

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

248 CMR 5.00: AMENDMENTS TO NFPA 54

Section

- 5.01: Modifications to Chapter 1, Administration
- 5.02: Modifications to Chapter 2, Referenced Publications
- 5.03: Modifications to Chapter 3, Definitions
- 5.04: Modifications to Chapter 4, General
- 5.05: Modifications to Chapter 5, Gas Piping System Design, Materials, and Components
- 5.06: Modifications to Chapter 6, Pipe Sizing
- 5.07: Modifications to Chapter 7, Gas Piping Installation
- 5.08: Modifications to Chapter 8, Inspections, Testing, and Purging
- 5.09: Modifications to Chapter 9, Appliance, Equipment, and Accessory Installation
- 5.10: Modifications to Chapter 10, Installation of Specific Equipment
- 5.11: Modifications to Chapter 11, Procedures to Be Followed to Place Appliance in Operation
- 5.12: Modifications to Chapter 12, Venting of Appliances

5.01: Modifications to Chapter 1, Administration

See 248 CMR 4.00: *Massachusetts Fuel Gas Code* for modifications to Chapter 1, Administration.

5.02: Modifications to Chapter 2, Referenced Publications

No modifications have been made to Chapter 2, Modifications.

5.03: Modifications to Chapter 3, Definitions

- (1) Replace subsection 3.2.2 with the following:

Authority Having Jurisdiction (AHJ). Inspector as defined in 248 CMR 3.02: *Definitions*, the Board, or such other authority approved by the Board.

- (2) Add to subsection 3.2.4 the following at the end of the subsection:

Listed equipment must meet product acceptance requirements in 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth*.

- (3) Delete subsection 3.3.85 Qualified Agency

- (4) Add to subsection 3.3.102 the following after the word "seal":

including pipe dope and pipe thread sealing tape (*e.g.* Teflon).

- (5) Add a new subsection 3.3.112 as follows:

3.3.112 Downstream. Outlet or discharge side of equipment, a fixture, an appurtenance, or other device from which gas, liquid, or other substances exit. This term may also be utilized to describe the direction in which a gas, liquid, or other substance is flowing.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

(6) Add a new subsection 3.3.113 as follows:

3.3.113 Upstream. Inlet or supply side of equipment, a fixture, an appurtenance, or other device into which gas, liquid, or other substances flow. This term may also be utilized to describe the direction from which a gas, liquid, or other substance has originated.

5.04: Modifications to Chapter 4, General

(1) Delete section 4.1 Qualified Agency

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.04: continued

(2) Revise subsection 4.2.1 as follows:

Replace the term "qualified agency" with "licensee"

(3) Add a new section 4.4 as follows:

4.4 Workmanship. Workmanship and installations shall:

- (a) comply with all applicable code requirements;
- (b) conform to generally accepted good mechanical work practice. Particular attention shall be applied to all gas piping and vent piping installations with regards to the alignment of said connections. All gas piping and vent piping arrangements shall be installed straight, level or plumb and be compliant with applicable grade or slope requirements;
- (c) The performance of gas-fitting work shall not impact the structural integrity of building components. *See 780 CMR: The Massachusetts State Building Code* for licensing and other requirements governing such issues; and
- (d) Gas equipment and appliances shall be installed in a manner so as not to prohibit the removal and replacement of other gas equipment and appliances.

5.05: Modifications to Chapter 5, Gas Piping System Design, Materials, and Components

(1) Delete sub-section 5.1.1 and replace with the following:

5.1.1 Installation of Piping Systems over Five Million BTU/hr. In addition to the permit requirements of 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth*, for gas installations of over 5,000,000 BTU/hr the following is required:

- (a) All piping systems over 5,000,000 BTU/hr shall be designed by a Massachusetts registered professional engineer. The design shall assure that the piping installation, including pipe sizing, dimension, and other aspects, meet the requirements for proper functioning, safety, and this code. The installer must submit drawings to the Inspector stamped by the engineer reflecting this design prior to being issued a permit. The installer shall also submit with the drawings a written statement from the serving gas supplier that it is able to provide fuel meeting the volume, pressure, and maximum gas demand required by the drawings as well as that required by any existing gas systems.
- (b) Once the installation is complete but prior to final inspection, the installer must provide the Inspector with a written certification by a Massachusetts registered professional engineer that the installation complies with the stamped drawings and specifications. The Inspector shall not be responsible for approving or inspecting design specifications, but must ensure the installation adheres to the provisions of 248 CMR 5.00.

(2) Add a new sub-section 5.1.3 as follows:

5.1.3 Dual Fuels Installed in Buildings and Structures. When Utility/Natural Gas and Undiluted Liquefied Petroleum Gas (Propane Gas) systems are installed within the same building or structure, the following additional conditions must be satisfied as well as those conditions required for each individual fuel system:

- (a) Written permission for the installation must be obtained by local fire officials and applicable utilities.
- (b) The natural gas and propane gas piping systems shall be labeled in the following

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

manner:

1. at a minimum of every ten feet;
2. at all changes of direction;
3. on each side of a penetration through a partition, wall or ceiling;
4. at every gas shut off valve;
5. for natural gas (color-coded yellow) and propane gas (color coded light green), the labels shall be;
 - a. black lettering indicating the type of gas within the piping system;
 - b. the letters shall be sized equal to a minimum of the pipe diameter. However, for piping with a diameter exceeding two inches, said lettering does not need to be larger than two inches.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.05: continued

(3) Add a new sub-section 5.4.2.3 as follows:

5.4.2.3 Diversity Factor for Domestic Ranges. Diversity factor is an important factor determining the correct gas piping size to be used for supplying domestic ranges in multiple family dwellings; it applies to domestic ranges only and shall not apply to any other gas appliances.

TABLE 5.4.2.3
Multi-family Dwellings
Diversity Factor in Percent of Total Load for
Domestic Gas Ranges with connected Load Ratings
of 63,000 Btu/hr. or more per Range

No. of Ranges	Demand cubic ft/hour	Percent of Ratings	No. of Ranges	Demand cubic ft/hour	Percent of Ratings
1	63	100	13	270	33
2	107	85	14	283	32
3	132	70	15	293	31
4	151	60	16	312	31
5	173	55	17	33	30
6	189	50	18	340	30
7	198	50	19	346	29
8	212	42	20	353	28
9	225	39	21	358	27
10	233	38	22	374	27
11	243	37	23	390	27
12	257	35	24 & Over	408	27

(4) Replace sub-section 5.5.1 with the following:

5.5.1 Maximum Design Operating Pressure.

- (a) General Rules. See 248 CMR 4.03(1)(b)
- (b) Elevated Pressure.

1. All elevated pressure systems shall be designed by a Massachusetts registered professional engineer. The design shall assure that the piping installation, including pipe sizing, dimension, and other aspects, meet the requirements for proper functioning, safety, and this code. The installer must submit drawings to the Inspector stamped by the engineer reflecting this design prior to being issued a permit. The installer shall also submit with the drawings a written statement from the serving gas supplier that it is able to provide fuel meeting the volume, pressure, and maximum gas demand required by the

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

drawings as well as that required by any existing gas systems. The provisions of this paragraph shall not be in effect until July 1, 2015. Prior to July 1, 2015, elevated pressure systems shall be subject to the special permission requirements of 248 CMR 3.04(3).

2. Once the installation is complete but prior to final inspection, the installer must provide the Inspector with a written certification by a Massachusetts registered professional engineer that the installation complies with the stamped drawings and specifications. The Inspector shall not be responsible for approving or inspecting design specifications, but must ensure the installation adheres to the provisions of 248 CMR 5.00.

3. When the maximum design operating pressure exceeds five PSIG, all piping shall be welded in accordance with subsection 5.6.2.2.1.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.05: continued

4. Elevated pressure piping shall be labeled in the following manner:
 - a. At a minimum of every ten feet;
 - b. At all changes of direction;
 - c. On each side of a penetration through a partition, wall or ceiling;
 - d. At every gas shutoff valve; and
 - e. The labels shall be yellow with black lettering that:
 - i. indicates the type of gas and the pressure contained within the piping system, and
 - ii. the letters shall be sized equal to a minimum of the pipe diameter. However, for piping with a diameter exceeding two inches, said lettering does not need to be larger than two inches; and
 - iii. for elevated dual fuel applications, labels for propane systems shall be color-coded light green.
 - f. Labeling shall not be required for elevated pressure piping that is between the first and second stage regulator in a liquefied petroleum gas installation.
5. Exceptions. The requirements of a professional engineer for elevated pressure installations shall not be required for:
 - a. installations of propane gas piping systems utilizing elevated pressure that are located between the first and second stage regulator when the second stage regulator is located on the exterior of a building; and
 - b. installations of gas piping between a meter and a regulator not installed/supplied by a gas company when the gas piping from the meter to the regulator does not exceed ten feet.

(5) Add a new sub-section 5.5.1.1 as follows:

5.5.1.1 Gas Pressure Boosters. Gas pressure boosters may be installed in that portion of the gas piping system extending from the outlet of the meter set assembly to the inlet of the equipment requiring elevated or increased pressure when the following conditions have been satisfied:

- (a) All gas pressure boosters must meet Product-acceptance requirements;
- (b) the serving gas supplier has provided written authorization;
- (c) If not part of the booster, the equipment served by the booster shall be equipped with a manual re-set low gas pressure switch and a check valve upstream of the booster. By-passes for pressure boosters shall include a manual shut off and a check valve;
- (d) A pressure regulator shall be provided to maintain a constant outlet pressure and be installed immediately downstream of the booster except when the pressure booster is equipped with an integral pressure regulator;
- (e) Gas pressure boosters shall be installed on a firm foundation or surface capable of supporting the imposed load, and the booster shall be kept free of vibration by the installation of vibration arrestors; and
- (f) Gas pressure boosters shall be located in well ventilated spaces and be readily accessible for examination, maintenance or replacement.

(6) Add a new sub-section 5.6.2.2.1 with the following:

5.6.2.2.1 Welding of Steel and Wrought Iron Pipe.

- (a) Welding shall not be construed as the practice of gas-fitting, however, a licensed plumber or gas fitter may not utilize welded pipes and fittings unless they conform to the

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

specifications cited in subsections 5.6.2.2 and A.5.5.1 (1).

(b) Gas piping systems with pressures under or equal to 70 P.S.I.G shall only be permitted to utilize welded pipes and fittings when:

1. The inspector has performed a visual inspection as to the quality of the weld; and
2. The test pressure used during an Inspection complies with the following:
 - a. Systems with a maximum operating pressure of ten P.S.I.G. or less, shall be tested to a minimum of three P.S.I.G. or ten times the operating pressure, whichever is greater.
 - b. Systems with an operating pressure greater than ten P.S.I.G. and less than or equal to 70 P.S.I.G. shall be tested at 100 P.S.I.G.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.05: continued

- c. The test duration shall be one hour for every 100 feet of pipe, or fraction thereof. The minimum test duration shall be one hour and the maximum test duration shall be 24 hours, irrespective of system design.
- (c) Gas piping systems with pressures over 70 P.S.I.G. may only utilize welded pipes and fittings when:
1. All welds are of full penetration; and
 2. The welds are subjected to the following tests:
 - a. All welds are subjected to a 100% X-ray or 100% Ultrasonic Examination (UT) test unless they are socket welded;
 - b. All socket welded type joints must be subjected to a magnetic particle test or other non-destructive test;
 - c. The gas piping system shall be pressure tested to a minimum of 1.25 times the gas piping systems working pressure. However, the test duration must be a minimum of one hour and the test must be witnessed by the Inspector; and,
 - d. Any testing company or field agent that provides a (UT) field examination must meet the requirements of 248 CMR 3.04(6). A copy of the testing certification shall be submitted to the Inspector.
 3. Repairs that are made to welded joints that fail the X-Ray or (UT) test shall be re-tested and re-certified. For future reference; the failed welded joint that is re-tested shall be identified by stenciling ½ inch high white lettering at the weld location the date of the re-test.
 4. The Inspector shall require an affidavit signed by the individual who performed the X-ray or (UT) examination for the testing agency. The affidavit shall state that all welds meet the requirements of the applicable specifications and tests.

(7) Add a new sub-section 5.6.2.7 as follows:

5.6.2.7 Galvanized. Galvanized pipe shall not be used.

(8) Replace sub-section 5.6.3.4 with the following:

5.6.3.4 Corrugated Stainless Steel.

- (a) CSST Fittings. All fittings and accessories used in the installation of CSST piping systems shall be approved by the CSST manufacturer for use with their system and shall only be installed by licensees who have completed manufacturer training/certification acceptable to the Board.
- (b) CSST Concealed Fittings.
 1. Where gas piping is to be concealed:
 - a. connections shall only be made with CSST fittings listed for use in concealed spaces; and
 - b. connections shall be produced by the manufacturer of the CSST piping system.
 2. Malleable fittings shall be permitted in concealed locations when used in combination with CSST fittings.
 3. For each malleable fitting there shall only be a single CSST connection.
- (c) Repairs to Concealed CSST Piping.
 1. Repairs required in a CSST system which is concealed, or otherwise not readily accessible, shall be repaired with a fitting listed for the CSST system being used.
 2. Installation of an access panel shall be required at the repair site.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

(d) Interior Meter Connections. Interior meter connections may be directly connected to the CSST system as long as the meter is securely affixed to the building, and the CSST is secured to the building structure when 24 inches or more of tubing is exposed.

(e) Exterior Meter Connections.

1. No CSST shall be connected to an exterior meter.
2. The tubing shall terminate at the foundation wall with a termination fitting, and the meter shall be rigidly connected with steel piping to the building structure.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.05: continued

- (f) Sleeved Gas CSST.
 - 1. CSST shall be sleeved when passing through a metal or concrete deck to protect the integrity of the tubing. Licensees should be aware that the tubing may be required to be fire stopped/rated per 780 CMR: *Massachusetts Amendments to the International Building Code 2009*. If applicable, this requirement will be regulated/ enforced by the Building Inspector, not the Inspector as defined in 248 CMR 3.01: *Definitions*.
 - 2. The sleeve shall be Schedule 40 black or galvanized pipe and shall extend a minimum six inches from the top of the finished floor and the underside of the deck.
- (g) Only manifolds for CSST systems supplied and listed by the CSST manufacturer may be concealed.
 - 1. Assembled manifolds shall be installed in an accessible location.
 - 2. Assembled manifold is a piping combination made up of close nipples and malleable tees.
- (h) Fireplace Log Installations.
 - 1. CSST shall terminate with a termination fitting at the entrance to the masonry fire box.
 - 2. The workmanship shall be performed and completed in such a manner so that the termination will not be exposed to any adverse effects.
- (i) Fixed Appliance Connection Using CSST. CSST may be directly connected to a fixed appliance when the following conditions are met.
 - 1. The tubing is securely attached to the building structure or other means of solid support.
 - 2. Tubing shall not run exposed for a distance greater than or equal to 30 inches without being physically attached to the building structure or other means of solid support.
 - 3. CSST terminates with a proper fitting and gas cock.
- (j) CSST Used Underground.
 - 1. When in contact with the earth or other material that could corrode the piping, the CSST shall be installed within a sleeve designed to withstand the superimposed loads.
 - 2. Except for pre-engineered sleeves that are Product-accepted by the Board, the sleeve shall allow free movement of the CSST.
 - 3. All sleeve ends shall be sealed liquid tight.
 - 4. An acceptable tape marking system shall be in place no more than six inches from the top of the grade indicating that a gas line is below.
 - 5. The minimum depth for buried gas piping as describe herein is 18 inches from the top of grade.
- (k) CSST Used as an Appliance Connection. CSST shall not be used as a flexible appliance connector downstream of the appliance shutoff device.
- (l) Sizing CSST Systems. CSST systems shall be sized and installed with a maximum 14 inch water column (0.5 P.S.I.G.) gas pressure.
- (m) CSST Installation and Modifications. Installation of CSST in the Commonwealth of Massachusetts shall be in strict compliance with the manufacturer's instructions and the Massachusetts State Plumbing and Gas Code 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth* through 7.00: *Large Gas Utilization Equipment*.
- (n) Testing Requirements for CSST Systems.
 - 1. Before any piping is covered, when CSST piping systems are installed in new construction or remodeling, the system shall be tested as part of the Inspection as prescribed under Section 7.1 as modified under 248 CMR 5.05.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

2. Before piping is connected to any appliance the licensed plumber or gas fitter shall do a second test of the system.
 3. A tag shall be:
 - a. affixed to the meter or service manifold acknowledging this test; and
 - b. signed and dated by the licensed plumber or gas fitter.
- (o) Liquid Leak Detector. No corrosive liquids shall be used in the testing of the CSST system. Some household soaps and detergents may be corrosive to gas and plumbing products.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.05: continued

(p) Exposed CSST Tubing. When CSST is installed outdoors or is subject to corrosive chemicals, exposed stainless CSST tubing (where the jacket has been removed) shall be recovered with tape as specified by the CSST manufacturer. Said re-covering of CSST shall occur following the testing.

(q) CSST Piping Installed on Roofs. CSST shall be installed for roof top equipment only when it is supported by one of the following methods:

1. The CSST tubing with a UV stabilized jacket is supported the full length of the CSST run.
 - a. The tubing shall be affixed to a wooden plank or a steel channel that is securely attached by an appropriate method every six feet to the roof structure.
 - b. The tubing shall be attached directly to the support every six feet.
2. The CSST tubing is installed within a metal or plastic conduit that is securely attached by an appropriate method every six feet to the roof structure. Where the piping system requires a tee to be installed within the line, the sleeve shall terminate no more than 12 inches from the tee on both runs and the branch line.
3. For CSST tubing having sizes of 1.5 and two inches and having a UV stabilized jacket, the following requirements shall be satisfied:
 - a. the CSST shall be supported on blocks which are spaced not more than 48 inches apart.
 - b. The blocks shall be constructed of materials appropriate for outdoor conditions and shall be securely attached by an appropriate method to the roof structure, and:
 - c. The method used to attach the CSST to the block shall not damage the plastic coating.
 - d. The maximum length of tubing not supported by any method listed shall not exceed 30 inches when connected to a gas fired roof top unit or similar gas equipment.

(9) Replace subsection 5.6.8.4(1) with the following:

Pipe and Fittings in excess of four inches in diameter shall be welded.

(10) Amend subsection 5.6.8.4(2) by deleting "or cast iron"

(11) Replace subsection 5.6.8.4(5) with the following:

Cast iron is only permitted for flanges, valves, strainers, and filters.

(12) Add a new subsection 5.6.8.5 as follows:

5.6.8.5 Other Fittings. Notwithstanding the provisions of this section, metallic piping joints and fittings which do not otherwise meet the requirements of this section may be utilized if approved by the Board or otherwise have met the product acceptance requirements of 248 CMR 3.04(1): *Board Required Product-acceptance*.

(13) Add a new subsection 5.7.6 as follows:

5.7.6 Limitation. The provisions of this section shall only apply to premises owned gas meters, which are comprised of a secondary meter and meter assembly installed on the downstream

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

portion of the gas piping system of a serving gas supplier's meter.

(14) Replace section 5.12 with the following:

5.12 Manual Shutoff Valves.

Acceptable Shutoff Devices: Gas Cocks and Ball Valves installed for use shall be listed. The Valves shall:

- (a) Have clearly indicated open and closed positions and rigidly secured stops to limit both extremes of rotation;

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.05: continued

- (b) shall be marked in a conspicuous place with the manufacturer's name or registered trademark; and
- (c) Where in contact with material or atmosphere exerting a corrosive action, a corrosion resistant handle shall be utilized.

5.06: Modifications to Chapter 6, Pipe Sizing

No modifications have been made to Chapter 6, Pipe Sizing.

5.07: Modifications to Chapter 7, Gas Piping Installation

(1) Replace section 7.1.6 with the following:

7.1.6 Piping Underground Beneath Buildings. When the installation of gas piping underground beneath buildings is unavoidable, the piping shall be encased in a vented conduit that is listed, certified by the manufacturer, or designed by a professional engineer to be capable of withstanding the imposed load and influences of the underground environment.

(a) Conduit Ventilation.

1. Conduit vents shall be sized no less than 50% of the conduit.
2. Conduit vents shall terminate at the exterior of the building or structure, be a minimum of four feet above finished grade, and shall be installed so as to prevent the entrance of water and insects.

(b) Undiluted Liquefied Petroleum Gas. Undiluted Liquefied Petroleum Gas shall not be conveyed in piping and through this type of conduit due to the characteristics and behavior properties of this gas.

(2) Add the following to the end of sub-section 7.2.5.4

Supports added for piping on rooftops must be installed in such a manner that they do not compromise the integrity of the roof. However, should the performance of gas-fitting work impact the structural integrity of roofing components, necessary corrective work falls outside the scope of this code. See 780 CMR: *Massachusetts Amendments to the International Building Code 2009* or 271 CMR: *Board of Examiners of Sheet Metal Workers*, if applicable, for licensing and other requirements for said work.

(3) Add a new sub-section 7.3.4.1 as follows:

7.3.4.1 CSST Tubing in Partitions. CSST installed vertically and horizontally in concealed wall spaces or partitions shall be protected in accordance with Table 7.3.4.1:

Table 7.3.4.1			
Protection of CSST Tubing Installed in Concealed Wall Spaces and Partitions			
Tubing Orientation and Location	Insulation Type	Tubing Size less than one inch	Tubing Size equal to or greater than one inch

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

Vertical Wall	None	<ol style="list-style-type: none">1. Single runs only.2. Tubing not secured to structure.3. CSST manufacturer specified strike plates at points of penetration.4. CSST Strike plates on both sides of wall.	Same as CSST less than one inch with CSST manufacturer specified shielding device along entire length in concealed space.
---------------	------	--	---

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.07: continued

Table 7.3.4.1 (continued) Protection of CSST Tubing Installed in Concealed Wall Spaces and Partitions			
Tubing Orientation and Location	Insulation Type	Tubing Size less than one inch	Tubing Size equal to or greater than one inch
Vertical Wall	Non-rigid	1. Single runs only. 2. Tubing not secured to structure. 3. Tubing installed between insulation and wall board. 4. CSST manufacturer specified strike plates at points of penetration	
Vertical Wall	Rigid	Schedule 40 pipe or CSST manufacturer specified shielding device along entire length and at points of penetration.	
Horizontal Wall	N/A	CSST manufacturer specified shielding device along length between studs and strike plates at points of penetration on both sides of wall.	Same as CSST less than one inch with CSST manufacturer specified shielding device along entire length in concealed space.

(4) Replace sub-section 7.9.2.4 with the following:

7.9.2.4 Emergency and Other Shutoff Valves for Laboratories. Each laboratory room or space containing a gas outlet installed on tables, benches, or in hoods in educational, research, commercial, and industrial occupancies shall have an emergency shutoff valve through which all gas outlets are supplied. The emergency shutoff valve must be in a readily accessible space adjacent to the laboratory's egress door and identified as such. Additional non-emergency shutoff valves shall be provided in an accessible location for each individual table, bench, or hood equipped with gas outlets.

(5) Delete sub-section 7.13.2 and replace with the following:

7.13.2 CSST. CSST systems shall be bonded in accordance with subsection 7.13.1 unless such bonding would be in conflict with manufacturer installation instructions. However, to the extent the manufacturer's installation instructions require additional bonding which falls within the scope of electrical licensure, this code shall not govern such requirements. In such instances, the installation may not be approved by a plumbing or gas inspector unless there is proof that an electrical permit has been obtained to perform such bonding.

5.08: Modifications to Chapter 8, Inspections, Testing and Purging

(1) Delete sub-section 8.1.1* and replace with the following:

8.1.1* General.

(a) Inspection of a new or rough gas piping system: Inspections shall conform to the requirements of 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing*

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

and Gas Fitting Work Performed in the Commonwealth in addition to the following:

1. Unless an emergency exists, gas shall not be turned on and gas piping systems shall not be placed into service until the following conditions have been satisfied:
 - a. The gas piping system shall be tested in the presence of the Inspector and approved to insure that it meets the requirements of 248 CMR; and
 - b. Where any part of the gas piping system is to be enclosed or concealed, the testing shall be conducted prior to the covering of any portion of the gas piping system.
2. Gas piping systems that extend from the outlet of the service meter assembly to the closed shutoff valve at each appliance shall satisfy the following:

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.08: continued

- a. withstand a pressure test of not less than six inches of mercury or three PSIG for a period of not less than ten minutes without showing any drop in pressure;
 - b. the pressure shall be measured with a mercury manometer, slope gauge or an equivalent device so calibrated as to read in increments of not less more than 0.1 PSIG; and
 - c. Where new branches are installed to an existing gas piping system, the newly installed branch(es) shall be required to be tested in compliance with this section so long as the newly installed branch(es) can be isolated from existing branch(es). Connections between the new piping and the existing piping shall be tested with a noncorrosive leak-detecting fluid or leak detecting methods as authorized by this code.
3. Gas piping systems in excess of one million BTU input shall be tested at a pressure not less than ten times the proposed maximum working pressure of the gas system and:
- a. the test duration shall be not less than one hour per 100 linear feet of piping or a fraction thereof: and:
 - b. The maximum test duration shall not exceed a 24 hour time period irrespective of the piping system design, and:
 - c. The maximum test pressure shall not exceed 100 PSIG.
4. For undiluted liquefied petroleum gas systems, all piping located upstream of the second stage regulator shall:
- a. be tested to a pressure not less than one and one half times the maximum operating pressure of said piping system; and
 - b. the pressure shall be measured with a device so calibrated as to read in increments of not greater than one tenth PSIG.
- (b) Inspection of the Final Gas Piping System.
1. After the test of the rough gas piping system, the gas piping system may be turned on and the appliance may be tested at normal operating pressure by means of:
 - a. a non-corrosive leak detection fluid; or
 - b. a properly calibrated electronic leak detector.
 2. Following the successful testing and approval of a gas piping system, the inspector shall attach a permanent tag in a conspicuous place. The tag shall indicate that the gas piping system has been tested and approved.
- (c) Minor repairs and additions are not required to be pressure tested, provided that the work is inspected and connections are tested with a non-corrosive leak detection fluid, a properly calibrated electronic leak detector or other method acceptable to the inspector.

(2) Delete sub-section 8.1.4.

(3) Delete sub-section 8.1.5.2.

(4) Delete sub-section 8.1.5.3 and replace with the following:

8.1.5.3 Defective or Damaged Piping. Whenever there is reason to believe the gas piping system of a building or structure is defective or damaged, it shall be subject to a test and inspection, and any defects or life safety hazards found shall be corrected as required and documented in writing to the inspector.

(5) Delete sub-section 8.2.1.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

(6) Delete sub-section 8.2.3* and replace with the following:

8.2.3* Leak Check. Immediately after the gas is turned on to a new or old gas piping system that has been tested, inspected and approved, the connected appliances shall:

- (a) be checked for leakage and proper operation, and:
- (b) where leakage or defective appliances or equipment are encountered, the gas supply to the appliance or equipment shall be shut off until the necessary repairs have been made.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.09: Modifications to Chapter 9, Appliance, Equipment, and Accessory Installation

(1) Delete sub-section 9.1.1* and replace it with the following:

9.1.1* Appliances, Equipment, and Accessories to be Approved.

Board Required Product Acceptance. Only products and materials that meet the product acceptance requirements of 248 CMR 3.04(1): *Board Required Product-acceptance* may be utilized in gas fitting work in Massachusetts unless the Board has waived the necessity for product acceptance per 248 CMR 3.04(1)(h).

(2) Delete sub-section 9.1.1.1.

(3) Delete sub-section 9.1.1.3 and replace with the following:

9.1.1.3 Unlisted Appliances, Equipment, and Accessories. Acceptance of unlisted gas appliances, equipment, and accessories shall require a variance by the Board.

(4) Delete sub-section 9.1.1.4.

(5) Add a new sub-section 9.1.19.1 as follows:

9.1.19.1 Vent Lines.

- (a) Vent lines shall be steel, wrought iron pipe, or corrugated stainless steel tubing (CSST). Vents shall be:
 - 1. sized as specified in this section; and
 - 2. run to the outside of the building or structure using the shortest practical route and shall not be trapped or installed in a manner that restricts air flow.
- (b) Vent Lines shall be supported in accordance with subsection 7.2.5.
- (c) Vent lines that terminate outside a building or structure shall be located no less than:
 - 1. four feet away from any building opening or air intake; and
 - 2. ten feet away from forced air intakes.
- (d) Vent lines that penetrate roofs and sidewalls shall be run through metallic sleeves that are sealed from the weather and insects, and:
 - 1. extend no less than 18 inches above a roof surface when penetrating the roof or;
 - 2. terminate through the sidewall to a safe location.
- (e) CSST vent lines shall not penetrate roofs or sidewalls and shall transition to steel, wrought iron pipe no less than one foot inside the building or structure.
- (f) Appliance pressure regulators shall not be connected to a common manifold.

TABLE 9.1.19.1
Minimum Schedule 40 Pipe Size/CSST for
Venting of Gas Components

Gas Components	Maximum lengths of iron pipe or corrugated stainless steel tubing (CSST) from components to outside the building		
	0 - 40 feet	0 - 100 feet	0 - 200 Feet

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

Main Gas Pressure Regulator - Steel Pipe Size - CSST Size (Low Pressure Gas only)	¾ inch IPS 30/31 EHD	1 inch IPS 37 EHD	1¼ inch IPS 46/48 EHD
High & Low Gas Pressure Switches When Manifolded - Steel Pipe Size - CSST Size (Low Pressure Gas only)	¾ inch IPS 30/31 EHD	1 inch IPS 37 EHD	1½ inch IPS 60/62 EHD

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.09: continued

TABLE 9.1.19.1 (continued)
Minimum Schedule 40 Pipe Size/CSST for
Venting of Gas Components

Gas Components	Maximum lengths of iron pipe or corrugated stainless steel tubing (CSST) from components to outside the building		
	0 - 40 feet	0 - 100 feet	0 - 200 Feet
Block and Bleed Valves (when used) - Steel Pipe Size - CSST Size (Low Pressure Gas only)	Full IPS Relief	Increase IPS/CSST one Size	Increase IPS/CSST two Sizes

(6) Delete sub-section 9.1.22 and replace with the following:

9.1.22 Installation Instructions.

- (a) The licensee shall conform to the equipment manufacturer's specific requirements in completing an installation unless those requirements conflict with or are less stringent than this code.
- (b) The licensee shall also leave the manufacturer's installation, operating, and maintenance instructions in a location at the premises where they will be readily available for reference and guidance.
- (c) When required by the Inspector, a copy of the manufacturer's installation, operating, and maintenance instructions shall be provided within two working days prior to calling for a final inspection.

(7) Delete sub-section 9.1.23 and replace with the following:

9.1.23 Carbon Monoxide Protection. No installation or replacement of a vented gas appliance shall be permitted unless a battery powered or electrically hard wired carbon monoxide detector is present on the same floor as the appliance or on the next adjacent floor when the appliance is located in a crawl space unless the appliance is located in a detached, uninhabitable garage. For all residential dwellings, a carbon monoxide detector must also be present on each habitable level of the dwelling. These requirements shall not be deemed to waive any additional requirements imposed by M.G.L. c. 148 § 26F½.

(8) Amend sub-section 9.2.1 by inserting the following at the end of the subsection:

Sufficient clearance must also be provided to allow the total replacement of the appliance or equipment.

(9) Add a new sub-section 9.6.1.4 as follows:

9.6.1.4 General Requirements for Connectors.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

- (a) The maximum length of a connector shall not exceed 48 inches, however, this restriction shall not apply to connectors utilized for a gas appliance subject to the provisions of sub-section 9.6.1(4) or sub-section 9.6.1.1.
- (b) A connector shall not be used for gas pressure in excess of 0.5 PSIG (14" water column).
- (c) A connector shall not be re-used except when used for disconnecting and reconnecting the original gas equipment or appliance for servicing.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.09: continued

(10) Add a new sub-section 9.6.3.5 as follows:

9.6.3.5 Flexible gas hoses used to connect portable and mobile industrial appliances shall not exceed a length of 20 feet.

(11) Amend sub-section 9.6.8 by inserting the following at the end of the subsection:

Such piping shall also be installed in a manner not to interfere with the total replacement of the appliance or equipment.

5.10: Modifications to Chapter 10, Installation of Specific Equipment

(1) Delete sub-section 10.1.2 and replace with the following:

10.1.2 Installation in a Bedroom or Bathroom. Gas utilization equipment shall not be installed so its combustion, ventilation, or dilution air is obtained from a bedroom or bathroom:

EXCEPTION: Type 1 clothes dryers may be installed in bathrooms when the air for combustion and ventilation is introduced to the space in accordance with the following:

- (a) A single air intake shall be installed and the minimum size of the single air intake shall be equal to the size of the exhaust vent area of the dryer, and;
- (b) The air for combustion shall not be obtained from a bedroom or bathroom, and;
- (c) The air for combustion shall be obtained from a space that is sized in compliance with Section 9.3, and;
- (d) The dryer is installed in compliance with Section 10.4.

(2) Delete sub-section 10.2.5.

(3) Delete sub-section 10.3.2.7.

(4) Delete sub-section 10.3.2.8.

(5) Delete sub-section 10.3.2.9.

(6) Delete sub-section 10.3.5 and replace with the following:

10.3.5 Safety Control. Each steam and hot water boiler shall be equipped with a control which will prevent firing of the boiler in the event of insufficient water in the boiler.

(7) Delete sub-section 10.3.7.1.

(8) Delete sub-section 10.3.7.2.

(9) Delete sub-section 10.3.7.3.

(10) Delete sub-section 10.3.8.

(11) Delete sub-section 10.3.9.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

(12) Delete sub-section 10.6.1 and replace with the following:

10.6.1 Prohibited Installations.

- (a) Decorative appliances that are designed for installation in vented fireplaces when installed in bedrooms or bathrooms shall be Direct Vent Appliances as defined in sub-section 3.3.6.3.
- (b) When decorative appliances are installed in vented fireplaces other than bedrooms and bathrooms, the flue damper shall be removed or welded in a fully open position.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.10: continued

(13) Delete sub-section 10.7.1 and replace with the following:

10.7.1 Prohibited Installations. Vented gas fireplaces installed in bedrooms or bathrooms shall be Direct Vent Appliances as defined in sub-section 3.3.6.3.

(14) Add a new sub-section 10.8.2.3 as follows:

Direct Gas-fired Industrial Air Heaters may not be utilized unless the manufacturer has specified that there is no more than 50 P.P.M. of Carbon Monoxide in the total volume of air discharged from the unit.

(15) Add a new sub-section 10.9.2.3 as follows:

Direct Gas-fired Industrial Air Heaters may not be utilized unless the manufacturer has specified that there is no more than 50 P.P.M. of Carbon Monoxide in the total volume of air discharged from the unit.

(16) Delete sub-section 10.12.2 and replace it with the following:

10.12.2 Prohibited Appliances. The following equipment shall be prohibited:

- (a) gas range ovens, broilers, or top burners for space heating purposes;
- (b) gas ranges with match-lit ovens;
- (c) any commercial cooking range without a listed oven safety pilot; and
- (d) appliances not in compliance with the statutory requirements of M.G.L. c. 148, § 25E.

(17) Add a new sub-section 10.12.9 as follows:

10.12.9 Gas Valves Installed for Fire Protection/Suppression Systems.

- (a) All gas valves shall be mechanical type with manual reset and shall be installed in close proximity to the cooking equipment and shall shut off the gas supply to the equipment served by the hood and duct system protected by the extinguisher/suppression system.
- (b) A permanent notice shall be posted at the reset device and gas meter or propane regulator cautioning the operator to shut off the gas to all appliances before resetting the device.
- (c) Actuation of the gas valve shall be made in the presence of the Inspector at the time of the gas piping tests.

(18) Delete sub-section 10.13.3.

(19) Delete sub-section 10.13.4.

(20) Delete sub-section 10.14.2.

(21) Delete sub-section 10.15.1.1(4).

(22) Delete sub-section 10.16.2.

(23) Delete sub-section 10.18.2(2).

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

- (24) Delete sub-section 10.19.2.
- (25) Delete sub-section 10.20.2.
- (26) Delete sub-section 10.21.2(3).
- (27) Delete sub-section 10.21.3.1.
- (28) Delete sub-section 10.21.4.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.10: continued

(29) Delete sub-section 10.23.1* and replace with the following:

10.23.1* Prohibited Installations.

- (a) Room heaters shall not be installed in bathrooms, bedrooms, or other sleeping quarters unless permitted by M.G.L. c. 148, § 25A and 527 CMR 30.04: *Installation*.
- (b) Exception: Notwithstanding sub-section 10.23.1*(a), room heaters may be utilized which are direct vented as defined in sub-section 3.3.6.3.

(30) Replace sub-section 10.23.2 with the following:

10.23.2 Unvented Room Heaters.

- (a) Unvented room heaters shall be installed in accordance with M.G.L. c. 148, § 25A and 527 CMR 30.00: *Unvented Propane or Natural Gas-fired Space Heaters*.
- (b) With regards to the installation of unvented room heaters, in the event of a conflict between 248 CMR 5.00 and M.G.L. c. 148, §25A and 527 CMR 30.00: *Unvented Propane or Natural Gas-fired Space Heaters*, the provisions of M.G.L. c. 148, § 25A and 527 CMR 30.00: *Unvented Propane or Natural Gas-fired Space Heaters* shall prevail.
- (c) In addition to complying with the permit requirements of 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth*, a permit shall be obtained from the head of the fire department.
- (d) A final inspection by the Inspector shall not be performed until proof is provided that the head of the fire department having jurisdiction has granted a permit.
- (e) Installations shall be of a permanent type, with a permanently piped fuel supply. LPG appliances shall be subject to the storage requirements in accordance with 527 CMR 6.00: *Liquefied Petroleum Gas Containers and Systems*.
- (f) Unvented room heaters shall not exceed a maximum of 40,000 BTU input per room or space.
- (g) At least one listed carbon monoxide detector, that is installed in accordance with the manufacturer's instructions, shall be installed and maintained in the same room where the heater is located, or otherwise in the location specified by the manufacturer's instructions.
- (h) Unvented room heaters may not be the primary source of heat for any room or building.

(31) Delete sub-section 10.23.3.

(32) Delete sub-section 10.23.4 and replace with the following:

10.23.4 Clearance. A room heater shall be placed so as not to cause a hazard to walls, floors, curtains, furniture, doors when open, and so on, and to the free movements of persons within the room. Heaters designed and marked "For use in noncombustible fireplace only" shall not be installed elsewhere. Only listed room heaters shall be installed and must be installed in accordance with the manufacturer's installation instructions. In no case shall the clearances be such as to interfere with combustion air and accessibility.

(33) Add a new-subsection 10.24.2 as follows:

10.24.2 Stationary Gas Engines Used for Life/Safety. When a dedicated gas fuel line is installed for a stationary gas engine used for life/safety purposes, it shall be installed immediately downstream of the meter assembly or shut off valve (if no meter is provided) and shall meet the

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

following requirements:

- (a) The fuel line for the stationary gas engine and the fuel line for the remaining appliances shall have shut off valves installed immediately downstream of the meter assembly to enable each line to operate independently;
- (b) When pressure regulators are installed, they shall enable each fuel line to operate independently and not adversely affect the gas pressure of the other fuel line, and:
- (c) The fuel line for the stationary gas engine shall be labeled at each shutoff valve with the following:

WARNING: Gas Used for Life/Safety, Avoid Shutting Off Gas Unless Necessary

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.10: continued

- (34) Delete sub-section 10.26.2.1(2).
- (35) Delete sub-section 10.26.2.2(3).
- (36) Delete sub-section 10.28.2.2.
- (37) Delete sub-section 10.28.3.
- (38) Delete sub-section 10.28.4.
- (39) Delete sub-section 10.28.5.
- (40) Delete sub-section 10.32.2 and replace with the following:

Listed outdoor open flame decorative appliances do not require any product acceptance under 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth.*

- (41) Add a new section 10.33 as follows:

10.33 Gas-fired Kilns. Gas Fired Kilns must meet product acceptance requirements in 248 CMR 3.00: *General Provisions Governing the Conduct of Plumbing and Gas Fitting Work Performed in the Commonwealth.*

5.11: Modifications to Chapter 11, Procedures to Be Followed to Place Appliance in Operation

No modifications have been made to Chapter 11, Procedures to Be Followed to Place Appliance in Operation.

5.12: Modifications to Chapter 12, Venting of Appliances

- (1) Delete sub-section 12.4.4.2 and replace with the following:

12.4.4.2 Venting Via a Damper or With a Power Means of Exhaust. Where gas appliances or equipment are vented through a ventilating or exhaust system equipped with a damper or with a power means of exhaust, provisions shall be made to allow the flow of gas to the main burners only when the damper is open to a position to properly vent the appliance or equipment when the power means of exhaust is in operation. All gas lines serving such appliances or equipment shall be equipped with a solenoid valve which meets the following criteria:

- (a) The solenoid valve may not be bypassed.
- (b) The solenoid valve must be equipped with or connected to a manual reset device controlled by one of the following options:
 - 1. at least one audible hard wired carbon monoxide detector listed for the environment in which the appliance or equipment is being installed. This carbon monoxide detector must be interlocked with the solenoid valve such that it will close the solenoid valve if an unsafe level of carbon monoxide is reached in the room or the detector becomes defective.
 - 2. a draft proving switch which allows the solenoid valve to be open only when:

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

- a. the equipped damper is 100% open; or,
- b. the power means of exhaust is fully operational.
- (c) Notwithstanding the provisions of subsection 1.3 (Retroactivity), installers of replacement appliances or equipment used in connection with ventilating hoods or exhaust systems must ensure that the gas line(s) serving the replaced appliances or equipment meet the requirements of subsection 12.4.4.2.

(2) Delete sub-section 12.5.2 and replace with the following:

Plastic Piping. Plastic piping may only be used for venting appliances when explicitly allowed by the appliance manufacturer's installation instructions.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.12: continued

(3) Replace sub-section 12.6.4.2, Exception with the following:

Exception: Chimneys which are tile lined or existing chimneys which do not meet the requirements of sub-section 12.6.4.2 may be utilized with the replacement or installation of a gas appliance, including a gas appliance replacing an oil appliance, when the following requirements are met:

- (a) The existing appliance must have operated with a non-positive vent static pressure that did not create condensation in the chimney.
- (b) Existing chimneys may not be utilized when replacing an atmospheric appliance with a fan assisted appliance; and
- (c) An existing chimney may only be utilized with one or multiple gas appliances if the interior area of the chimney is no greater than seven times the area of the smallest flue to be connected to that chimney.

(4) Add a new sub-section 12.7.6.1 as follows:

12.7.6.1 Marking of Schedule 40 PVC and Other Non-metallic Piping. Schedule 40 PVC and other non-metallic piping used for ventilation, make-up, or combustion air intake shall be labeled as follows:

- (a) Throughout the entire developed length:
 1. Labels must be placed every ten feet for exposed/visible piping; or
 2. Labels must be placed every three feet for concealed piping.
- (b) At all changes of direction;
- (c) On each side of a penetration through a partition, wall or ceiling; and
- (d) The labels shall be black lettering that:
 1. indicates that the piping is used for ventilation, make-up, or combustion air intake, and
 2. the letters shall be sized equal to a minimum of the pipe diameter. However, for piping with a diameter exceeding two inches, said lettering does not need to be larger than two inches.

(5) Delete the last sentence of sub-section 12.9.4.

(6) Add a new subsection 12.9.7 as follows:

12.9.7 Signage. Whenever any through-the-wall vent is installed less than seven feet above the finished grade, a metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight feet above grade directly in line with the exhaust vent terminal. The sign shall read, in print size no less than 0.5 inches in size, "**GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS**".

(7) Add a new sub-section 12.9.8 as follows:

12.9.8 Vent Termination or Intake. A side wall horizontal exhaust vent termination or intake for gas fueled equipment installed in every dwelling, building or structure shall be located no less than three feet from a gas meter. When manufacturer's installation instructions reference snow lines or levels in establishing a minimum height for the installation of an exhaust vent termination or intake, snow lines or levels shall be determined as follows:

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

- (a) from the manufacturer installation requirements when those requirements are specific as to the source and method for the calculation of snow lines/levels;
- (b) when the installation instructions are not specific as to how snow lines/levels are calculated, the city or town may, by ordinance, designate how snow lines/levels are calculated in that location; or
- (c) In the absence of specific manufacturer instructions or ordinances, snow lines/levels shall be calculated from the average monthly maximum depth of snow accumulation as indicated by the National Weather Service's ten year statistics for the installation location/geographical area.

248 CMR: BOARD OF STATE EXAMINERS
OF PLUMBERS AND GAS FITTERS

5.12: continued

(8) Delete section 12.10.

(9) Delete sub-section 12.11.6 and replace with the following:

12.11.6 Joints. Joints between sections of connector piping and connections to flue collars or draft hood outlets shall be fastened in accordance with one of the following methods:

- (a) The fastening of single wall metal piping shall utilize no less than three corrosion resistant fastening devices to secure each joint;
- (b) Vent connectors of listed vent material assembled and connected to flue collars or draft hood outlets in accordance with the manufacturers' instructions; or
- (c) Other approved means.

REGULATORY AUTHORITY

248 CMR 5.00: M.G.L. c. 112, § 61; c. 142, §§ 13 and 21.