

CHAPTER 1346
DEPARTMENT OF ADMINISTRATION
MINNESOTA STATE BUILDING CODE
UNIFORM MECHANICAL CODE

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1346.0050 TITLE; INCORPORATION BY REFERENCE.

This chapter is known and may be cited as the "Minnesota State Mechanical Code " As used in this chapter, "the code" and "this code" refer to this chapter

Chapters 1 to 20 and appendixes A, B, and C of the 1991 edition of the Uniform Mechanical Code, promulgated by the International Conference of Building Officials, 5360 South Workman Mill Road, Whittier, California 90601 and the International Association of Plumbing and Mechanical Officials, 20001 South Walnut Drive, Walnut, California 91789, are incorporated by reference as part of the Minnesota State Mechanical Code with the amendments in this chapter. As used in this chapter, "UMC" means the Uniform Mechanical Code incorporated in this part

The UMC is not subject to frequent change and a copy of the UMC, with amendments for use in Minnesota, is available in the office of the commissioner of administration

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.0108 SECTION 108.

UMC Section 108 is amended by adding a section to read as follows

Section 108(a) Balancing Means must be provided to balance air and water systems in accordance with this section

(b) Air system balancing Air systems must be balanced Fan speed must be adjusted to meet design air system flow.

EXCEPTION Speed adjustment is not required for air system balancing with fan motors of one horsepower or less

(c) Hydromc system balancing Hydronic systems must be balanced. Pump impellers must be trimmed or pump speed must be adjusted to meet design system flow

EXCEPTION Impeller trimming or speed adjustment is not required for hydronic system balancing with pump motors of five horsepower or less

(d) Systems balancing reports Systems balancing reports must be submitted to the building official upon request.

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.0201 [Repealed, 19 SR 1306]**1346.0302 SECTION 302.**

UMC Section 302(b), the first paragraph, is amended to read as follows

(b) Plans and specifications Plans, engineering calculations, diagrams, and other data shall be submitted in one or more sets with each application for a permit. The building official may require that the plans or other data be prepared in accordance with the rules of the Board of Architecture, Engineering, Land Surveying, Landscape Architecture, and Interior Design, chapter 1800 and Minnesota Statutes, sections 326.02 to 326.15, and other state laws relating to plan and specification preparation by occupational licensees

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.0403 [Repealed, 19 SR 1306]

1346.0406 SECTION 406.

UMC Section 406 is amended by adding the following definition

“Dual fuel burner” means a gas burner firing into the same combustion chamber zone into which another fuel is used and connected to an approved flue.

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.0411 SECTION 411.

UMC Section 411 is amended by adding the following definitions.

“Interlock” means a device that senses a limit or off-limit condition or improper sequence of events, shuts down the offending or related piece of equipment, and prevents proceeding in an improper sequence to prevent a hazardous condition from developing

“Intermittent pilot” means a pilot that burns during light-off and while the main burner is firing and that is shut off with the main burner.

“Interrupted pilot” means a pilot that burns during light-off and that is shut off during normal operation of the main burner

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.0424 SECTION 424.

UMC Section 424 is amended by adding the following definition:

“Ventilation” means the process of supplying or removing air by natural or mechanical means to or from any space. The air may or may not have been conditioned.

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.0706 [Repealed, 19 SR 1306]

1346.0707 SECTION 707.

UMC Section 707(c) is added to read as follows:

(c) Garage Heating Warm air supply ducts must not be installed for the purpose of heating attached private garages from any forced air system serving habitable areas

Statutory Authority: *MS s 16B.61*

History: *19 SR 1306*

1346.0710 SECTION 710.

UMC Section 710(h) is amended to read as follows.

(h) Access

1 Every furnace installed in or on an exterior wall of a building that is designed so that the burners or controls must be serviced from the outside of the building must be accessible

2 Mechanical equipment installed on the roof of a building must be provided with access as required in chapter 1300.

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.0808 SECTION 808.

UMC Section 808 is amended by adding a section to read as follows:

Section 808 Duct furnaces Installation of duct furnaces must comply with the requirements of NFPA 54–1992.

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.0809 SECTION 809.

UMC Section 809 is amended by adding a section to read as follows

Section 809 Infrared heaters Installation of infrared heaters must comply with the requirements of NFPA 54–1992.

NOTE: Mechanical exhaust must be provided in the quantity recommended by the manufacturer and be sufficient to prevent condensation in the space to be heated. Heaters must be installed so they will not operate until the exhaust air quantity has been proved. Makeup air must be provided to the space to be heated.

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.0906 [Repealed, 19 SR 1306]

1346.0913 SECTION 913.

UMC Section 913(b), the first two paragraphs, are amended to read as follows

(b) Gas venting into masonry chimneys. Lined and unlined masonry chimneys may be used to vent gas appliances, provided

1 Except when serving a gas log appliance for installation in a vented fireplace, an approved liner must be installed in a masonry chimney when the combined input is less than 400,000 Btu/h or when considered necessary by the building official considering local problems of vent gas condensate. The liner must comply with one of the following

A. aluminum 2S–H14, 1/2 hard, thickness .032 inches to eight inches diameter, temperatures not to exceed 550 degrees Fahrenheit at outlet of equipment,

B. stainless steel No. 302, No. 26 U.S. Standard gauge to eight inches diameter, No. 24 U.S. Standard gauge to eight inches diameter,

C. vitreous coated steel of No. 22 U.S. Standard gauge before coating;

D. class “B” vents approved by Underwriters Laboratories, or other approval and listing agencies, temperatures not to exceed 550 degrees Fahrenheit at outlet of appliance; or

E. other types of liners as approved by the building official.

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.1002 SECTION 1002.

UMC Section 1002(a), the fifth paragraph, is amended to read as follows

Exhaust ducts under positive pressure must not extend into or pass through ducts or plenums

UMC Section 1002(g) is added to read as follows

(g) Volume dampers. Volume dampers must be provided for all ducts. The dampers must be set according to air measurements of the system and be locked in place. In finished or inaccessible locations, a friction-type register box may be used

UMC Section 1002(h) is added to read as follows:

(h) Elbows, transitions, and obstructions.

1 Elbows. Radius elbows with velocities exceeding 1,000 FPM shall have an inside radius not less than the width of the duct or have turning vanes. Square throat elbows with velocities exceeding 1,000 FPM shall have turning vanes.

EXCEPTION. Ducts serving a dwelling unit need not comply

2 Transition fittings. Transition fittings shall be constructed with a maximum slope of 45 degrees

3 Obstructions Where a pipe or other obstruction passes through a duct, a streamlined sleeve must be constructed equal in type and gauge to the duct The area of the duct, at the point of such obstruction, must be increased by an amount equal to the area of the streamlined sleeve.

Statutory Authority: *MS s 16B.61*

History: *19 SR 1306*

1346.1004 SECTION 1004.

UMC Section 1004(a), the second paragraph, is amended to read as follows.

Metal ducts must be installed with at least four inches separation from earth Metal ducts when installed in or under concrete slab must comply with each of the following

- 1 Ducts must be completely coated with asphalt or bituminous coating
- 2 Ducts must be encased in at least two inches of concrete
- 3 A vapor barrier of polyethylene at least four mill thickness or equal must be installed around the underground duct

UMC Section 1004(d), is amended by adding a third paragraph to read as follows

Duct system supports may be used for the support of other materials and equipment only when the duct support systems have been specifically engineered for the total load

UMC Section 1004(e) is added to read as follows

(e) Underground duct installation Ducts must slope back to the plenum or a collection point Access openings must be provided for inspection and cleaning at each low point of the system

Underground ducts must not be installed unless means are provided to collect and drain surface and underground water by the installation of a drainage system around the perimeter of the space served by the underground duct system The drainage system must be designed to prevent water from entering the duct system When drain tile is installed, the top of the drain tile must be installed at an elevation lower than the bottom of the underground duct

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.1005 SECTION 1005.

UMC Section 1005 is amended to read as follows

Insulation and Sealing of Ducts

UMC Section 1005(a) Insulation Ducts must be insulated in accordance with the following table

Minimum Required Duct Insulation
(see table notes for letter interpretations)

Duct Location	Cooling only or heating and cooling	Heating only
Exterior of building, attics, garages, and ventilated crawl spaces	C, V, and W	C and W
Inside of building and in unconditioned spaces ¹ TD less than or equal to 15°F	None required	None required
TD greater than 15°F and less than or equal to 40°F	A and V	A
TD greater than 40°F	B and V	B

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Within conditioned space or in basements with insulated walls	None required	None required
Intake and exhaust ducts ²	A and V	A
Within cement slab or within ground	B	B

NOTES

¹Duct insulation is not required at the following locations

(a) ceilings which form plenums, and

(b) for that portion of the duct which is located within a wall or a floor-ceiling space with conditioned space on both sides

²Exhaust ducts within a heated space must be insulated for a distance of three feet from the duct outlet

A = A material with installed minimum thermal resistance of R-3.3 Examples.

1 5-inch, 0.60 lb/cu ft mineral fiber, slag, or fiberglass blankets,
one-inch, 1.5 to 3.0 lb/cu ft mineral fiber blanket duct liner,
one-inch, 3.0 to 10.0 lb/cu ft mineral fiber board.

B = A material with installed minimum thermal resistance of R-5.0 Insulation encased in cement or within ground must be approved for that application and be installed on the bottom and sides of ducts and plenums Examples

2 5-inch, 0.60 lb/cu ft mineral fiber, slag, or fiberglass blankets,
1 5-inch, 1.5 to 3.0 lb/cu ft mineral fiber blanket duct liner,
1 5-inch, 3.0 to 10.0 lb/cu ft mineral fiber board,
one-inch, 1.35 lb/cu ft extruded polystyrene board

C = A material with installed minimum thermal resistance of R-8.0 Examples

four-inch, 0.60 lb/cu ft mineral fiber, slag, or fiberglass blankets,
two-inch, 1.5 to 3.0 lb/cu ft mineral fiber blanket duct liner,
two-inch, three to ten lb/cu ft mineral fiber board

The example of materials listed under each type is not meant to limit other available thickness or density combinations with the equivalent installed resistance based on the insulation only

V = Vapor retarder with all joints sealed

W = Approved weatherproof barrier

TD = the design temperature differential between the air in the duct and the ambient temperature outside of the duct

(b) Sealing Ducts must be sealed in accordance with this subsection Pressure sensitive tape must not be used as the primary sealant for ducts designed to operate at static pressure of one inch water gauge or greater In accordance with the Uniform Mechanical Code, section 706(e), adopted by chapter 1346, return air ducts conducting air into a furnace through the same space as the furnace must be continuously airtight

	Minimum Required Sealing	
Location	Design Static Pressure	Sealing Required
All locations	Greater than three inches water gauge	Joints, seams, and all wall penetrations must be sealed Ductwork must be less than or equal to Class 6 as defined in section 4 of the HVAC Duct Leakage Test Manual*

Outside conditioned space	3 0 inches water gauge and less	All transverse joints and longitudinal seams must be sealed
All locations except ducts within return, relief, or exhaust plenums	3 0 to greater than 0.25 inches water gauge	All transverse joints must be sealed
Ducts within return, relief, or exhaust plenums	3.0 to 0 25 inches water gauge inclusive	All transverse joints must be sealed

*Leakage testing may be limited to representative sections of the duct system, but in no case shall such tested sections include less than 25 percent of the total installed duct area for the design pressure class

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.1104 SECTION 1104.

UMC Section 1104, the fourth paragraph, is amended to read as follows

Bathroom and laundry room exhaust ducts may be of gypsum wallboard subject to the limitations of Section 1002(a), including part 1346.1002 Exhaust ducts under positive pressure must not extend into or through ducts or plenums

Statutory Authority: *MS s 16B.61*

History: *19 SR 1306*

1346.1107 SECTION 1107.

UMC Section 1107(b), exception 3, is amended to read as follows

3. Ducts used in central vacuum-cleaning systems within a dwelling unit may be of PVC pipe Penetrations of fire walls, floor-ceiling, or roof-ceiling assemblies must comply with Sections 4304 and 4305 of the Building Code Copper or ferrous pipes or conduits extending from within the separation between a garage and dwelling unit to the central vacuuming unit may be used.

UMC Section 1107(c), exception 2, is amended to read as follows

2. Ducts used in central vacuuming systems within a dwelling unit may be constructed of PVC pipe Penetrations of fire-resistive walls, floor-ceiling, or roof-ceilings assemblies must comply with Sections 4304 and 4305 of the Building Code. Copper or ferrous pipes or conduit extending from within the separation between a garage and dwelling unit to the central vacuum unit may be used.

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.1207 SECTION 1207.

UMC Section 1207 is added to read as follows

Section 1207. Air supply. Cooling system supply ducts must not be installed for the purpose of cooling attached private garages from any forced air system serving habitable areas.

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.1503 SECTION 1503.

UMC Section 1503(c) is amended by adding the following

(c) Alternative Refrigerants The following refrigerants may be used in air-conditioning and refrigeration equipment as substitutes for the refrigerants listed in Section 1503(a).

Ethane, 2,2-Dichloro-CHC₁2CF₃
1,1-Trifluoro (Refrigerant 123)

Ethane, 1,1,1,2-CH₂FCF₃
Tetrafluoro (Refrigerant 134a)

Limitations.

With direct systems the quantity must be limited to the amount noted in pounds per 1,000 cubic feet of room volume

R123	R134a
0 004	16.0

With indirect systems, detectors and machinery room alarms must be provided as noted.

R123	R134a
Compound specific refrigerant detector, alarm at the allowable exposure limit (AEL) of 10 ppm	Oxygen monitor, alarm below 19.5 percent

The above refrigerants must be installed in a refrigeration machinery room as required by Section 1505 for systems greater than 100 horsepower

Construction and ventilation requirements must comply with Sections 1507 and 1508 and other applicable provisions of this chapter

In addition, at least one self-contained breathing apparatus must be provided for each refrigeration machinery room containing these refrigerants

If a purge system is provided for the above refrigerants, it must be discharged to the outside of the building in the same manner as relief devices specified in Section 1517

Statutory Authority: *MS s 16B.61*

History: *19 SR 1306*

1346.1505 SECTION 1505.

UMC Section 1505(a), the first paragraph, is amended to read as follows:

Condensing units and compressors or combinations of refrigerant interconnected condensing unit and compressors totaling 100 or more horsepower rating which contain a Group 1 refrigerant must be enclosed in a refrigeration machinery room

Statutory Authority: *MS s 16B.61*

History: *19 SR 1306*

1346.1520 TABLE NO. 15-D.

UMC Table No 15-D, is amended by adding the following:

	HIGH-PRESSURE TEST	LOW-PRESSURE TEST
Refrigerant Ethane, 2,2-Dichloro-1 1, 1-Trifluoro (Refrigerant 123)	30	30
Ethane, 1,1,1,2-Tetrafluoro (Refrigerant 134a)	235	140

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.1521 SECTION 1521.

UMC Chapter 15 is amended by adding a section to read as follows.

GAS AIR CONDITIONERS

Section 1521. The installation of gas-fired air conditioners must comply with the requirements of NFPA 54-1992 Section 6.2

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.1906 SECTION 1906.

UMC Chapter 19 is amended by adding a section to read as follows

WATER HEATERS

Section 1906 Water heaters which depend on the combustion of fuel for heat shall not be installed in a room used or designed to be used for sleeping purposes, bathroom, clothes closets, or in a closet or other confined space opening into a bathroom or bedroom

EXCEPTION Direct vent water heaters

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.2002 SECTION 2002.

UMC Section 2002(a)1, the third paragraph, is amended to read as follows

Joints, seams, and penetrations shall be made with a continuous liquid-tight weld or braze made on the external surface of the duct system. A vibration isolation connector may be used, provided it consists of noncombustible packing in a metal sleeve joint of approved design

Statutory Authority: *MS s 16B.61*

History: *19 SR 1306*

1346.2003 SECTION 2003.

UMC Section 2003(g)4, the first paragraph, is amended to read as follows

4 Type I hoods where the cooking equipment includes low-temperature appliances such as medium-to-low temperature ranges, roasters, roasting ovens, pastry ovens, and equipment approved for use under a Type II hood

UMC Section 2003(i) is amended to read as follows

(i) Makeup air Each room provided with an exhaust system must have air supplied to the room equal to the amount of air to be exhausted. Makeup diffusers must be located to prevent a short circuiting of air furnished to the exhaust system. Windows and doors must not be used for the purpose of providing makeup air. The exhaust and makeup air systems must be connected by an electrical interlocking switch. Exhaust systems must be provided with tempered makeup air. Tempered air is air of a temperature not less than 55 degrees Fahrenheit, measured at the flow of air from the discharge diffuser into the room. Compensating hoods must meet the airflow requirements in Section 2003(g), 2, 3, and 4. Compensating hoods must extract at least 80 percent of their required exhaust airflow from the kitchen area

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.2104 SECTION 2104.

UMC Appendix B, Section 2104, the first paragraph, is amended to read as follows:

Section 2104 The definitions in this section apply to this chapter, unless a word's context clearly indicates a different meaning. For additional definitions, see Chapter 4 of this code

UMC Appendix B, Section 2104, is amended by adding the following definition

"Piping system" means the method of conveying liquid, vapor, steam, gases, or slurry from one point to another for purposes of this code, including accessories, appurtenances, and equipment necessary for proper operation

UMC Appendix B, Section 2104, definitions of "package boiler" and "pressure vessel (unfired)," are amended to read as follows

“Package boiler” means a boiler equipped and shipped complete with electrical heating elements or fuel burning equipment, automatic controls and accessories, and mechanical draft equipment, if used.

“Pressure vessel” means an unfired, closed container for liquids, gases, or vapors subjected to pressures exceeding 15 pounds per square inch, or steam and hot water under any pressure

UMC Appendix B, Section 2104, is amended by deleting the definitions of “low-pressure hot-water-heating boiler,” “power hot-water boiler (high-temperature water boiler),” and “steam heating boiler”

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.2107 SECTION 2107.

UMC Appendix B, Section 2107(a), (b), and (c) are amended to read as follows

Section 2107 (a) General A hot water heating system must be provided with an air expansion tank securely fastened to the structure. Supports must be adequate to carry twice the weight of the tank filled with water without placing any strain on connecting piping. Hot water heating systems incorporating hot water tanks or fluid relief columns must be installed to prevent freezing under normal operating conditions

EXCEPTION Small expansion tanks installed consistent with manufacturer’s recommendations may be supported by the piping if so designed

(b) Systems with open expansion tank Systems equipped with an open expansion tank to satisfy thermal expansion must be provided with an indoor overflow from the upper portion of the expansion tank in addition to an open vent. The indoor overflow must be carried within the building to a suitable plumbing fixture

(c) Closed-type systems Systems of the closed type must have an airtight tank or other suitable air cushion that will be consistent with the volume and capacity of the system, and must be suitably designed for a hydrostatic test pressure of 2-1/2 times the allowable working pressure of the system. Expansion tanks for systems designed to operate at or above 30 psig must be constructed according to nationally recognized standards approved by the building official. Provisions must be made for draining the tank without emptying the system, except for pressurized tanks. The valve between the boiler or mains and the expansion tank must have permanently attached to it a metal tag having substantially the following wording stamped or etched on it: “This valve must be OPEN at all times except when draining the expansion tank”

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.2133 TABLE NO. 21-C.

UMC Appendix B, Table No 21-C, is amended to read as follows.

TABLE NO. 21-C---(CONTROL 5 AND) LIGHT DEVICES FOR AUTOMATIC BOILERS

BOILER GROUP	FUEL	FUEL INPUT RANGE 1 (Inclusive)	TYPE OF PILOT 2	Safety Control Timing (Nominal Maximum Time in Seconds)				ASSURED FUEL SUPPLY CONTROL 4	ASSURED AIR SUPPLY CONTROL 5	LOW FUEL START UP CONTROL 6	PRE-PURGING CONTROL 7	HOT WATER TEMPERATURE AND LOW WATER LIMIT CONTROLS 8	STEAM PRESSURE AND LOW WATER LIMIT CONTROLS 9	APPROVED FUEL SHUTOFF 10	CONTROL AND LIGHT DEVICE SYSTEM DESIGN 11
				TRIAL FOR PILOT	Trial for Main Burner Flame		MAIN BURNER FLAME FAILURE 3								
					DIRECT ELECTRIC IGNITION	FLAME PILOT									
A	Gas	0 400 000 999 999 BTU/h	Interrupted Intermittent Continuous	90	Not Allowed	90	180	Not Required	Required	Not Required	Required	Required	Required	Required	
B	Gas	400 001 999 999 BTU/h	Interrupted Intermittent	15	Not Allowed	15	2 4	Not Required	Required	Not Required	Required	Required	Required	Required	
C	Gas	1 000 000 2 499 999 BTU/h	Interrupted	15	Not Allowed	15	2-4	Not Required	Required	Required	Required	Required	Required	Required	
D	Gas	2 500 000 over BTU/h	Interrupted	10	Not Allowed	10	2-4	Not Required	Required	Required	Required	Required	Required	Required	
E	Oil	0-5 GPH	Any Type	15	90	90	90	Not Required	Required	Not Required	Required	Required	Required	Required	
F	Oil	Over 5 GPH	Interrupted	15	Not Allowed	15	2-4	Required	Required	Not Required	Required	Required	Required	Required	
G	Oil	7 to 10 GPH	Interrupted	15	Not Allowed	10/15	2-4	Lo - Oil Required	Required	Required	Required	Required	Required	Required	
H	Oil	Over 10 GPH	Interrupted	15	Not Allowed	10/15	2-4	Lo - Oil Required	Required	Required	Required	Required	Required	Required	
K	Electric	All	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Required	Required	Not Required	Required	

FOOTNOTES FOR TABLE NO. 21-C

¹ Fuel input must be determined by the maximum burner input as shown on the burner nameplate.

² Automatic boilers must have one flame failure device on each burner that must prove the presence of a suitable ignition source at the point where it will reliably ignite the main

burner, except that boiler group E that is equipped with direct electric ignition must monitor the main burner. Boiler group A equipped with continuous pilot must accomplish 100 percent shutoff within 90 seconds after flame failure. Boiler groups G and H trial for ignition timing is ten seconds for distillate oils and 15 seconds for oil requiring preheating.

³ Electronic safety equipment must be provided for all burners exceeding 400,000 Btu/h input, except on multiple burner equipment where each section of 400,000 Btu/h input or fraction of it is supervised by an approved safety pilot.

⁴ Boiler groups B, C, and D must have controls interlocked to accomplish a nonrecycling fuel shutoff upon high or low gas pressure and boiler groups B, C, D, F, G, and H using steam or air for fuel atomization must have controls interlocked to accomplish a nonrecycling fuel shutoff upon low atomizing steam or air pressure. Boiler groups F, G, and H equipped with a preheated oil system must have controls interlocked to provide fuel shutoff upon low oil temperature. Boiler groups F, G, and H must have controls for high oil temperature, and groups G and H must have controls for low oil pressure.

⁵ Automatic boilers must have controls interlocked to shut off the fuel supply in the event of draft failure if forced or induced draft fans are used or, in the event of low combustion air flow, if a gas power burner is used. If a single motor directly driving both the fan and the oil pump is used, a separate control is not required.

⁶ Boiler groups B, C, D, G, and H, when firing in excess of 400,000 Btu/h per combustion chamber, must be provided with low fire start of its main burner system to permit smooth light-off. This will normally be a rate of approximately one-third of its maximum firing rate.

⁷ Boiler groups B, C, D, F, G, and H must not permit pilot or main burner trial for ignition operation before a purging operation. Purging is an acceptable method of scavenging the combustion chamber, boiler passages, and breeching to remove all combustion gases. It consists of at least four air changes for trial of ignition and after lockout at high fire damper setting, at least 90 seconds minimum. An atmospheric gas burner with no mechanical means of creating air movement or an oil burner that obtains two-thirds or more of the air required for combustion without mechanical means of creating air movement must not require purge by means of four air changes so long as its secondary air openings are not provided with means of closing. If burners have means of closing secondary air openings, a time delay must be provided that puts these closures in a normally open position for four minutes before an attempt for ignition. An installation with a trapped combustion chamber must in every case be provided with a mechanical means of creating air movement for purging.

⁸ Every automatic hot water supply boiler, low pressure hot water heating boiler, and power hot water boiler must be equipped with two high temperature limit controls with a manual reset on the control with the higher setting interlocked to shut off the main fuel supply, except that manual reset on the high temperature limit control must not be required on an automatic package boiler not exceeding 400,000 Btu/h input and that has been approved by an approved testing agency. Every automatic hot water heating, power boiler, and package hot water supply boiler exceeding 400,000 Btu/h input must be equipped with one low water level limit control with a manual reset interlocked to shut off the fuel supply installed to prevent damage to the boiler and to permit testing of the control without draining the heating system.

⁹ Every automatic low pressure steam heating boiler, small power boiler, and power steam boiler must be equipped with two high-steam pressure limit controls interlocked to shut off the fuel supply to the main burner with manual reset on the control with the higher setting and two low water level limit controls, one of which must be provided with a manual reset device and independent of the feed water controller.

¹⁰ Boiler groups A, B, C, D, E, F, G, and H must use approved safety shutoff valves for the main burner fuel shutoff that must be interlocked to the flame safeguard control devices required under UMC Chapter 25. On oil burners where the safety shutoff valves will be subjected to pressures in excess of ten pounds per square inch when the burner is not firing, relief valves must be provided. Proof of closing valves must be provided for boiler groups C and D of over 1,000,000 Btu/h. The requirements in NFPA 85-A-1987 may be used for boilers of groups D and H with Btu/h input of over 12,500,000.

¹¹ Control and limit device systems must be grounded with operating voltage not to exceed 150 volts. Control and limit devices must interrupt the ungrounded side of the current. A readily accessible means of manually disconnecting the control circuit must be provided with controls so arranged that when they are de-energized the burner must be inoperative.

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.2212 SECTION 2212.

UMC Appendix B, Section 2212, is amended to read as follows

Section 2212 (a) Materials Pipe used for the installation, alteration, or repair of gas piping must comply with the following minimum requirements

1 Standard weight (schedule 40) wrought iron, galvanized or black steel

2 Copper pipe of full weight standard gauge and thickness

3 Copper tubing of standard type K, L, or of ACR (AIR CONDITIONING AND REFRIGERATION) specification

4 Plastic pipe, tubing, and fittings shall be used outside underground only and shall conform with Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings, ASTM D2513. Pipe to be used shall be marked "gas" and "ASTM D2513." The use of plastic pipe, tubing, and fittings in undiluted liquefied petroleum gas piping systems shall be in accordance with Standard for the Storage and Handling of Liquefied Petroleum Gases, ANSI/NFPA 58-1992

(b) Fittings Fittings for screw or flange piping, except stopcocks and valves, must be malleable iron or steel. Joints for copper tubing must be made with approved flared gas fittings or by brazing with a material having a melting point in excess of 1,000 degrees Fahrenheit. Compression-type fittings must not be used for joining copper tubing.

Polyethylene plastic pipe tubing and fittings shall be joined in accordance with manufacturer's instructions. Joints may be made by heat fusion or mechanical fittings and must comply with ASTM D2513. Mechanical joints must not be used on polyethylene piping in excess of two-inch pipe size.

(c) Standards. Gas piping, fittings, and materials must be in compliance with the appropriate ANSI/ASME and ASTM Standards as referenced in NFPA 54-1992 Section 2.6

(d) Steel pipe run outside exposed aboveground must be galvanized or coated with approved rust-resistant material.

(e) Copper or iron tubing must not be used for piping within the burner zone of the burners.

(f) Gas pipe must be new or may have been used previously for conveying gas. It must be in good condition, clean, and free from internal obstructions. Burred ends must be reamed to the full bore of the pipe.

(g) Valves and appurtenances for gas piping must be designed and approved for use with fuel gas.

Statutory Authority: *MS s 16B 61*

History: *19 SR 1306*

1346.2213 SECTION 2213.

UMC Appendix B, Section 2213, is amended to read as follows

Section 2213 (a) Joints. Metallic pipe joints in the piping system, unless welded, must be screwed joints having approved standard threads. Screwed metallic pipe joints must be made with approved pipe joint material, insoluble in fuel gas, and applied to the male threads only. Piping 2-1/2 inches or larger must have welded joints. Nonmetallic pipe may have joints using approved mechanical or heat fusion fittings.

(b) Location. Gas piping must not be installed in or on the ground under a building or structure and exposed gas piping must be kept at least 3-1/2 inches above grade or structure. Concealed, unprotected gas piping may be installed above grade in approved recesses or channels.

EXCEPTIONS 1 If necessary due to structural conditions, approved-type gas piping may be installed in other locations if permission has been first obtained from the building official

2 If gas piping is to be run in false ceilings and the space is to be used as an air plenum, the piping must have all connections made by welding or brazing. No valves, threads, unions, or connectors are permitted

(c) Drip tees Drip tees comprised of a tee fitting with the bottom outlet capped must be installed at the base of supply piping dropping down to an automatically controlled gas burner or appliance, before any regulator or automatic gas valve, and ahead of all pounds-to-inches pressure regulators. The tee must be installed so that the gas enters the tee from the top and leaves at a 90 degree angle from the inlet.

(d) Corrosion and covering protection Ferrous gas piping installed underground in exterior locations must be protected from corrosion by approved coatings or wrapping materials. Horizontal metallic piping must have at least six inches of earth cover or equivalent protection

Nonmetallic piping shall have at least 18 inches of earth cover or equivalent protection. Risers, including prefabricated risers inserted with plastic pipe, shall be metallic and shall be protected in an approved manner to a point at least six inches above grade. When a riser connects to plastic pipe underground, the horizontal metallic portion underground shall be at least 30 inches in length before connecting to the plastic service pipe. An approved transition fitting or adaptor shall be used where the plastic joins the metallic riser

(e) Corrosion isolation If soil conditions present a corrosion problem, underground ferrous gas piping must be electrically isolated from the rest of the gas system with listed isolation fittings installed at least six inches above grade

(f) [Unchanged]

(g) Building shutoff If meters are installed inside the building, a main shutoff valve must be installed in a readily accessible location inside the building on the street side of the meter.

If a meter or meters are installed on the exterior of the building walls, a main shutoff valve the same as the main building gas supply must be installed on the inside of the building between the meter and the first branch gas line. The shutoff valve must be installed in the first readily accessible location for use and operation and must have a permanently attached handle. In multiple dwellings, the main shutoff valve must not be located in an apartment or locked room, but must be in the utility room or otherwise located to be readily accessible to all occupants of the building at all times.

All main shutoff valves must be approved, lubricated plug-type, ball-type, or of a type approved by the administrative authority. Main shutoff valves controlling several gas piping systems must be placed an adequate distance from each other so they will be easily accessible for operation and must be installed to be protected from physical damage. Each valve must be plainly marked with a metal tag attached by the installing contractor so that the gas piping system supplied through it can be readily identified. A shutoff valve must be installed at every location where safety, convenience of operation, and maintenance demands.

In multiple tenant buildings supplied through a master meter or one service regulator when a meter is not provided, or where meters or service regulators are not readily accessible from the appliance location, an individual shutoff valve for each apartment or for each separate house line must be provided in an accessible location

(h) Unions. Ground joint unions may be used at exposed fixture, appliance, or equipment connections and in exterior locations immediately on the discharge side of the building shutoff valve. Heavy-duty flanged type unions may be used in special cases when approved by the building official. Unions, flared fittings, running threads, right and left couplings, bushings, and swing joints made by a combination of fittings shall not be used on concealed gas piping inside a building

(i) [Unchanged.]

(j) Valves Valves used in connection with gas piping must be of approved types, including, but not limited to, approved lubricated plug-type, ball-type, or a type approved by the building official

Gas valves must be of the lever handle type and be installed in the piping system serving each appliance, located within easy reach of the appliance. For inputs exceeding 1,000,000 Btu/h or where metering or regulating pressure exceeds 14 inches water column, the valve must be an approved, lubricated plug-type, ball-type, or of a type approved by the building official.

(k) and (l) [Unchanged.]

(m) [Unchanged.]

(n) [Unchanged.]

Statutory Authority: *MS s 16B.61*

History: *19 SR 1306*

1346.2500 CHAPTER 25.

UMC Appendix B is amended by adding a new chapter to read as follows:

Chapter 25

INSTALLATION AND TESTING OF GAS- OR FUEL-FIRED EQUIPMENT

[For text of subpart 1, see M.R.]

Subp 2. SECTION 2502.

Section 2502. Standards. The standards to be used in conjunction with this chapter are the appropriate standards published by ANSI/UL-1992, NFPA 54-1992, and NFPA 85A-1987.

[For text of subs 3 to 10, see M.R.]

Statutory Authority: *MS s 16B.61*

History: *19 SR 1306*

1346.2600 CHAPTER 26.

UMC Appendix B is amended by adding a new chapter to read as follows:

Chapter 26

INSTALLATION AND TESTING OF OIL- OR FUEL-FIRED EQUIPMENT

[For text of subs 1 to 4, see M.R.]

Subp 5. SECTION 2605

Section 2605 Installation of oil or fuel burning equipment (a) General. The installation of oil or fuel burning equipment must be in keeping with the requirements of the appropriate ANSI/UL Standards, NFPA 31-1992, or the UMC.

(b) Placing equipment in operation. Following completion of all installation, the installer shall test all safety and operating and venting before placing the burner in service. The correct input of fuel must be determined and the fuel-to-air ratio set.

Each fuel burner must be adjusted to its proper input according to the manufacturer's instructions. Overrating of burners is prohibited.

(c) Conversion burners. For conversion burners installed in hot water boilers or warm air furnaces, the rate of flow of the fuel in Btu/h must be adjusted to within plus or minus five percent of 1.7 times the calculated Btu/h heat loss of the building in which it is installed.

For conversion burners installed in steam boilers, the fuel hourly input demand must be adjusted to meet the steam load requirements. The fuel input demand necessitated by an oversized boiler must be established and added to the input demand for load requirements to arrive at a total input demand.

(d) Pilot operation. Pilot flames must be effective to ignite the fuel at the main burner and must be adequately protected from drafts. Pilot flames must not become extinguished when the main burner is turned on or off in a normal manner either manually or by automatic controls.

(e) Burner operation. In conducting tests to determine compliance with the requirements of this section, care must be exercised to prevent the accumulation of unburned fuel in the appliance that might result in an explosion or fire.

1 The flames from the burner must freely ignite the fuel when operating at the prevailing fuel pressure and when the main control valve is regulated to deliver at one-third the full fuel rate.

2. Burner flames must not flash back after immediate ignition nor after turning the fuel cock until the flow rate to the burner is one-third the full supply

3 Burner flames must not flash back when the fuel is turned on or off by an automatic control mechanism.

4 Main burner flames must ignite freely from the pilot when the main control valve is regulated to one-third the full fuel rate or when the pilot flame is reduced to a minimum point that will actuate the safety device

5 When ignition is made in a normal manner, the flame must not flash outside the appliance

6 Burners must not expel fuel through air openings when operating at prevailing pressure.

(f) Method of test. The appliance must be allowed to operate until the stack temperature becomes stabilized after which a sample of the undiluted flue products must be taken from the appliance flue outlet ahead of the draft hood.

The sample taken must be analyzed for carbon monoxide, carbon dioxide, and oxygen

NOTE. Furnace designs incorporating induced draft assemblies may require flue gas samples to be taken ahead of the inducer fan.

The venting, safety, and operating controls of the appliance must be checked by the installer to ensure proper and safe operation. After completion of the test of newly installed fuel burner equipment as provided in this section, the installer must file with the building official complete records of the test on a form approved by the building official. A tag stating the date of the test and the name of the tester must be attached to the appliance at the main appliance valve.

Oil- or fuel-fired equipment must have draft in water and smoke samples taken

[For text of subps 6 to 8, see M R.]

Statutory Authority: *MS s 16B.61*

History: *19 SR 1306*