumbing inspectors, or