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City Gas

Recommended Good Practice Requirements for the Installation, Maintenance and Use of Piping and Fittings for City Gas

Prepared by Committee on Gases

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(Subject to change before official adoption)

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International
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Owing to the rapidly increasing use of natural gas in various portions of the country and greater use of both manufactured and natural gas for general heating purposes, there has been an insistent demand for the revision of the Regulations for the Installation, Maintenance and Use of Piping and Fittings for City Gas, edition of 1920, to take care of the specific features noted. In deciding upon these revisions the Committee on Gases has received the cooperation of the American Gas Association. In this connection the suggestion has been made to the committee that instead of promulgating specific N.F.P.A. rules on the subject, the National Fire Protection Association be requested, following consideration by the Committee on Gases, to endorse the A.G.A. requirements for house piping and appliance installation. At its meeting on March 27th the committee discussed this proposal and its feasibility has been referred to a special committee for further consideration. For this reason the committee is submitting the following revised requirements simply as a progress report and recommends that it be received as such.

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This report will be further considered by the committee and revised before presentation to the National Fire Protection Association for final action. The committee will welcome comments and criticisms for guidance in making revisions.

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RECOMMENDED GOOD PRACTICE REQUIREMENTS FOR THE INSTALLATION, MAINTENANCE AND USE OF PIPING AND FITTINGS FOR CITY GAS.

Foreword.

The following provisions constitute a revision of those promulgated in 1920. As experience has demonstrated that they are of most value as a basis for ordinance requirements, and the present need is for requirements of such nature, the general arrangement of subjects has been changed so as to bring together those provisions justifying adoption as ordinance requirements, with the remaining provisions of a supplementary or informative character presented in the Appendix.

These provisions are intended to apply to the installation of gas piping in buildings and the use of city gas, i.e., natural and manufactured, in and about buildings. They do not apply to large underground gas distributing systems leading up to buildings and such parts of a gas system as the manufacturing plants, etc., which are the properties of gas companies.

General.

1. Definitions of Special Terms.

The following definitions give the meanings of the terms occurring in these rules. Terms not defined will be understood to have their usual meanings:

(a) GAS FITTER means any individual, firm, corporation, or company which either in person or through a representative is engaged in and is responsible for gas fitting or the connection or installation of gas appliances within a building.

NOTE: The term does not include any assistant who works under the supervision of a gas fitter, such as a gas fitter's helper. A master plumber, journeyman plumber, or a licensed gas fitter are examples of the term gas fitter. Whenever a gas company or its qualified employees do work on appliances of building piping they are expected to comply with this part of the requirements, and they therefore fall within the meaning of "gas fitter." The duty of instructing these workmen in the meaning and application of these requirements is usually imposed upon their employers.

(b) GAS UNDER PRESSURE means gas in piping or appliances which is under pressure imparted from the source of gas supply, usually by the gas company from outside the building.

(c) UNMEASURED GAS (or unmetered gas) means gas which has not passed through a customer's service meter.

(d) CONCEALED GAS PIPING means piping which, when in place in the finished building, will be hidden from view by the structure.

(e) EXPOSED GAS PIPING means piping which will be in view in the finished structure.

(f) STREET MAIN (or main) means a portion of the system used for distributing gas, generally located entirely outside of the customers' premises, and which is designed to supply gas to the service pipes of one or more customers. The main is generally parallel to the line of the street in which it lies.

NOTE: In some instances the distinction between a main and a service is more or less arbitrary, as, for example, when a long service pipe (or main) is run to supply a single customer, or a larger service pipe is run to supply a number of smaller services to the same premises.

(g) SERVICE PIPE (or service) means the pipe and fittings used to convey unmeasured gas from the main to the premises to be supplied, and in general extends underground to the inside face of the first main foundation wall through which the pipe passes. If a fitting is used at this point to change the direction of the pipe, the service extends to and includes this fitting.

(h) SERVICE EXTENSION means all of the pipe and fittings (including any service pressure regulator, meter header, etc.), which is installed inside of the premises to connect the end of the service with the fitting to which the inlet piping for the meter installation is to be attached, and which contains unmeasured gas.

(i) METER CONNECTION (Inlet or Outlet Connection) means any form of pipe, combination of fittings, or any device used to connect the inlet of the service meter to the service extension or other source of supply and the outlet of the service meter to the house piping.

(j) SERVICE METER (or meter) means the instrument installed on the customers' premises by the gas company for measuring the gas supplied to the customer, the readings of which are used as a basis for computing the customer's bill.

(k) HOUSE PIPING means the system of piping within a building, either exposed or concealed, which conveys gas from the outlet of the service meter to appliances at various places throughout the building. Any piping underground which contains measured gas is also house piping.

(l) MAIN SUPPLY LINE means that portion of the house piping, beginning at the outlet of the meter, from which branch lines of smaller size are taken. If this line divides into lines of equal size, these lines in turn to supply several branch lines, each of the branches from the single main supply is to be considered as a supply line. When the end of a supply line divides into lines of equal size, each to supply an appliance, these are to be regarded as branches.

It is often difficult to determine where the main supply line ends and branches or supply lines begin. However, no sharp distinction need be drawn in order to make clear the interpretation of the requirements.

(m) RISER means any vertical pipe which conducts the gas upwards.

(n) BRANCH LINES (or branches) mean those pipes which convey gas from a supply line to appliances.

(o) OUTLET means a threaded connection in a piping system to which a gas-burning appliance is or may be attached.

(p) DROP means any vertical pipe or nipple which conducts the gas downward.

(q) APPLIANCE means a gas appliance which utilizes gas fuel to produce light, heat or power.

(r) LIGHTING FIXTURE means an appliance which supplies gas to one or more lighting burners.

(s) SECONDARY METER means any meter installed at a point following the service meter, the readings of which are not used as a basis for computing the customer's bill. It is to be considered as a part of the house piping system.

(t) SERVICE COCK means any shut-off on a service or service extension between the main and the meter cock.

(u) CURB COCK means a service cock which is placed at or near the curb, outside of the building.

(v) METER COCK means the shut-off adjacent to and controlling the gas to a single service meter.

(w) LINE COCK means a shut-off installed in the house piping to control the supply of gas to all or any section of the piping system.

NOTE: "Cock" means any valve used for shutting off gas.

2. General Requirements.

The following basic rules outline in a general way what is necessary to insure a safe and satisfactory installation of house piping. The detailed requirements given later are means of accomplishing the fundamental requirements here given.

(a) Piping shall be constructed and installed so as to make a durable, substantial and gas tight system.

(b) Piping shall be of a size and so installed as to provide a supply of gas sufficient to meet the maximum demand without undue loss of pressure between the street service and the appliance or appliances.

(c) Piping shall be so installed as to prevent an accumulation of condensation from interrupting the flow of gas.

(d) The building structure shall not be weakened by the installation of the piping.

(e) No unnecessary hazard from escaping gas or fire shall be incurred during the installation or repair of piping.

(f) The system shall be left by the gas fitter in a safe and satisfactory condition for use by an unskilled person.

(g) No combustible gas shall be used unless it has a definite and distinctive odor, or is properly odorized.

3. General Precautions.

(a) WORK WITH GAS OFF. Gas-fitting, appliance installation and repair work shall be done with the gas turned off so that the danger from leakage during the work will be a minimum, except as provided in paragraph (b).

(b) WORKING ON PIPES FILLED WITH GAS. Work which involves removal of an appliance or unscrewing of a cap, plug or pipe which will open an outlet and permit the escape of gas shall never be done without shutting the gas off, except in emergency cases where interruption of the service is impracticable, and unless the work can be done without danger to life and property with the gas on.

(c) ONE MAN SHALL NOT WORK ALONE. In any one of the following conditions there shall be more than one man present, one of whom shall be in such location that he is not exposed to any possible asphyxiating influence from the escaping gas:

(1) When necessary to make installations, repairs, or do other work on piping filled with live gas.

(2) When work is done in a gassy atmosphere.

(3) When work is done in any confined space where gas may accumulate or in any space not readily accessible, e.g., where the gas fitter must lie down or assume a cramped position.

(d) USE OF MATCHES, CANDLES AND FLAMES. No matches, candles or flame or other sources of ignition shall be used by a gas fitter or his helper when working on meters, piping or appliances filled with gas, except for such work as necessarily involves the use of such flames. A flame shall never be used in searching for leaks. In no case should a flame be allowed to touch a meter, meter connection, or other piping.

(e) SMOKING. A gas fitter shall not smoke while working on piping which is filled with gas, or has been filled with gas, nor permit others to smoke while near such work.

(f) SAFETY LIGHTS TO BE PROVIDED. Every gas fitter shall be provided with an approved electric flash lamp or safety lamp which is adequately protected to prevent explosion or fire if used in a gassy atmosphere.

No other type of lamp shall be used in such atmosphere when searching for a leak or when working on piping filled with live gas.

(g) HANDLING COMBUSTIBLE LIQUIDS. Alcohol, gasolene, and other combustible liquids, including the liquid which is removed from meters or from drips in gas piping, shall be handled with proper precautions, and shall not be left by the gas fitter on the premises of the customer. The ordinary fitter's torch or furnace shall not be left within the premises from the end of one working day to the beginning of the next unless the torch or furnace is of an approved type, or is placed in a fire-resistive receptacle.

4. Gas Fitting to be Done Only by Qualified Gas Fitters.

(a) The installation and repair of piping and appliances shall be done only by qualified gas fitters. By the term qualified gas fitter is meant one who is experienced in the work, familiar with all precautions required, and who has complied with all the requirements as to qualification, registration, licensing, etc., of the proper administrative authority. This applies to the installation and repair of electrical apparatus and wiring, heating and ventilating equipment, etc., where the same involves work on combination gas and electric fixtures or appliances, or where electric apparatus or other equipment is attached to or forms any part of the gas fitting system. Such work should be done only by a workman fully qualified in both of the skilled trades involved, or by an electrician or other craftsman working under the supervision of a qualified gas fitter.

(b) No gas fitter, unless in the employ of the gas company or having a permit from the gas company, shall repair, alter or open the service pipe or service extension, or set or remove the service meter, or do any other work on the parts of the gas supply system up to and including this meter.

5. Plans and Specifications.

Plans and specifications shall be submitted to the proper administrative authority, and those for large or unusual installations or appliances shall be submitted to the gas company for criticism before the work is begun. Plans shall show the size and length of all piping and the size of all outlets in accordance with standard legends and symbols so far as practicable, and plans shall be so drawn as to permit compliance with these regulations.

Inspections and Tests.

6. Test Required for Concealed Piping.

(a) Gas shall not be turned on any new system of concealed piping nor any concealed extension of an existing system until inspected and tested as described in paragraph 14, in the presence of the proper administrative authority or by a representative of the gas company.

(b) In the installation of new piping, all work shall be subject to the approval of the inspection department having jurisdiction and the gas company, by whom the work should be inspected before piping is concealed.

7. Installations for Stores and Places of Assembly.

The gas company and inspection department having jurisdiction shall be consulted in advance and shall pass on all details of such installations which differ from the ordinary house-lighting practice in volume of gas required or any special features. Special attention shall be paid to exit and stair lights, remote controls, fire and accident conditions; frequent inspections shall be made.

8. Repairs, Alterations and Maintenance.

(a) All repairs, alterations or additions are to be in conformity with such parts of these regulations as apply.

(b) None but experienced gas fitters shall do such work.

9. Repetition of Air-Pressure Test.

Before gas is turned into old piping which has not been used for a number of months or whenever a gas fitter, from the appearance of the building, deems a test desirable, the piping shall be tested by him as described in Rule 14.

10. General Inspection.

When a general inspection is required, all portions of the piping installation shall be closely examined by the proper administrative authority to ensure that there is full compliance with this Code as regards size, grading, outlets, materials used, and all other points which can be determined by examination.

11. Testing for Tightness.

Piping shall be tested for tightness by means of air or gas pressure. Such tests shall be made in an approved manner. (See Appendix.)

12. Searching for Leaks.

In no case shall a flame be used when searching for a leak. (See Appendix for recommended procedure.)

13. Use of Water Prohibited.

In no case shall gas pipe be filled with water, acid, or other liquids to test or tighten leaks, except the application of a soap and water solution to pipe exterior, and if it is found that water has been used in the pipe, it shall be sufficient cause for the inspector to condemn the whole line of pipe.

14. Inspection of New Piping.

(a) IF THE PIPING IS TO BE CONCEALED:

(1) It shall be inspected as described in Rule 10.

(2) It shall be tested by the proper administrative authority before the pipes are concealed. A pressure of 3 times the expected service pressure, but never less than 3 pounds per square inch (indicated by a 6-inch column of mercury) shall be applied. The pressure should remain on the system for a period of at least 10 minutes, the mercury column showing no detectable drop.

(3) It shall be again tested by the proper administrative authority after all work in the building which might disturb the piping has been completed, but before appliances are attached. The pressure to be applied and the duration of the test period shall be the same as that required in Section 2 of this paragraph.

(b) IF THE PIPING IS TO BE CONCEALED AND ATTACHED TO OLD PIPING.

(1) It shall be inspected as described in Rule 10.

(2) It shall be tested by the proper administrative authority before the pipes are either concealed or attached to the old system. The pressure to be applied and the duration of the test period shall be of the same as that specified in paragraph (a) 2, of this rule.

(3) After fulfilling the requirements of the previous paragraphs, it may be attached to the old system; but the combined system shall be subjected to the test specified in Rule 15.

(c) IF THE PIPING IS TO BE EXPOSED:

(1) If the piping is simple and short or if all joints are readily accessible, it shall be inspected by the gas fitter in the manner described in Rule 10, and tested by him as specified above in (a) (2).

(2) If the piping is long or complicated, or if all joints are not readily accessible, it shall be inspected by the gas fitter and tested by him as specified in Rule (a) (2) at a pressure of at least twice the expected service pressure, but never less than one pound per square inch (indicated by a two-inch column of mercury). The pressure should remain on the system for at least 10 minutes, the mercury showing no perceptible drop.

15. Inspection of Old Piping.

(a) CONCEALED PIPING WITH NO RECORD OF INSPECTION. If there is no record of inspection of an old piping system, it shall be tested preferably by the proper administrative authority or the gas company as described in Rule 14 (a) (2), with the pressure and duration prescribed in Rule 14 (c) (2) before gas is turned into it.

(b) AFTER REPAIRS, ALTERATIONS, OR ADDITIONS. The entire system shall be tested as described in Rule 14 (a) (2) preferably by the proper administrative authority, or the gas company except in minor changes, which may be examined by the gas fitter alone.

NOTE: The following work may be classed under the term "Minor change":

(1) The connecting of appliances on previously installed piping systems or where the installation of exposed piping to connect such appliance does not exceed 50 feet in length.

(2) The removal of appliances and replacement by others for the same or similar service, or the removal of appliances and capping of outlets.

(3) The removal of appliances from one location to another on the same premises or making small alterations in piping which do not require the installation of over 50 feet of exposed piping.

(4) The making of emergency repairs, or the permanent repair of a leak on concealed piping, or any leak on exposed piping or appliances.

(5) The repair or adjustment of appliances or piping, removal of obstructions from piping, and the cleaning of appliances where no leakage is involved.

16. Record of Inspections.

A metal strap or tag, suitably marked and showing the date of approval by the proper administrative authority, shall be secured to each piping system near the outlet for the meter.

In addition a certificate of approval shall be issued to the gas fitter installing the piping.

NOTE: The issuance of this certificate not only protects the customer but likewise protects the gas fitter since it establishes the fact that his work was satisfactory, regardless of subsequent installations.

Services and Meters.

17. Work by Gas Fitters Between the Main and the Meter.

(a) No gas fitter, unless in the employ of the gas company or having a permit from the gas company, shall repair, alter or open the service pipe or service extension, or set or remove the service meter, or do any other work on the parts of the gas supply system up to and including the meter. However, if gas is leaking from any part of the gas supply system referred

to, a gas fitter not in the employ of the gas company may make necessary temporary repairs and notify the gas company to make permanent repairs.

Any concealed part of a gas supply system up to and including the service meter, when installed by a gas fitter on the premises of a prospective customer, shall be reported to, and should be inspected by, the gas company before it is concealed, either within the building or underground, and before it is connected with the main or service pipe which contains gas.

(b) Under no circumstances shall a gas fitter not in the employ of the gas company be permitted to open or make connections with a main, service pipe, or other part of the underground supply system which contains unmeasured gas, except with the consent of the gas company and in the presence of its authorized representative.

(c) A gas fitter may disconnect the outlet of a service meter from the house piping only when necessary. If the gas company will promptly disconnect the outlet of a service meter from the house piping, it shall not be done by a gas fitter not in the employ of the gas company.

A gas fitter shall not disconnect the inlet of the meter from the service extension nor move the meter on its support. If the gas company is to turn on the gas at the completion of the work and the use of the meter outlet was unavoidable, a gas fitter shall not remake the joint at the outlet of the meter, but shall leave this work for the gas company representative.

(d) In case any work done by a gas fitter discloses the need for repairs or alterations by the gas company on any part of the system containing unmeasured gas, the gas company shall be notified promptly of this fact.

18. Location of Meter.

(a) House piping should not be run so as to necessitate the placing of a meter under steps, under a show window, in an unventilated closet or other small confined space, in a coal bin, driveway, passage or other location where it will be subject to damage, or near a furnace or boiler or other equipment which produces large heating effects. The meter should be located at a safe distance from any probable source of unguarded flame or electric sparks, and where it will not be subject to unusual corrosion. Extremely high or low temperatures and sudden changes of temperature shall be avoided as much as possible.

(b) METER SUPPORT. Meters should be adequately supported and connected to the piping so as not to exert undue strain on the connection.

19. Pressure Regulation.

(a) Where the gas pressure in the street main is in excess of one pound per square inch, an approved gas pressure regulator of sufficient size shall be installed in the service pipe to prevent pressure in excess of one pound per square inch being introduced into the house piping.

(b) In those territories where the pressure fluctuates to such an extent as to render the supply uncertain, a no pressure shut-off valve shall be installed at each appliance.

(c) PRESSURE REGULATOR TO BE VENTED. A pressure regulator or governor which requires access to the atmosphere for successful operation shall be equipped with a vent pipe leading to the outer air or into the combustion chamber of an appliance where gas from the regulator may be discharged adjacent to a constantly burning flame. Means shall be employed to prevent water from entering this pipe, and also to prevent its stoppage by insects or other foreign matter.

20. Interconnection of Piping Systems.

Any interconnection of piping systems which are supplied through separate service meters shall be avoided. If necessary, as when an appliance such as a laundry stove or drier is installed for the joint use of tenants of a building, a special pipe from each tenant's meter shall be installed to the room where such appliances are located and a header provided adjacent to the appliances. Each pipe shall be provided with a lock-cock at a point near the header, and each such cock shall be labeled with a metal tag wired in place or with other suitable device indicating the number of the tenant's apartment or other designation for identification. Not more than one illuminating fixture shall be supplied from such header in addition to the fuel appliance.

Piping, Valves and Fittings.

21. Quality Materials.

(a) Standard full weight wrought-iron or steel pipe free from defects shall be used in conveying gas to and inside of buildings. Approved seamless drawn well annealed copper or brass tubing with approved fittings may be used in connecting stationary appliances that are anchored in place. All fittings for wrought-iron or steel pipe (except stop cocks or valves) shall be of best quality malleable iron. Threads shall be in accordance with the American Pipe Thread Standard.

(b) Material delivered to any job shall be carefully inspected as soon as possible by the gas fitter in charge of the work, and any part of it which is defective or which has been repaired with cement, lead, or other material, or by caulking, rusting, or any other methods, except by welding, shall not be used.

(c) Pipe, fittings, cocks, valves, or accessories removed from any installation shall not be again used until they have been thoroughly cleaned, inspected, and ascertained to be the equivalent of new material.

(d) Where necessary, due to corrosive materials in the soil or to harmful ingredients in the gas, piping shall be suitably coated to resist corrosion.

(e) Replacement of Defective Pipe or Fittings. In no case is it permissible to repair defects in pipe or fittings, but, having been located, the defective pipe or fitting must be removed and replaced with perfect material.

(f) Use of Old Pipe. No second-hand pipe shall be used except that when a building is undergoing reconstruction or repairs such old gas pipe as is taken out and found to be in perfect condition may be rerun in that building.

(g) Bending Pipe Prohibited. All bends or angles in pipe must be made with fittings.

22. Cutting, Threading and Jointing.

(a) All pipe shall be cut square with its length, and the exact dimensions as given on the piping plans should be followed. Pipe shall be threaded with clean-cut threads and all burrs or other obstructions shall be removed from the pipe.

(b) Nominal ordinary iron pipe sizes and American Standard are understood in these regulations for all pipes and threads where not otherwise specified.

(c) The following table specifies the number of threads to be cut and the length of section to be threaded for each size of pipe, based on American Standard:

Table 1.

Size of Pipe (Inches)	Approximate Length of Threaded Portion (Inches)	Approximate Number of Threads to be Cut
3/8	9/16	10
1/2	3/4	10
3/4	3/4	10
1	7/8	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

(d) Pipe with threads stripped, chipped, or damaged or which has corroded threads shall not be used, or if the weld opens during the operation of cutting or threading, that portion of the pipe shall not be used.

(e) When an approved jointing compound is used, it shall be applied sparingly and only to the male thread of the joint. Sealing wax or any material or compound known as "Gas Fitter's Cement" shall not be used in the making up of joints in piping systems. If material containing lead is used for a jointing material, it shall not be applied with the hand because of its poisonous nature.

23. Size of Pipe.

(a) A system of piping as a whole, and each of its branches, shall be designed to have a capacity, with a pressure of 0.3 inch, that is not less than the maximum probable demand through it. Table 2 is a table of the capacity of pipe of different diameters and lengths for gas of 0.6 specific gravity (referred to air). To convert the figures in this table to any other gravity multiply the value by 0.6/sp.gr. where sp.gr. represents the specific gravity of the gas to be used. By adopting a 0.3 inch pressure drop as standard enough allowance is made for the effect of an ordinary number of fittings.

(b) No pipe smaller than standard 3/8-inch size shall be used in any concealed gas piping installations; and no pipe smaller than standard 1/2-inch size should be used for concealed horizontal piping.

(c) SIZE OF EXTENSIONS. Extensions to existing piping shall conform to Table 2 and shall be converted where the proper size of pipe can be maintained. In no case shall extensions be made from smaller pipe.

24. Accessibility of Piping.

(a) VERTICAL PIPE. Vertical pipe when concealed in partitions shall be located in hollow rather than in solid partitions; such pipe shall be so located as not to be in contact with plaster more than is necessary.

(b) UNDER TILE, ETC. Piping shall not be laid in or under tile, mosaic, or composition floors if it can be avoided, but shall be so placed as to be accessible with a minimum of damage to walls, ceilings, or floors.

(c) PIPING CONCEALED UNDER FLOORING. Above the basement, pipe shall not be run under beams or floor joists where it will be covered with plastering, but shall be run along the top of the beams or joists so that it will be accessible by removing one or two boards from the floor. Where

it is necessary to notch beams or joists, piping shall not be more than 24 inches from the wall or supports below the beam.

(d) IN CHIMNEYS. Chimneys or flues shall not be used for pipe chases.

25. Piping in Concrete, Masonry, Etc.

(a) PIPING IN CHASES. When piping is to be placed in concrete, cement, masonry, etc., it shall, if possible, be laid in a conduit pipe or in a chase or channel left in the solid work. All conduit pipes, pipe channels, and chases shall be carefully graded and drained to prevent the accumulation of water about the pipe. The walls of such pipe chases or channels shall be coated with a suitable corrosion resisting material before the pipe is placed. Piping installed in such locations shall be galvanized on the exterior, or be otherwise suitably protected against corrosion. All exposed threads or tool marks on galvanized piping shall be given a protective coating.

(b) PIPING EMBEDDED IN STRUCTURAL MATERIAL. When necessary to embed a pipe in direct contact with neat cement or concrete, black iron pipe may be used.

When in contact with material exerting a corrosion action, the piping shall be made up of pipe and fittings galvanized on the outside and also coated with a suitable corrosion resisting material.

(c) No pipes shall be embedded in the required protection of columns or other structural member in buildings of fire-resistive construction.

26. Passing Offsets in Walls.

When the thickness of a wall has been increased and it is necessary to offset a vertical pipe, the offset shall not be made around the projection by the use of right-angle fittings, but shall be made with 45° fittings in order to reduce the likelihood of stoppage.

When the point of offset is accessible, as in the case of a foundation wall, the upper fitting shall be a 45° ell and the lower a 45° y-bend. The branch of the Y shall be vertical, and the lower "run" opening shall be plugged.

When the offset is not accessible, or when there is a change of direction necessitating a plugged tee with a short distance below the lower offset fitting, two 45° fittings shall be used.

27. Piping Exposed to Changes in Temperature or to Moisture.

(a) EXPOSURE. All pipes shall be so placed as to avoid exposure to extreme heat, cold, or moisture in so far as is practicable. Supply lines and other piping shall not be located in or on outside walls of vestibules; they shall be at least 3 feet from the outside walls when practicable.

(b) STOPPAGES. When piping must be so located that it may be exposed to low temperatures, special care shall be taken to prevent stoppages. This may be done by covering the pipe, by use of larger size than otherwise necessary, or by other approved means.

(c) ENLARGING. When piping is exposed through areaways or other similar locations, the pipe shall be increased in size sufficiently to prevent stoppages due to freezing by the use of eccentric fittings which shall be set to permit drainage of the enlarged section. The enlarged section shall extend through the wall at each side of the areaway. In the case of outside gas lamps, the pipe shall be increased by an ordinary concentric enlarging fitting just inside of the point where it passes through the wall.

When the pipe is to extend through a window frame it shall be as large as practicable, and shall be increased in size immediately outside the frame.

Table 2.

Showing Capacity of Pipe of Different Diameters and Lengths in Cu. Ft. per Hour with Pressure Drop of 0.3 in. and Specific Gravity 0.60.

Length of Pipe	Diameter of Pipe in Inches									
Feet	½	¾	1	1¼	1½	2	3	4	6	8
15	76	218	440	750	1220	2480	6500	13880	38700	79000
30	55	155	320	535	850	1780	4700	9700	27370	55850
45	44	124	260	435	700	1475	3900	7900	23350	45600
60	38	119	226	380	610	1290	3450	6800	19330	39500
75		97	200	345	545	1120	3000	6000	17310	35300
90		88	180	310	490	1000	2700	5500	15800	32250
105		80	168	285	450	920	2450	5100	14620	29850
120			158	270	420	860	2300	4800	13680	27920
150			140	242	380	780	2090	4350	12240	25000
180			128	225	350	720	1950	4000	11160	22800
210				205	320	660	1780	3700	10330	21100
240				190	300	620	1680	3490	9600	19740
270				178	285	580	1580	3250	9000	18610
300				170	270	545	1490	3000	8500	17660
450				140	226	450	1230	2500	7000	14420
600				119	192	390	1030	2130	6000	12480

28. Piping to Overhanging Rooms.

Where there are overhanging kitchens or other rooms, built beyond foundation walls, in which gas appliances are installed, care shall be taken to avoid placing the piping supplying these appliances in the open where it will be exposed to extreme changes of temperature. In all such cases the piping shall be brought up inside the building proper and run around the sides of the rooms in the most practical manner.

29. Supporting Pipe.

(a) Piping Not Under Strain. Piping shall be installed so that it is subjected to no unnecessary strain. Where ceiling fixtures are hung from drops, the outlet fittings shall be securely and rigidly fastened. (See Rule 27 (c).) Piping shall not be laid to support any weight (except fixtures) or be subjected to any extra strain.

(b) Number of Supports. The following is the maximum spacing of supports which shall be used in continuous piping installations:

⅜ inch or ½ inch pipe .....6 feet
¾ inch or 1 inch pipe .....8 feet
1¼ inch or larger (Horizontal) .....10 feet
1¼ inch or larger (Vertical) .....every floor level

When the length of pipe is shorter than that given in the above table, it shall be adequately supported.

Wherever there is a change of direction of 45° or more or a branched fitting is used, support shall be provided on at least one side of the bend or fitting, preferably within 6 inches of this point, unless other supports render this unnecessary.

(c) Fastening Pipe. Only such metal pipe straps, iron hooks, hook plates, or hangers suitable for the size of pipe to be secured, and of standard strength and quality, shall be used for supporting piping.

Pipe straps or iron hooks shall not be used for fastening pipe of a size

over 2 inches. Beyond this size, when the pipe is horizontal and is to be fastened to the floor joists or beams, pipe hangers shall be used; when the pipe is horizontal and is to be fastened to the wall, hook plates shall be used. In the case of a vertical pipe over 2 inches in size, a strap made of band iron fashioned on the job, or a standard form of prepared band strap securely fastened to the wall shall be employed.

(d) SECURING PIPE TO WOOD WALLS, PARTITIONS, OR CEILING. When piping is run on wood walls, partitions, or ceilings, the supports should be securely screwed (not nailed) to the woodwork at the intervals given in (b). When the piping does not run sufficiently close to the woodwork to admit of its being fastened directly thereto, wood strips spaced at the distances given in (b) should be securely fastened to the woodwork as above described.

(e) SECURING PIPE TO CONCRETE, MASONRY, BRICK OR TILE WALLS, PARTITIONS, OR CEILINGS. When piping is run on masonry, concrete, brick or tile walls, etc., it shall be rigidly fastened by hooks, metal straps, or pipe hangers which are securely held to the wall, partition or ceiling by the use of suitable expansion bolts or other approved device, spaced at the distances given in (b). If this method is not practicable, the hooks, metal straps, or pipe hangers should be fastened by screws to plugs or blocks, which shall be firmly embedded in the masonry, or to wood strips securely fastened to the masonry.

(f) Pipes shall not be fastened to walls of chimneys or flues.

30. Protection Against Strains.

(a) ENCLOSED BY CEMENT, ETC. Where piping is enclosed by or embedded in cement, concrete, or other structural material, not reinforced, it shall be so placed as to avoid the strains which may be induced by settling or cracking of the structure.

(b) PASSING THROUGH WALLS. Where piping (not including the service pipe, which is always to be made gas and watertight through the foundation wall) passes through concrete, masonry, brick, or tile walls, it shall be encased, with the pipe resting on the bottom of the casing pipe to provide at least ½-inch clearance above it. The space above the pipe shall be packed with mineral wool or other incombustible material to afford a fire stop, but care shall be taken to avoid packing above the pipe in such a way that settling of the wall will produce excessive strain.

(c) BASEMENT PIPING. Pipe shall not be run in coal bins or in other parts of a basement where wood, lumber, or other material is likely to be stored against it or to subject it to strain. Pipe which is run in a cellar shall be hung from the ceiling and not supported on the walls.

31. Cutting Timbers.

When, in running pipe, it is necessary to cross wood joists or beams, they shall be notched as little as possible, but never to a depth of more than one-fifth of the depth of the timber. This notching shall be as close as possible to a point of support of the timber, and shall in no case be further from a support than one-sixth of the total unsupported span of the timber. Where feasible, the piping shall be run so that only timbers having the shortest spans shall be cut.

32. Piping to be Graded.

All piping shall be graded, preferably not less than ¼ inch in 15 feet to prevent traps and also to prevent level runs as far as practicable. All horizontal lines shall drain to risers and from the risers to the meter unless

the structure is so framed as to prevent this; but this rule does not permit violation of Rule 31 on cutting timbers.

33. Safeguarding Trapped Piping.

(a) If no practicable method for avoiding a trap in piping is found, a tee with a proper length nipple and cap shall be provided at the lowest point on the trapped portion to facilitate removal of any condensed liquid.

(b) Such drips shall be installed only in such locations that the outlet of the drip will be readily accessible to permit cleaning or emptying. The size of any drip used should be determined by the capacity and the exposure of the piping which drains to it.

34. Drip to be Provided.

(a) Where condensation in house piping is excessive, a drip should be provided at the outlet of the meter.

(b) Drips shall be installed only in such locations that the outlet of the drip will be readily accessible to permit cleaning or emptying. Drips should not be located where the condensation is likely to freeze.

35. Branches.

All branches should be taken from the top or side of horizontal piping. When ceiling outlets are taken from horizontal piping the branch shall be taken from the side of the piping and carried in a horizontal direction, preferably not less than 6 inches.

36.

When practicable piping to each outlet shall be run as a riser rather than as a drop.

37. Fitting at Lower End of Vertical Supply Line.

The lower end of a vertical supply line, if accessible, shall be equipped with a tee (or cross) having a full-sized, plugged opening looking down to permit access for removing stoppages.

38. Painting or Covering.

(a) Piping exposed on the outside of buildings or in a damp location shall be carefully cleaned after installation and painted with two coats of a pure red lead paint or covered with other material equally effective in preventing corrosion of the metal. Additional coats of paint shall be applied as often as necessary to prevent rusting.

NOTE: Pipe should not be coated or painted until after the first inspection.

(b) PAINTING AND PROTECTING BEFORE AND AFTER TEST. Piping shall not be concealed from view, painted, coated, or covered in any manner until it has passed the inspection described in Rule 14 (a) (1) and (2).

During the interval between the installation of the piping and its final closing in, particularly between the tests described in Rule 14 (a) (2) and (3), the gas fitter shall take every precaution to properly protect the piping from injury.

39. Relation to Electric Wiring.

Piping should not be installed closer than 5 inches to any electric wiring which carries current at more than 25 volts above ground, unless such wiring is enclosed in a proper metal conduit or armored cable, or where

not enclosed is separated from the pipe by some continuous and firmly fixed non-conductor; and no piping shall be run closer than 3 feet to any electric cut-out box, fuse box, or meter.

Whenever gas piping is run near or in contact with the conduit or metallic cable covering for wires carrying current of more than 25 volts above ground, the piping shall be placed in substantial permanent electrical contact with some conduit or cable covering.

All grounding, wiring and piping which affects electrical installations shall be in accordance with the National Electrical Code and the National Electrical Safety Code.

40. Lines Supplying Pilots for Oil Burners.

Lines supplying pilots for oil burning appliances shall be of not less than ½-inch standard pipe size and shall not be run below the burner or in any place exposed to extreme temperatures.

41. Supply Lines for Gas Engines or Other Large Appliances.

The pipe to supply gas to a gas engine or other appliance of large consumption or high momentary demand shall, in every case, be carried back far enough independent of other piping, or other provision be made, to ensure that the pressure at the other appliances is not disturbed by the operation of this appliance.

(a) Every gas piping system shall be of adequate size and so designed as to give as nearly equal distribution as possible.

(b) Piping and connections shall be run as directly as possible.

(c) A gas bag, if used to supply high momentary demand and maintain constant pressure, shall be enclosed in a substantial gas-tight metal drum of approved construction, vented to the outer air through a pipe used for no other purpose, and the outer end have a protected turned-down fitting to prevent clogging.

(d) When not otherwise provided for, the regulator shall be arranged with an automatic gas shut-off to prevent the flow of gas into the room in case the engine shuts down from any cause.

42. Cocks and Valves.

(a) Valves Operated from Outside of Building. All service pipes 2 inches in diameter and over shall be equipped with a gate valve for shutting off the gas, located outside the building. All new service pipes under 2 inches, except those for residence buildings intended for not more than two families and having not over 15 sleeping rooms shall have an outside cock or valve shut-off.

Shut-off cocks and valves shall be placed in suitable stop or valve boxes, manholes or vaults, the covers of which shall bear the name of the company to which it belongs and the valves if necessary tagged to properly identify their purpose.

(b) Separate Shut-off Required. Separate valves or cocks are required on every supply line or branch if the operation or maintenance of the appliance supplied requires that gas be shut off from the line or branch from time to time, unless gas can be otherwise shut off when necessary with equal safety and convenience. Such separate valves or cocks shall be provided on any branch or supply line which is 2 inches or more in diameter, or which is rated to supply more than 200 cubic feet of gas per

hour, or which supplies an appliance used for heating flammable materials or materials which give off combustible vapors or gases.

NOTE: It is recommended that special valves or cocks be installed on any pipe which supplies gas to six or more separate appliances of a similar nature, such as pressing irons; at the inlet of any secondary meter; and in multiple burner installations the nature of which makes master control advisable.

The requirements of paragraph (b) are not to be construed as recommending an additional shut-off on the supply pipe to a single appliance if one is already installed as required under paragraph (a). In each installation special consideration should be given to the location for the shut-off. The desired end is the placing of a master shut-off at every point where safety and convenience of operation and maintenance demand.

(c) LOCATION OF LINE COCKS. Cocks or valves required under paragraphs (a) and (b) shall be placed near enough to the appliance controlled and in such location as to be readily accessible at all times, and the handle of the cock or valve shall be easy to reach and to operate.

When a cock is placed on an independent supply line to cut off gas from that line, no branch shall be taken from this supply line between the meter and the cock. This precaution ensures that the line cock will control the gas to the whole line. If a branch is taken off between the meter, and the cock, this new branch shall be controlled by a separate shut-off.

On circulating systems of piping care should be taken to provide cocks to cut off the supply from both directions wherever this may be necessary.

43. Prohibited Fittings.

(a) Unions shall not be used on concealed piping. When necessary to reconnect piping, the connection should be made with a right and left coupling or with a running thread with suitable lock-nut.

(b) The use of bushings is not recommended. When necessary to connect two sizes of pipe, a reducing fitting is preferable, but a hexagonal head bushing may be employed if necessary.

(c) Swing joints on concealed house piping which are made by the use of combination of fittings shall not be used.

NOTE: This rule is intended to forbid the use of combination of fittings where useful only to produce flexibility and therefore for convenience in connecting up piping. This necessity can be avoided by cutting accurately to length and careful threading, which is essential to good workmanship. The use of fittings for necessary offsets is not forbidden.

44. Size of Outlets.

(a) MINIMUM SIZE. When an outlet is placed on a supply pipe before it is known what size of pipe will be connected to it, the outlet shall be of the same size as the line which supplies it, or, if other lines are also supplied through the same fitting, at least as large as the smallest of the other lines supplied.

(b) SIZE OF OUTLETS FOR PUBLIC BUILDINGS AND DISPLAY WINDOWS. Ceiling outlets in churches, stores, theaters, or other places of assembly, or in rooms where ceilings are 20 feet in height or over, or in display or show windows, should not be less than ½ inch.

45. Location of Outlets.

(a) Outlets for gas appliances such as ranges or space heaters must not be less than three inches above the floor and two inches in the clear from the baseboard.

(b) OBJECTIONABLE LOCATIONS FOR OUTLETS. Outlets shall not be placed back of swinging doors or close to the window or door frames, or any other place where good practice forbids.

46. Ceiling and Wall Bracket Outlets.

(a) Outlets on concealed piping should project beyond the finished wall or ceiling (or in a suitable recess in the case of recessed fittings), so that all of the threads required by Rule 23 (c) are clear and available for use and there is sufficient wrench space on the unthreaded portion of the pipe; and the pipe shall be run far enough from floor and walls to permit the use of a suitable size wrench without straining or bending the pipe.

When the type of appliance to be secured to the drop requires a longer projection than stated above, this fact shall be shown on the plans and allowance be made for such equipment at the time of the installation of the piping.

Where combination fixtures or recessed baseboard fittings are used, the threads on the piping shall be clear of the back plate of the outlet box.

(b) OUTLET FITTINGS. Outlets on concealed piping for drops and brackets, and such short outlets as can not give the wrench space described in paragraph (a) shall be made by the use of drop ells or by fittings which provide the means for rigidly securing them in place.

47. Secure Outlets from Concealed Pipe.

All outlets shall be set plumb and securely fastened, each one having at least two straps, and they shall be left capped until appliances are connected.

48. Fastening Outlets.

In every case outlets shall be so installed that they can not become displaced in the wall or ceiling. When an outlet is to be placed between joists, beams or studs, the outlet fitting shall be secured to a strut fastened between the joists or studs, in order to prevent the fixture from swinging and straining the joint.

49. Closing Outlets.

Each outlet shall be securely closed gas-tight with a threaded iron plug or cap immediately after installation, and shall be left so closed until an appliance is installed thereon. In no case shall the outlet be closed with lead caps or plugs.

When an appliance is removed from an outlet, and the outlet is not to be used again immediately, it shall be securely closed gas-tight with a threaded iron plug or cap.

APPLIANCES.

50. Only Approved Appliances to be Used.

No appliance and no device, attachment or accessory to any appliance which can in any way affect combustion or safety shall be installed unless it has been approved within the meaning of the definition of the term given in these regulations. Provisions are made by the National Board of Fire Underwriters and the American Gas Association for the testing and approval of appliances of the more common and important types. When, because of the novel or unusual character of an appliance or device no provision has been made for its testing and approval by these or other officially recognized agencies, the approval of the proper administrative authority shall be secured before such an appliance or device shall be used.

51. Attachments.

(a) No device or attachment shall be installed on any appliance which may in any way impair the combustion of the gas.

(b) Any combination of appliances, attachments or devices used together in any manner shall meet the requirements which apply to individual appliances.

52.

No devices employing or depending upon an electrical current shall be used to control or ignite a gas supply if of such a character that failure of the electrical current could result in the escape of unburned gas or in failure to reduce the supply of gas under conditions which would normally result in its reduction.

53. Supporting Appliances.

Appliances shall be adequately supported and so connected to the piping as not to exert undue strain on the connection.

54. Ventilation.

No appliance shall be installed in a room in which the facilities for ventilation do not permit the proper combustion of gas under normal conditions of use.

55. Convenience of Shut-off During Lighting.

A gas cock or shut-off shall be easily accessible and within convenient reaching distance when lighting the burner.

56. Air Under Pressure.

When air or oxygen under pressure is used in connection with any gas supply, effective means shall be provided to prevent the air or oxygen from going back into the gas piping.

57.

(a) The location of gas lighting fixtures shall be such as not to constitute a fire hazard to persons or property. All such fixtures less than five feet from plastered ceilings or overhead woodwork or closer than five inches from plastered walls or woodwork shall be protected by shields.

(b) No swinging or folding gas bracket shall be used.

(c) Gas-consuming appliances shall be arranged so that their continued operation will not raise the temperature of surrounding combustible material, including woodwork, more than 90° F. from a normal temperature of 70° F.; that is, a maximum of 160° F.

(d) Appliances are in nearly all cases designed and approved for placing at least six inches from any combustible material including a lath and plaster wall. This distance should be maintained if possible; when it is not possible to maintain this distance the combustible material shall be adequately protected.

58.

Every appliance shall be located so that it will be readily accessible for operation and adjustment.

59.

Appliances with closed bases in which no provision is made for the circulation of air below the burner boxes shall not be placed directly on combustible floors, and suitable insulation shall be provided.

60. Connection of Appliances with Flexible Tubing.

(a) Only appliances which are necessarily portable or which have to be moved from place to place may be connected with flexible tubing. On such appliances the shut-off shall be in the solid connection or piping only, and not at the appliance end of the tubing.

(b) Only approved tubing of proper design and good quality shall be used, and it shall be securely attached to each end.

(c) The key of the shut-off on an independent connection shall not be within 6 inches of the key of any other shut-off. In such an installation the keys should be in directions perpendicular to each other so that the possibility of the accidental turning on of the gas at the wrong shut-off will be lessened.

(d) A shut-off should not be placed close to the floor or in other position where it may be turned on by accident.

(e) A wall outlet to which an appliance is to be connected with flexible tubing shall be so placed as to reduce to a minimum the passing to and fro across the tubing. Where flexible tubing is used, it shall be of the minimum practicable length.

(f) Where an appliance, such as a gas iron for industrial work, is always used in the same location, but its operation demands a flexible connection, the flexible tube shall be permanently attached at the supply end by a threaded or other secure metal connection, and the appliance end shall be provided with a secure metal joint, which can be conveniently made and separated, in preference to a rubber slip end.

(g) Where the tubing is likely to be subjected to excessive temperatures, either through accident or because of the special nature of the appliance, only tubing properly protected or made up of incombustible material shall be used.

61. Independent Gas Piping.

A domestic appliance which is automatically controlled and equipped with a quick-acting valve and which has a demand rating greater than 50,000 B.T.U. per hour shall be supplied by an independent fuel line from the meter to the appliance.

62.

Every appliance shall be properly adjusted after being installed, and the customer shall be instructed as to its safe operation. When purging an appliance having burners inclosed in a space wherein gas may collect, the air shall be drawn, in so far as possible, from an opening outside the enclosure, such as the end of the manifold.

63. Ranges, etc.

(a) Ranges, water heaters, space heaters, clothes dryers, incinerators, wall heaters, etc., shall not be installed in rooms where the facilities for ventilation do not permit proper combustion of the gas, under normal conditions of use.

(b) When installed they shall be set level and so located as to permit ready accessibility of parts for repair, adjustment, or inspection.

(c) Appliances of this character shall be designed with a heat deflector or burner tray to prevent incandescent particles of dust, carbon, etc., from falling on to the floor and igniting combustible material.

(d) In buildings supplied by a master meter or where meters are not readily accessible an individual control cock should be placed at each appliance.

64.

(a) Water heaters shall not be installed in bathrooms, bedrooms, or any occupied rooms normally kept closed.

(b) RELIEF FOR OVERHEATED WATER. No water heating appliance shall be installed in a closed system of water piping, unless a water pressure relief valve is provided.

65. Gas Fired Boilers and Furnaces and Conversion Burners for House Heating.

(a) GENERAL.

(1) These regulations are intended for application only to low pressure heating systems. Such systems shall be defined as those wherein the pressure does not exceed 15 pounds.

(2) No gas fired boilers or furnaces for heating a building or buildings shall be installed and no boiler or furnace designed for other fuels shall be converted to the use of gas fuel unless the following regulations are complied with.

(3) Either a thermostatic pilot light, so constructed and adjusted that no gas can flow through the main burner unless the pilot light is burning, or some other similar type of safety device serving this same end shall be employed. The operation of the safety device shall not depend on the closing of an electric circuit to shut off the main gas supply.

(4) The boiler or furnace shall be equipped with safety devices arranged to shut off the main burners in case of high steam pressure or low water (or high temperature) for steam or vacuum vapor boilers, or high air temperatures for warm air furnaces. A steam or vacuum vapor boiler equipped with a high temperature limiting device need not be equipped with high pressure or low water cut off. These devices shall not depend upon the closing of an electric circuit to shut off the main gas supply. This section shall not be understood to prohibit the use of electrical regulating devices provided safety devices meeting the above requirements are also installed.

(5) An approved gas pressure regulator of sufficient size shall be installed in the gas line leading to the appliance.

(6) All boilers or furnaces shall be connected to flues. The size of the flue and flue pipe shall be proportionate to the maximum rate of gas consumption, not less than 10 square inches in cross sectional area for each 50,000 B.T.U. of gas used per hour. All flue pipes shall be provided with a draft hood or down draft diverter of an approved type which shall have a cross sectional area at least equal to that of the flue pipe. No damper shall be installed in the flue pipe unless so arranged that the main gas valve will not open until the damper has opened and the damper will not close until the main gas valve has closed, in which case the damper and draft hood shall be so located and proportioned that they will not cause the formation of carbon monoxide even if the damper is closed while the gas is burning. Where dampers are an integral part of the heating plant, they shall be removed or permanently secured in the wide open position.

(b) FLUEWAYS AND CHIMNEY.

(1) Flueway and chimney construction shall conform to that recommended by the Building Code of the National Board of Fire Underwriters. Such flues and chimneys shall not be used to vent the products of combustion of any other appliance utilizing fuel other than gas.

(2) Care shall be exercised to prevent the flue pipe from entering the chimney so far as to unduly restrict the space between its end and the opposite wall of the chimney.

(c) DRAFT HOODS OR REGULATOR.

The draft hood or regulator shall be of a type that will insure the ready escape of the products of combustion by maintaining a draft sufficient for the burner for which it is designed, and prevent a back draft from interfering with the proper operation of the burner.

(d) INSTALLATION.

(1) Previous to the installation of a conversion burner, the ash pit door of the heating plant shall be permanently removed, or bottom ventilation otherwise provided to prevent the accumulation of gas within the ash pit unless the burner is of a type which mechanically purges the ash pit.

(2) When the ash pit door is closed it is recommended that the other doors of the heating appliance be hinged at the top to swing freely or to be otherwise arranged to relieve pressure due to puffs or backfire caused by delayed ignition.

(3) All heating surfaces and flue ways of the plant shall be gastight and shall be thoroughly cleaned of soot, carbon, and other foreign substances before the burner is installed. Where leaks are found in the walls of the combustion chamber heating surfaces, or flue ways, such defects shall be adequately repaired before the installation is completed.

(e) BURNERS.

(1) Conversion burners shall consist of factory assembled and tested units accompanied by complete and comprehensive installation and operation instructions that observe the foregoing and following features.

(2) The equipment shall incorporate acceptable provisions for adjustment, control, support and attachment to the heating plant or to the foundation on which it rests. It shall be so installed (and attached) as to prevent twisting, sliding, or dropping out of the intended correct position.

(3) Installation and assembly shall be such as to permit ready accessibility for inspection, repair, and replacement of parts.

(4) Each burner shall be installed with a properly designated manually operated shut-off valve in the main gas supply line to the burner. This valve shall be positioned at a point readily accessible for use and inspection.

(5) Burners should be supplied by an independent gas line direct from the meter.

66. Garage Heaters.

(a) Garage heaters for domestic use shall be of an approved type designed to prevent ignition of flammable vapors that may be present in the garage.

(b) Except in the case of a heater, the design and construction of which insure its safe lighting and operation in an explosive mixture of air and gasoline vapor, a minimum clearance of 2 feet shall be maintained between the floor and the burner of a heater in a garage.

67. Gas Engines.

(a) The exhaust pipe of a gas engine shall be run to the outside air, preferably above the roof.

(b) Each gas engine shall be equipped with an approved anti-fluctuating device installed as near the engine as practicable.

68. Flue Connections.

Every gas appliance should be connected to an effective flue if it is included in any of the following classifications:

(a) Any appliance used for domestic purposes which has a demand in excess of 50,000 B.T.U. per hour.

(b) Automatically controlled appliances which use more than 5,000 B.T.U. per hour. Automatically controlled appliances which use less than this amount shall be flue connected unless equipped with an effective device which, in the event that the constantly burning flame or pilot flame is extinguished, will automatically shut off the supply of gas to the main burner or burners.

(c) Appliances installed in the same room which have an aggregate demand at normal rating as great as 30 B.T.U. per hour per cubic foot of room content.

(d) Automatically controlled gas appliances which connect to flues of other fuel burning appliances shall be equipped with an effective device which, in the event that the constantly burning flame of pilot light is extinguished, will automatically shut off the gas supply to the main burner or burners.

NOTE 1. On account of its intermittent use, the domestic gas range is exempt from the provisions of this rule.

NOTE 2. For the purpose of this rule "automatically controlled appliances" shall not include appliances equipped with devices or controls governing the supply of gas to the main burner or burners which can not automatically reduce the supply below thirty per cent of the "maximum" demand.

(e) Every flue connected appliance except an incinerator, unless its construction serves the same purpose, shall be equipped with an approved and effective draft hood. In general the draft hood should be placed in a vertical position adjacent to the appliance.

(f) FLUE CONNECTION EFFECTIVE. Before making a flue connection, the chimney or flue should be examined to ascertain that it is properly constructed, clear, and will normally conduct the products of combustion to the outer air.

(g) SIZE. The vent pipe or connection should not be smaller than the size indicated by the vent collar of the appliance.

(h) LENGTH OF VENT PIPE. (a) The horizontal vent connection should be as short as possible and therefore the appliance should be located as near the chimney or flue as is practicable.

(i) AVOID BENDS. The vent pipe shall be so installed as to avoid sharp turns or other constructional features which would create excessive resistance to the flow of the gaseous products.

(j) PITCH. The vent pipe shall maintain a pitch or rise from the appliance to the flue or chimney. For long runs it is desirable to maintain a pitch or rise of at least ¼ inch to the foot.

(k) CHIMNEY ENTRANCE. In cutting the flue or chimney the connection should be above the extreme bottom to avoid stoppage by falling plaster. Where more than one vent pipe is connected to a chimney flue, the connection shall be at different levels. Means shall be employed which will prevent the vent pipe from entering so far as to restrict unduly the space between its end and the opposite wall of the flue.

(l) DAMPERS. No dampers shall be placed in any flue connection between the appliance and the draft hood. Dampers are to be avoided between the draft hood and the chimney.

(m) MATERIAL. The material used for the vent pipe should be such as to resist the corrosive action of flue gases and condensate particularly

where the vent pipe is long and the condensate will occur in this pipe rather than in the chimney flue.

Chimney flues shall be of corrosion resisting material, and the joints between different sections shall be tight, with the male, spigot, or crimped end pointing down.

Turning Gas On and Off.

69. Responsibility for Turning Gas On.

If the gas company will turn gas on at the meter cock, whenever this operation is necessary, a gas fitter not in the employ of the gas company shall not turn the gas on at such cock except with the specific permission of the gas company.

70. When Gas May Be Turned On.

(a) METER OR LINE COCK TO BE USED. A gas fitter who is not in the employ of the gas company shall not turn the gas on except at the meter cock or a line cock unless special permission is granted to him by the gas company. In general, only employees of the gas company should be permitted to turn on gas at a service cock or curb cock, or at any cock which controls the supply of gas to more than one customer.

(b) WHEN GAS FITTER SHALL NOT TURN GAS ON AT METER COCK. A gas fitter shall not turn the gas on at any meter cock without specific permission from the gas company or the proper administrative authority if any of the following conditions prevail:

1. If the piping, appliances, or meter supplied through the cock are known to leak or to be defective.

2. If the piping or appliances supplied are required to be inspected and have not been inspected as prescribed by Rules 38 to 44 inclusive.

3. If the proper administrative authority or the gas company has requested that the gas be left turned off.

4. If the meter cock is found shut off, unless the gas fitter has himself shut it off or knows that it was shut off by the customer to prevent leakage, and the cause of the leakage has been repaired by the gas fitter. If the gas is found turned off for other cause or for some reason not known to the gas fitter, then he shall secure permission from the gas company before turning on the gas.

(c) WHEN GAS FITTER SHALL NOT TURN GAS ON AT LINE COCK. A gas fitter shall not turn the gas on at any line cock if any of the conditions described in 1, 2 or 3 in paragraph (b) prevail. However, if a line cock is found closed, he may at the request of the customer again turn gas on at such cock, if proper precautions are taken to prevent leakage and if no unsafe conditions are thereby established.

(d) APPLIANCES NOT CONNECTED. Gas shall not be turned on at either a line cock or meter cock unless a gas-burning appliance is connected to the piping system supplied.

(e) GAS TO BE TURNED ON EACH NIGHT. A gas fitter when working on a piping system which supplies gas for domestic purposes or for lighting should, if possible, arrange his work so that the gas service can be restored each evening when he leaves work. Wherever gas is thus turned on for temporary use at night, every precaution indicated in Rule 34 shall be observed.

71. Procedure When Turning Gas On.

(a) GAS FITTER TO DO WORK HIMSELF. A gas fitter, when turning gas on, shall personally observe the precautions indicated; no helper or other person shall be directed or allowed to turn gas on unless his work is closely supervised by the gas fitter who shall be personally on the job at the time when the work is done.

(b) PRECAUTIONS TO BE OBSERVED. The precautions indicated shall be taken each and every time the gas is turned on, even though the gas has been shut off only for a few minutes and the same precautions have been taken only a few minutes previously. The two principal precautions to avoid leakage are checks on each other, and are not to be regarded as alternatives.

(c) PROCEDURE WHEN GAS IS TURNED ON. A gas fitter shall observe the following procedure when gas is turned on at any meter cock:

1. Before turning gas under pressure into any piping, the person in charge shall assure himself that there are no openings from which gas can escape.

2. The meter should next be turned on and the hand on the test dial (a small dial generally above the regular dials) carefully watched to ascertain that no gas is passing through the meter. To assist in observing any movement of the dial hand, it is customary to wet a small piece of paper and paste its edge directly over the center of the hand as soon as the gas is turned on.

3. If the test hand shows any movement all cocks, pilot burners, etc., supplied through the meter should be examined to see that they are turned off and do not leak. If these are found tight it will indicate that there is a leak in the house piping. The meter cock should then be turned off until the necessary repairs have been made, after which the above tests should be repeated.

4. If careful observation of the test hand for sufficient length of time reveals no movement, the piping should be purged and a small burner turned on and lighted and the hand of the test dial again observed. If this dial hand now moves (as it should) it will show that the meter is operating properly. If the test hand does not show a movement or register the flow of gas through the meter to the small burner, it is evident that the test for tightness could not have been performed properly. The gas should be turned off, the meter changed, and the tests prescribed in this section repeated.

5. Before leaving the premises all air must be drawn from piping and appliances and all pilot burners of incandescent lamps, automatic appliances, or gas range lighters, must be lighted and properly adjusted. When purging pipes supplying appliances which have burners enclosed in spaces wherein gas may collect, the air should be drawn, in so far as possible, from an opening outside of the enclosure, such as the end of the manifold.

72. Notice to Gas Company and Proper Administrative Authority.

(a) NOTICE TO GAS COMPANY OR PROPER ADMINISTRATIVE AUTHORITY IF GAS CANNOT BE TURNED ON. If for any reason a gas fitter cannot turn the gas on when he has completed his work on any piping system, or is forbidden by these rules to do so, he shall at once notify the gas company, and, when necessary, the proper administrative authority, of the conditions which prevent him from turning gas on. (See paragraph (b).)