

(b) *Exhaust.* All exhaust openings shall be provided with automatic or self-activating back-draft dampers to prevent the intake of outside air into the building when the exhaust units are not in operation.

History: Cr. Register, December, 1976, No. 240; eff. 1-1-76; am. (b) (a), Register, December, 1976, No. 262, eff. 1-1-77.

#### PART IV—HEATING EQUIPMENT REQUIREMENTS

Ind 64.20 Equipment ratings and safety controls. (1) \* TEST AND INSTALLATION STANDARDS. All oil- and gas-fired heating equipment, electric heating equipment, solid-fuel heating equipment and accessory equipment or devices shall be tested and installed in accordance with standards recognized by the department. Department review and approval of input or output ratings or both are required when ratings are needed to satisfy s. Ind 64.03 or 64.09.

Note: For a list of standards acceptable to the department, refer to Appendix A.

(2) SAFETY CONTROLS. (a) *General.* The complete safety control package for the heating and ventilating equipment shall comply with standards accepted by the department.

(b) *Limits and controls.* Oil and gas-fired heating equipment and electric heating equipment shall be equipped with primary (flame safeguard) safety controls, safety limit switches, and burners or electric elements that comply with standards accepted by the department.

Note: The department recognizes UL 296—Oil Burners, and UL 795—Commercial-Industrial Gas-Heating Equipment, as acceptable standards that satisfy the requirements of subs. (1) and (2).

(3) LISTED EQUIPMENT. Complete factory assembled heating units shall be labeled by listing agencies approved by the department.

Note: The department accepts heating equipment listed by American Gas Association (AGA), Underwriters' Laboratories—(UL) and PFS corporation.

(4) UNLISTED EQUIPMENT. If the heating equipment is unlisted, the following provisions shall be taken:

(a) *Manufacturer's statement.* A statement from the equipment manufacturer shall be provided indicating the national standard with which the equipment complies.

(b) *Tests.* A test by a Wisconsin registered engineer shall be conducted on the output and safety controls, in accordance with the national standard used by the manufacturer. A statement regarding the test of the rating and safety controls shall be furnished for each installation unless an approval for the equipment is obtained from the department in accordance with sub. (5).

(5) EQUIPMENT APPROVAL. Equipment approval may be obtained from the department upon submission of a technical report, based on the test

\* See Appendix A for further explanatory material.

required in sub. (4) (b), together with the fee as specified in ch. Ind 69 for equipment approval.

Note: The purpose of the technical report is to show that the equipment is in complete compliance with the national standard by which the equipment is designed, constructed and tested.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-75; r. and recr. Register, December, 1976, No. 252, eff. 1-1-77; am. (5), Register, December, 1977, No. 264, eff. 1-1-78; am. (1), Register, December, 1981, No. 312, eff. 1-1-82.

**Ind 64.21 Location of equipment.** The various types of heating equipment and the corresponding types of occupancies in which the equipment may be located are shown in Table 64.21. The footnotes below the table designate special requirements for the listed equipment.

Note: The department will accept net ratings as listed by Mechanical Contractors Association of America, Inc., Institute of Boiler and Radiator Manufacturers, and equipment tested according to commercial standard 140-47.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; r. and recr. Register, December, 1976, No. 252, eff. 1-1-77.

**Ind 64.22 Special requirements. (1) BOILERS AND PRESSURE VESSELS.** (a) *Construction standards.* Boilers and pressure vessels shall be constructed and installed in compliance with the standards of the American Society of Mechanical Engineers, as adopted under chs. Ind 41-42.

(b) *Installation notification.* The installing contractor shall notify the department of boiler installation, in accordance with the requirements of s. Ind 41.05, before the boiler or pressure vessel is put into operation.

(2) **FURNACES.** Forced-air heating systems shall be designed to prevent a negative pressure on the heat exchanger.

(3) **SUSPENDED AND GUARDED EQUIPMENT.** Equipment suspended or guarded as specified in s. Ind 64.21 shall be installed in an occupied space. The equipment shall be visible to persons within the room.

(a) If the entering air to the heat exchanger of all gas-fired equipment is 30° F. or lower, the heat exchanger and burners shall be constructed of corrosion-resistive materials.

(4) **GAS OR OIL-FIRED RADIANT HEATERS.** Gas or oil-fired radiant heaters are subject to the following provisions:

(a) The heaters shall be equipped with an automatic pilot of the complete shutoff type or with a 100% shutoff electric ignition;

(b) If unvented radiant heaters are used, gravity or mechanical means shall be provided to exhaust at least 4 CFM per 1000 Btu per hour input of installed heaters. Provisions shall be made for an equal supply of outside air;

(c) Exhaust openings for removing products of combustion shall be provided above the level of the radiant heaters; and

(d) Oil-fired radiant heaters shall be equipped with mechanical pressure-atomizing burners.

TABLE 64.21—LOCATION OF EQUIPMENT

Location and Type of Occupancy	VESTED UNITS						UNVENTED UNITS		ELECTRIC Furnaces, Unit Heaters, Heat Pumps, Baseboard Heaters, etc.	WATER OR STEAM Unit Ventilators, Heaters, Makeup Air Units, Baseboard Heaters, etc.
	Gas or Oil or Solid Fuel Boilers	Gas or Oil or Solid Fuel Furnaces		Gas or Oil Unit Heater	Gas or Oil Infrared	Gas or Oil Space Heater	Solid Fuel Space Heater or Fireplace <sup>11</sup>	Gas Oil Fired Makeup Air <sup>1</sup>		
	Rated Enclosure	Rated Enclosure	Suspended or Guarded <sup>2</sup>	Suspended or Guarded <sup>2</sup>	Suspended or Guarded <sup>2</sup>			Suspended or Guarded <sup>2</sup>	Suspended or Guarded <sup>2</sup>	
<b>Type of Occupancy</b>										
Factories	Yes	Yes <sup>2</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Mercantile buildings	Yes	Yes	Yes	Yes	Yes	N.P. <sup>3</sup>	N.P. <sup>3</sup>	N.P.	N.P.	
Office Buildings	Yes	Yes	Yes	Yes	N.P.	Yes	Yes	N.P.	N.P.	
Places of assembly, entertain- ment, recreation, worship or dining (100 persons or less)	Yes	Yes	Yes	Yes	Yes	N.P. <sup>3</sup>	N.P. <sup>3</sup>	N.P. <sup>4</sup>	N.P.	
Tennis facilities (court areas only)	Yes	Yes	Yes	Yes	Yes	N.P.	N.P.	N.P.	N.P.	
Tennis facilities (all other areas)	Yes	Yes	N.P. <sup>5</sup>	N.P. <sup>5</sup>	N.P.	N.P.	Yes	N.P.	N.P.	
Theaters & places of assembly, entertainment, recreation, worship or dining (more than 100 persons)	Yes	Yes	N.P.	N.P.	N.P.	N.P.	N.P. <sup>3</sup>	N.P.	N.P.	
Restaurants	Yes	Yes	N.P.	N.P.	N.P.	N.P.	N.P. <sup>3</sup>	N.P. <sup>5</sup>	N.P.	
Tennis facilities (court areas only)	Yes	Yes	Yes	Yes	Yes	N.P.	N.P.	N.P.	N.P.	
Tennis facilities (all other areas)	Yes	Yes	N.P. <sup>5</sup>	N.P. <sup>5</sup>	N.P.	N.P.	Yes	N.P.	N.P.	
Schools & other places of instruction	Yes	Yes	N.P. <sup>6</sup>	N.P. <sup>6</sup>	N.P.	N.P.	N.P.	N.P. <sup>6</sup>	N.P.	
Hospitals, nursing homes & penal institutions	Yes	Yes	N.P.	N.P.	N.P.	N.P.	N.P. <sup>7</sup>	N.P.	N.P.	
Residential occupancies	Yes	Yes	N.P.	N.P.	N.P.	N.P.	N.P. <sup>8</sup>	N.P.	N.P.	
Hazardous Occupancies										
Garages	Yes	Yes	Yes <sup>9</sup>	Yes <sup>9</sup>	Yes <sup>9</sup>	N.P. <sup>13</sup>	N.P. <sup>14</sup>	Yes <sup>9</sup>	Yes <sup>9</sup>	
Aircraft hangars	Yes	Yes	Yes <sup>10</sup>	Yes <sup>10</sup>	Yes <sup>10</sup>	N.P.	N.P.	Yes <sup>10</sup>	Yes <sup>10</sup>	
Day care centers	Yes <sup>15</sup>	Yes <sup>12</sup>	N.P.	N.P.	N.P.	N.P.	N.P.	N.P.	N.P.	
Community Based Residential Facilities <sup>16</sup>	Yes	Yes	N.P.	N.P.	N.P.	N.P.	Yes	N.P.	N.P.	

N.P. = Not Permitted

Unlisted occupancies - Use the listed occupancy in the table that is most similar to the subject occupancy.

Clearances - Equipment shall be installed in accordance with the clearance from combustibles indicated in the name plate of the unit.

<sup>1</sup> Direct-fired makeup air units shall be mechanically exhausted in the range of 90% to 150% of the air supplied.<sup>2</sup> Where permitted, such equipment shall be located in an occupied space (see s. Ind 64.22 (3)) and suspended at least 7 feet above the floor or guarded to maintain clearances to combustibles and prevent accidental damage. Suspension of solid-fuel fired equipment is not permitted. Central furnaces with 400,000 Btu/hr or greater fuel input rating must be enclosed. See s. Ind 54.14 (3) for additional requirements.<sup>3</sup> Permitted in occupancies less than 1500 square feet gross area with combustion air ducted to unit.<sup>4</sup> Permitted in kitchens to provide makeup air for kitchen exhaust systems if located outside building or in a rated enclosure.<sup>5</sup> Spectator areas in tennis facilities may be served by suspended equipment located in court areas.<sup>6</sup> Permitted only in shops with a 4-hour separation from other parts of the building.<sup>7</sup> Fireplaces may be installed and used only in areas other than patient sleeping areas provided those areas are separated from the patient sleeping areas by construction having at least a one-hour fire-resistive rating. The fireplace shall be equipped with safety screens and a heat tempered glass fireplace enclosure capable of withstanding temperatures up to 650° F.<sup>8</sup> Gas-fired, direct-vent wall furnaces are permitted in apartments and motels.<sup>9</sup> Suspended heating units are allowed in garages if located at least 8 feet off the floor. Suspension of solid-fuel fired equipment is not permitted.<sup>10</sup> Suspended heating units are allowed if located at least 10 feet above the upper surface of the wings or engine enclosure of the aircraft. Suspension of solid-fuel fired equipment is not permitted.<sup>11</sup> All solid-fuel fired space heaters and fireplaces shall be located in occupied space or in a space provided with approved smoke detectors and located or guarded to maintain clearances to combustibles and prevent accidental damage or contact with hot surfaces. Solid-fuel burning stoves are limited to 150,000 BTU/hr output.<sup>12</sup> Solid-fuel fired space heaters and fireplaces are permitted in rowhouse units. Masonry fireplaces with or without inserts and built-in factory-built fireplace-type units only are permitted in all other residential occupancies.<sup>13</sup> Waste oil burners are permitted provided they are installed on mezzanines or service platforms located at least 8'-0" above the main floor, are visible from the main floor and are guarded as specified in this section.<sup>14</sup> Solid-fuel burning devices are permitted provided they are installed on mezzanines or service platforms located at least 8'-0" above the main floor, are visible from the main floor and are guarded as specified in this section.<sup>15</sup> See s. Ind 60.25 for smoke detector alternative.<sup>16</sup> See s. Ind 61.24 for requirements.Register, June, 1988, No. 380  
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(5) **SPACE HEATERS.** Space heaters shall comply with the following provisions:

(a) The burner of the appliance shall be enclosed with a metal housing so constructed that there will be no open flame and the burner housing shall be effectively guarded against personal contact. The arrangement shall be such that the shield will prevent any combustible material in the vicinity of the appliance from coming in contact with the flame or with the housing that encloses the burner. Oil-fired space heaters shall be equipped with a mechanical pressure atomizing burner; and

(b) Space heaters shall not be equipped with duct extensions beyond the vertical and horizontal limits of the metal enclosure.

(6) **EQUIPMENT IN HAZARDOUS LOCATIONS.** The types of heating and ventilating equipment that may be installed in hazardous locations (as defined in Article 500 of the National Electrical Code) are as follows:

(a) Listed low-pressure steam or hot water unit heaters and makeup air units; and

(b) Listed electric units.

(7) **FIREPLACES AND FIREPLACE STOVES.** Masonry fireplaces, factory-built fireplaces and factory-built fireplace stoves shall be constructed and installed in accordance with the NFPA standard No. 211—Standard for Chimneys, Fireplaces and Vents.

(a) *Masonry fireplaces.* 1. Masonry fireplaces shall be constructed of solid masonry units, stone or reinforced portland or refractory cement concrete.

a. Where a lining of low-duty firebrick complying with the provisions of ASTM C64, or the equivalent, at least 2 inches thick laid-in fire-clay mortar complying with the provisions of ASTM C105, or the equivalent, or other approved lining is provided, the total thickness of back and sides, including the lining, shall be not less than 8 inches.

b. Where the lining described in subpar. a. is not provided, the thickness of back and sides shall be not less than 12 inches.

2. Steel fireplace units incorporating a firebox liner of not less than ¼ inch thick steel and an air chamber shall be installed with masonry to provide a total thickness at the back and sides of not less than 8 inches, not less than 4 inches of which shall be solid masonry.

3. Warm air ducts employed with steel fireplace units of the circulating air type shall be constructed of metal or masonry.

4. Fireplace hearth extensions of approved noncombustible material for all fireplaces shall be provided.

a. Where the fireplace opening is less than 6 square feet, the hearth extension shall extend at least 16 inches in front of, and at least 8 inches beyond each side of the fireplace opening.

b. Where the fireplace opening is 6 square feet or larger, the hearth extension shall extend at least 20 inches in front of, and at least 12 inches beyond each side of the fireplace opening.

(b) *Required exhaust hood.* Exhaust hoods shall be required where frying and/or broiling is done (includes deep-fat frying and surface frying), and where cooking is a regular commercial operation (includes ranges, griddles, fryers, broilers and similar grease-producing equipment).

(3) **REPLACEMENT AIR.** Adequate replacement air shall be provided to equal the air being exhausted by all exhaust systems.

(4) **EXHAUST HOOD REQUIREMENTS.** (a) *Size of hood.* The horizontal inside dimensions for canopy hoods shall be sized to effectively capture grease vapors, but in no case shall these dimensions be less than the overall horizontal dimensions of the grease-producing equipment. The horizontal inside dimensions for noncanopy, prefabricated backshelf hoods may be less than the overall horizontal dimensions of the grease-producing equipment.

(b) *Exhaust rates.* The kitchen exhaust hood shall be provided with a capture velocity to effectively capture the grease vapors and may be designed through engineering analysis or the empirical design formulas stated below:

1. *Canopy hood.* Hood open on all 4 sides:  $Q = 150 A$  (area).

2. *Wall hood.* Hood open on 3 sides or less:  $Q = 100 A$  (area).

3. *Slotted-type hood.*  $V = 350$  feet per minute through the slot opening. The slot shall be at least 3 inches in width.

4. *Noncanopy hood.* The minimum volume of exhaust air for noncanopy type hoods (prefabricated backshelf) shall be not less than  $Q = 300 L$  (length).

Note:  $Q$  equals the exhaust air in cubic feet per minute;  $A$  equals the area of the hood over the grease-producing equipment in square feet;  $V$  equals the velocity in feet per minute; and  $L$  equals the total length in feet of the cooking appliance being ventilated, and measured parallel to the front edge of the appliance.

(c) *Materials.* Hoods shall be constructed and supported by steel not less than .0478 inch U.S. standard gage (No. 18 manufacturers standard gage) or stainless steel not less than .0359 inch U.S. standard gage (No. 20 manufacturers standard gage) or other materials of equivalent strength, fire and corrosion resistance.

(d) *Seams.* All seams and joints shall be liquid-tight.

(e) *Grease-removal devices.* Approved grease extractors, grease filters or other grease-removal devices shall be provided.

(f) *Exposed hood surfaces.* Hood surfaces and exposed exhaust ducts within 18 inches of combustible material shall be protected as specified in sub. (5) (f).

(g) *Concealed hood surfaces.* Hood surfaces that are concealed by or recessed into adjoining construction shall be protected as specified in sub. (5) (f).

(h) *Double-wall hoods utilizing outdoor air.* When hoods are connected to ducts supplying outside air, performance data shall be submitted.

Note: Double-wall hoods provided with a supply of outdoor air conserve energy.

(5) **EXHAUST DUCTS FROM HOODS.** (a) *Design.* All ducts shall lead, as directly as possible, to the exterior of the building without forming dips or traps which collect residues. Ducts exposed to the exterior shall be protected with a suitable weatherproof coating.

Note: Temperatures in excess of 2000° F. may be experienced within ducts in the event of fire. A means of expansion of long ducts should be considered.

(b) *Materials.* Ducts shall be constructed of and supported by steel not lighter than .0598 inch U.S. standard gage (No. 16 manufacturers standard gage) or stainless steel not lighter than .0478 inch U.S. standard gage (No. 18 manufacturers standard gage) or other materials of equivalent strength, fire and corrosion resistance.

(c) *Seams and joints.* All seams and joints shall be liquid-tight.

(d) *Clean-out openings.* Accessible clean-out openings at the sides of ducts shall be provided at each change of direction of the duct for inspection and servicing.

(e) *Interior ducts.* Ducts shall not pass through required fire walls or partitions.

(f) *Concealed exhaust ducts.* 1. Horizontal ducts. Horizontal concealed ducts connected to hoods that pass through any other area of the building, including suspended ceilings, shall be protected with insulating material to withstand a flue temperature of not less than 1000° F. The temperature of the exposed surface of the insulating material shall not exceed 250° F. above the normal ambient temperature of 68° F.

Note: The department will accept the use of masonry chimneys or manufactured chimneys which are tested and approved for use at a flue gas temperature of not less than 1000° F., or insulating materials for fire endurance systems listed in the Fire Resistance Index published by Underwriters' Laboratories, Inc.

2. Vertical ducts. Vertical concealed ducts that pass through any other area of the building, including suspended ceilings, in one- and 2-story buildings, shall be protected with insulating material as specified in subd. 1., or shall be located in 2-hour noncombustible fire-resistive enclosures. In buildings of 3 or more stories, vertical ducts shall be located in 2-hour noncombustible fire-resistive enclosures.

(g) *Exposed exhaust ducts.* Exposed exhaust ducts connected to hoods or canopies shall be located not less than 18 inches from combustible material unless the duct is protected in accordance with the requirements of par. (f).

(h) *Air discharge.* The air discharge shall be directed away from the roof or combustible materials.

(i) *Dampers.* Fire dampers shall not be installed in kitchen exhaust duct systems unless the assembly includes an approved extinguishing system designed to operate with a fire damper in the closed position.

(6) **AUTOMATIC SUPPRESSION SYSTEMS.** Exhaust hoods and ducts in kitchens used for commercial purposes shall be protected by an approved automatic fire suppression system. The suppression system shall comply with the following:

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(a) When the fire suppression system is activated, all gas and electrical sources serving cooking appliances, grease consuming appliances or fume incinerators and equipment associated with the hoods shall be automatically deactivated. Such gas and electrical sources shall not be capable of reactivation except by manual means after the fire suppression system has been serviced and is again ready for action;

(b) 1. Except as provided in subd. 2., hood and duct suppression systems shall provide for both automatic and manual actuation of the system;

2. Automatic fire sprinkler systems using water need not be provided with means for manual actuation.

(c) A manual station for actuation of the suppression system shall be located at or near one of the means of egress from the area but not nearer than 10 feet to the range hood unless otherwise specifically approved, and shall be securely mounted not less than 4½ feet nor more than 5 feet above the floor;

(d) The system shall be maintained at full operating capacity by the owner and shall be serviced every 6 months; and

(e) All nozzles shall be accessible for cleaning and replacement.

History: Cr. Register, December, 1976, No. 240, eff. 1-1-76; renum. from 64.66, r. and rec. (5) (a) to (d), renum. (5) (e) to (i) to be (5) (d) to (h), am. (6) (b), Register, December, 1976, No. 252, eff. 1-1-77; am. (5) (f) and (g), Register, December, 1977, No. 264, eff. 1-1-78; am. (4) and (6) (f) 1., Register, December, 1978, No. 276, eff. 1-1-79; am. (2)(a), r. (4), renum. (5) and (6) to be (4) and (5), Register, January, 1980, No. 289, eff. 2-1-80; am. (2) (a), (4) (f) and (g), Register, December, 1981, No. 312, eff. 1-1-82; cr. (6), Register, June, 1983, No. 330, eff. 7-1-83.

Ind 64.68 Seasonal occupancies. When approved in writing by the department, heating requirements may be waived but not ventilation required by s. Ind 64.05, Table 1 during the period of May 15 through September 15 for the following or similar occupancies: drive-in eating places, club houses, outdoor toilets, camp lodge buildings, canning factories and migrant labor camps.

Note: Rules on migrant labor can be found in ch. Ind 201.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; renum. from 64.67, Register, December, 1976, No. 252, eff. 1-1-77; am., Register, December, 1981, No. 312, eff. 1-1-82.