

1 Department of Administration

2 Building Code Division

3

4 Adopted Permanent Rules Relating to the Minnesota Uniform

5 Mechanical Code

6

7 Rules as Adopted

8 1346.0050 TITLE; INCORPORATION BY REFERENCE.

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

12 Chapters 1 to 20 and appendixes A, B, and C of the 1991  
13 edition of the Uniform Mechanical Code, promulgated by the  
14 International Conference of Building Officials, 5360 South  
15 Workman Mill Road, Whittier, California 90601 and the  
16 International Association of Plumbing and Mechanical Officials,  
17 20001 South Walnut Drive, Walnut, California 91789, are  
18 incorporated by reference as part of the Minnesota State  
19 Mechanical Code with the amendments in this chapter. As used in  
20 this chapter, "UMC" means the Uniform Mechanical Code  
21 incorporated in this part.

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

25 1346.0108 SECTION 108.

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

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

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

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

34 (c) Hydronic system balancing. Hydronic systems must be  
35 balanced. Pump impellers must be trimmed or pump speed must be

1 adjusted to meet design system flow.

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

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

7 1346.0302 SECTION 302.

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

10 (b) Plans and specifications. Plans, engineering  
11 calculations, diagrams, and other data shall be submitted in one  
12 or more sets with each application for a permit. The building  
13 official may require that the plans or other data be prepared in  
14 accordance with the rules of the Board of Architecture,  
15 Engineering, Land Surveying, Landscape Architecture, and  
16 Interior Design, chapter 1800 and Minnesota Statutes, sections  
17 326.02 to 326.15, and other state laws relating to plan and  
18 specification preparation by occupational licensees.

19 1346.0406 SECTION 406.

20 UMC Section 406 is amended by adding the following  
21 definition:

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

25 1346.0411 SECTION 411.

26 UMC Section 411 is amended by adding the following  
27 definitions:

28 "Interlock" means a device that senses a limit or off-limit  
29 condition or improper sequence of events, shuts down the  
30 offending or related piece of equipment, and prevents proceeding  
31 in an improper sequence to prevent a hazardous condition from  
32 developing.

33 "Intermittent pilot" means a pilot that burns during  
34 light-off and while the main burner is firing and that is shut

1 off with the main burner.

2 "Interrupted pilot" means a pilot that burns during  
3 light-off and that is shut off during normal operation of the  
4 main burner.

5 1346.0424 SECTION 424.

6 UMC Section 424 is amended by adding the following  
7 definition:

8 "Ventilation" means the process of supplying or removing  
9 air by natural or mechanical means to or from any space. The  
10 air may or may not have been conditioned.

11 1346.0707 SECTION 707.

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

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

16 1346.0710 SECTION 710.

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

18 (h) Access.

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

22 2. Mechanical equipment installed on the roof of a  
23 building must be provided with access as required in chapter  
24 1300.

25 1346.0808 SECTION 808.

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

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

30 1346.0809 SECTION 809.

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

33 Section 809. Infrared heaters. Installation of infrared

1 heaters must comply with the requirements of NFPA 54-1992.

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

8 1346.0913 SECTION 913.

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

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

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

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

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

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

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

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

32 1346.1002 SECTION 1002.

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

35 Exhaust ducts under positive pressure must not extend into

1 or pass through ducts or plenums.

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

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

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

9 (h) Elbows, transitions, and obstructions.

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

14 EXCEPTION: Ducts serving a dwelling unit need not comply.

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

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

22 1346.1004 SECTION 1004.

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

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

28 1. Ducts must be completely coated with asphalt or  
29 bituminous coating.

30 2. Ducts must be encased in at least two inches of  
31 concrete.

32 3. A vapor barrier of polyethylene at least four mill  
33 thickness or equal must be installed around the underground duct.

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

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

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

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

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

17 1346.1005 SECTION 1005.

18 UMC Section 1005 is amended to read as follows:

19 Insulation and Sealing of Ducts

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

22 Minimum Required Duct Insulation

23 (see table notes for letter interpretations)

24 Duct Location	Cooling only	Heating only
25 26 27 Exterior of building, 28 attics, garages, and 29 ventilated crawl spaces	or heating and cooling	C and W
30 31 Inside of building and 32 in unconditioned spaces <sup>1</sup> 33 TD less than or 34 equal to 15°F	None required	None required

1	TD greater than 15°F and		
2	less than or equal to 40°F	A and V	A
3			
4	TD greater than 40°F	B and V	B
5			
6	Within conditioned space		
7	or in basements with		
8	insulated walls	None required	None required
9			
10	Intake and exhaust		
11	ducts <sup>2</sup>	A and V	A
12			
13	Within cement slab or		
14	within ground	B	B
15			

## 16 NOTES:

17 <sup>1</sup>Duct insulation is not required at the following locations:

18 (a) ceilings which form plenums; and

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

21 <sup>2</sup>Exhaust ducts within a heated space must be insulated for a  
22 distance of three feet from the duct outlet.

23 A = A material with installed minimum thermal resistance of

24 R-3.3. Examples:

25 1.5-inch, 0.60 lb/cu ft mineral fiber, slag, or fiberglass  
26 blankets;

27 one-inch, 1.5 to 3.0 lb/cu ft mineral fiber blanket duct liner;

28 one-inch, 3.0 to 10.0 lb/cu ft mineral fiber board.

29 B = A material with installed minimum thermal resistance of

30 R-5.0. Insulation encased in cement or within ground must be

31 approved for that application and be installed on the bottom and  
32 sides of ducts and plenums. Examples:

33 2.5-inch, 0.60 lb/cu ft mineral fiber, slag, or fiberglass  
34 blankets;

35 1.5-inch, 1.5 to 3.0 lb/cu ft mineral fiber blanket duct liner;

- 1 1.5-inch, 3.0 to 10.0 lb/cu ft mineral fiber board;  
 2 one-inch, 1.35 lb/cu ft extruded polystyrene board.  
 3 C = A material with installed minimum thermal resistance of  
 4 R-8.0. Examples:  
 5 four-inch, 0.60 lb/cu ft mineral fiber, slag, or fiberglass  
 6 blankets;  
 7 two-inch, 1.5 to 3.0 lb/cu ft mineral fiber blanket duct liner;  
 8 two-inch, three to ten lb/cu ft mineral fiber board.

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

12 V = Vapor retarder with all joints sealed.

13 W = Approved weatherproof barrier.

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

16 (b) Sealing: Ducts must be sealed in accordance with this  
 17 subsection. Pressure sensitive tape must not be used as the  
 18 primary sealant for ducts designed to operate at static pressure  
 19 of one inch water gauge or greater. In accordance with the  
 20 Uniform Mechanical Code, section 706(e), adopted by chapter  
 21 1346, return air ducts conducting air into a furnace through the  
 22 same space as the furnace must be continuously airtight.

#### 23 Minimum Required Sealing

24 Location	25 Design Static 26 Pressure	27 Sealing 28 Required
29 All locations	30 Greater than 31 three inches 32 water gauge	33 Joints, seams, and all 34 wall penetrations must be 35 sealed. Ductwork must 36 be less than or equal to 37 Class 6 as defined in 38 section 4 of the HVAC 39 Duct Leakage Test Manual*
40 Outside 41 conditioned 42 space	43 3.0 inches water 44 gauge and less	45 All transverse joints 46 and longitudinal seams 47 must be sealed
48 All locations 49 except ducts 50 within return, 51 relief, or 52 exhaust plenums	53 3.0 to greater 54 than 0.25 inches 55 water gauge	56 All transverse joints 57 must be sealed
58 Ducts within 59 return, relief, 60 or exhaust	61 3.0 to 0.25 inches 62 water gauge 63 inclusive	64 All transverse 65 joints must be 66 sealed

1 plenums

2

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

7 1346.1104 SECTION 1104.

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

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

14 1346.1107 SECTION 1107.

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

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

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

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

33 1346.1207 SECTION 1207.

34 UMC Section 1207 is added to read as follows:

35 Section 1207. Air supply. Cooling system supply ducts

1 must not be installed for the purpose of cooling attached  
2 private garages from any forced air system serving habitable  
3 areas.

4 1346.1503 SECTION 1503.

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

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

9 Ethane, 2,2-Dichloro- CHCl<sub>2</sub>CF<sub>3</sub>  
10 1,1-Trifluoro (Refrigerant 123)

11  
12 Ethane, 1,1,1,2- CH<sub>2</sub>FCF<sub>3</sub>  
13 Tetrafluoro (Refrigerant 134a)

14  
15 Limitations:

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

18 R123 R134a  
19 0.004 16.0  
20

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

23 R123 R134a  
24 Compound specific refrigerant Oxygen monitor, alarm  
25 detector, alarm at the allowable below 19.5 percent  
26 exposure limit (AEL) of 10 ppm  
27

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

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

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

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

40 1346.1505 SECTION 1505.

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

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

5 1346.1520 TABLE NO. 15-D.

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

	HIGH-PRESSURE TEST	LOW-PRESSURE TEST
7 Refrigerant		
8 Ethane, 2,2-Dichloro-1		
9 1, 1-Trifluoro (Refrigerant 123)	30	30
10 Ethane, 1,1,1,2-Tetrafluoro		
11 (Refrigerant 134a)	235	140

12  
13  
14  
15 1346.1521 SECTION 1521.

16 UMC Chapter 15 is amended by adding a section to read as  
17 follows:

18 GAS AIR CONDITIONERS.

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

22 1346.1906 SECTION 1906.

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

25 WATER HEATERS.

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

31 EXCEPTION: Direct vent water heaters.

32 1346.2002 SECTION 2002.

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

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

1 metal sleeve joint of approved design.

2 1346.2003 SECTION 2003.

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

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

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

10 (i) Makeup air. Each room provided with an exhaust system  
11 must have air supplied to the room equal to the amount of air to  
12 be exhausted. Makeup diffusers must be located to prevent a  
13 short circuiting of air furnished to the exhaust system.  
14 Windows and doors must not be used for the purpose of providing  
15 makeup air. The exhaust and makeup air systems must be  
16 connected by an electrical interlocking switch. Exhaust systems  
17 must be provided with tempered makeup air. Tempered air is air  
18 of a temperature not less than 55 degrees Fahrenheit, measured  
19 at the flow of air from the discharge diffuser into the room.  
20 Compensating hoods must meet the airflow requirements in Section  
21 2003(g), 2, 3, and 4. Compensating hoods must extract at least  
22 80 percent of their required exhaust airflow from the kitchen  
23 area.

24 1346.2104 SECTION 2104.

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

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

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

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

1 equipment necessary for proper operation.

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

5 "Package boiler" means a boiler equipped and shipped  
6 complete with electrical heating elements or fuel burning  
7 equipment, automatic controls and accessories, and mechanical  
8 draft equipment, if used.

9 "Pressure vessel" means an unfired, closed container for  
10 liquids, gases, or vapors subjected to pressures exceeding 15  
11 pounds per square inch, or steam and hot water under any  
12 pressure.

13 UMC Appendix B, Section 2104, is amended by deleting the  
14 definitions of "low-pressure hot-water-heating boiler," "power  
15 hot-water boiler (high-temperature water boiler)," and "steam  
16 heating boiler."

17 1346.2107 SECTION 2107.

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

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

27 EXCEPTION: Small expansion tanks installed consistent with  
28 manufacturer's recommendations may be supported by the piping if  
29 so designed.

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

1 (c) Closed-type systems. Systems of the closed type must  
 2 have an airtight tank or other suitable air cushion that will be  
 3 consistent with the volume and capacity of the system, and must  
 4 be suitably designed for a hydrostatic test pressure of 2-1/2  
 5 times the allowable working pressure of the system. Expansion  
 6 tanks for systems designed to operate at or above 30 psig must  
 7 be constructed according to nationally recognized standards  
 8 approved by the building official. Provisions must be made for  
 9 draining the tank without emptying the system, except for  
 10 pressurized tanks. The valve between the boiler or mains and  
 11 the expansion tank must have permanently attached to it a metal  
 12 tag having substantially the following wording stamped or etched  
 13 on it: "This valve must be OPEN at all times except when  
 14 draining the expansion tank."  
 15 1346.2133 TABLE NO. 21-C.

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

TABLE NO. 21-C--CONTROLS AND LIMIT 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 FIRE 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	POC 10	CONTROL AND LIMIT 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 BTU/h	Interrupted Intermittent or Continuous	90	Not Allowed	90	<del>90</del> 180	Not Required	Required	Not Required	Not Required	Required	Required	Required	Not Required	Required
B	Gas	400,001-999,999 BTU/h	Interrupted Intermittent	15	Not Allowed	15	2-4	Hi Gas Required	Required	Not Required	Required	Required	Required	Required	Not Required	Required
C	Gas	1,000,000-2,499,999 BTU/h	Interrupted	15	Not Allowed	15	2-4	Lo/Hi Gas Required	Required	Required	Required	Required	Required	Required	Required	Required
D	Gas	2,500,000 over BTU/h	Interrupted	10	Not Allowed	10	2-4	Lo/Hi Gas Required	Required	Required	Required	Required	Required	Required	Required	Required
E	Oil	0-5 GPH	Any Type	15	90	90	90	Not Required	Required	Not Required	Not Required	Required	Required	Required	Not Required	Required
F	Oil	Over 5 GPH	Interrupted	15	Not Allowed	15	2-4	Required	Required	Not Required	Required	Required	Required	Required	Not 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	Not Required	Required
H	Oil	Over 10 GPH	Interrupted	15	Not Allowed	10/15	2-4	Lo - Oil Required	Required	Required	Required	Required	Required	Required	Not Required	Required
K	Electric	All	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Required	Required	Not Required	Not Required	Required

32 FOOTNOTES FOR TABLE NO. 21-C

33 <sup>1</sup> Fuel input must be determined by the maximum burner input  
 34 as shown on the burner nameplate.

35 <sup>2</sup> Automatic boilers must have one flame failure device on

1 each burner that must prove the presence of a suitable ignition  
2 source at the point where it will reliably ignite the main  
3 burner, except that boiler group E that is equipped with direct  
4 electric ignition must monitor the main burner. Boiler group A  
5 equipped with continuous pilot must accomplish 100 percent  
6 shutoff within 90 seconds after flame failure. Boiler groups G  
7 and H trial for ignition timing is ten seconds for distillate  
8 oils and 15 seconds for oil requiring preheating.

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

13       <sup>4</sup> Boiler groups B, C, and D must have controls interlocked  
14 to accomplish a nonrecycling fuel shutoff upon high or low gas  
15 pressure and boiler groups B, C, D, F, G, and H using steam or  
16 air for fuel atomization must have controls interlocked to  
17 accomplish a nonrecycling fuel shutoff upon low atomizing steam  
18 or air pressure. Boiler groups F, G, and H equipped with a  
19 preheated oil system must have controls interlocked to provide  
20 fuel shutoff upon low oil temperature. Boiler groups F, G, and  
21 H must have controls for high oil temperature, and groups G and  
22 H must have controls for low oil pressure.

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

29       <sup>6</sup> Boiler groups B, C, D, G, and H, when firing in excess of  
30 400,000 Btu/h per combustion chamber, must be provided with low  
31 fire start of its main burner system to permit smooth  
32 light-off. This will normally be a rate of approximately  
33 one-third of its maximum firing rate.

34       <sup>7</sup> Boiler groups B, C, D, F, G, and H must not permit pilot  
35 or main burner trial for ignition operation before a purging  
36 operation. Purging is an acceptable method of scavenging the

1 combustion chamber, boiler passages, and breeching to remove all  
2 combustion gases. It consists of at least four air changes for  
3 trial of ignition and after lockout at high fire damper setting,  
4 at least 90 seconds minimum. An atmospheric gas burner with no  
5 mechanical means of creating air movement or an oil burner that  
6 obtains two-thirds or more of the air required for combustion  
7 without mechanical means of creating air movement must not  
8 require purge by means of four air changes so long as its  
9 secondary air openings are not provided with means of closing.  
10 If burners have means of closing secondary air openings, a time  
11 delay must be provided that puts these closures in a normally  
12 open position for four minutes before an attempt for ignition.  
13 An installation with a trapped combustion chamber must in every  
14 case be provided with a mechanical means of creating air  
15 movement for purging.

16 <sup>8</sup> Every automatic hot water supply boiler, low pressure hot  
17 water heating boiler, and power hot water boiler must be  
18 equipped with two high temperature limit controls with a manual  
19 reset on the control with the higher setting interlocked to shut  
20 off the main fuel supply, except that manual reset on the high  
21 temperature limit control must not be required on an automatic  
22 package boiler not exceeding 400,000 Btu/h input and that has  
23 been approved by an approved testing agency. Every automatic  
24 hot water heating, power boiler, and package hot water supply  
25 boiler exceeding 400,000 Btu/h input must be equipped with one  
26 low water level limit control with a manual reset interlocked to  
27 shut off the fuel supply installed to prevent damage to the  
28 boiler and to permit testing of the control without draining the  
29 heating system.

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

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

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

17 1346.2212 SECTION 2212.

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

19           Section 2212. (a) Materials. Pipe used for the  
20 installation, alteration, or repair of gas piping must ~~be of~~  
21 comply with the following minimum requirements:

- 22           1. Standard weight (schedule 40) wrought iron, galvanized  
23 or black steel.
- 24           2. Copper pipe of full weight standard gauge and thickness.
- 25           3. Copper tubing of standard type K, L, or of ACR (AIR  
26 CONDITIONING AND REFRIGERATION) specification.
- 27           4. Plastic pipe, tubing, and fittings shall be used  
28 outside underground only and shall conform with Standard  
29 Specification for Thermoplastic Gas Pressure Pipe, Tubing, and  
30 Fittings, ASTM D2513. Pipe to be used shall be marked "gas" and  
31 "ASTM D2513." The use of plastic pipe, tubing, and fittings in  
32 undiluted liquefied petroleum gas piping systems shall be in  
33 accordance with Standard for the Storage and Handling of  
34 Liquefied Petroleum Gases, ANSI/NFPA 58-1992.

35           (b) Fittings. Fittings for screw or flange piping, except

1 stopcocks and valves, must be malleable iron or steel. Joints  
2 for copper tubing must be made with approved flared gas fittings  
3 or by brazing with a material having a melting point in excess  
4 of 1,000 degrees fahrenheit. Compression-type fittings must not  
5 be used for joining copper tubing.

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

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

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

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

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

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

24 1346.2213 SECTION 2213.

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

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

33 (b) Location. Gas piping must not be installed in or on  
34 the ground under a building or structure and exposed gas piping  
35 must be kept at least ~~six~~ 3-1/2 inches above grade or

1 structure. Concealed, unprotected gas piping may be installed  
2 above grade in approved recesses or channels.

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

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

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

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

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

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

36 (f) [Unchanged.]

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

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

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

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

32 (h) Unions. Ground joint unions may be used at exposed  
33 fixture, appliance, or equipment connections and in exterior  
34 locations immediately on the discharge side of the building  
35 shutoff valve. Heavy-duty flanged type unions may be used in  
36 special cases when approved by the building official. Unions,

1 flared fittings, running threads, right and left couplings,  
2 bushings, and swing joints made by a combination of fittings  
3 shall not be used on concealed gas piping inside a building.

4 (i) [Unchanged.]

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

9 Gas valves must be of the lever handle type and be  
10 installed in the piping system serving each appliance, located  
11 within easy reach of the appliance. For inputs exceeding  
12 1,000,000 Btu/h or where metering or regulating pressure exceeds  
13 14 inches water column, the valve must be an approved,  
14 lubricated plug-type, ball-type, or of a type approved by the  
15 building official.

16 (k) and (l) [Unchanged.]

17 (m) [Unchanged.]

18 (n) [Unchanged.]

19 1346.2500 CHAPTER 25.

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

22 Chapter 25

23 INSTALLATION AND TESTING OF GAS- OR FUEL-FIRED EQUIPMENT

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

25 Subp. 2. SECTION 2502.

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

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

30 1346.2600 CHAPTER 26.

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

33 Chapter 26

34 INSTALLATION AND TESTING OF OIL- OR FUEL-FIRED EQUIPMENT

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

1 Subp. 5. SECTION 2605.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

34 REPEALER. Minnesota Rules, parts 1346.0201; 1346.0403;  
35 1346.0706; and 1346.0906, are repealed.