

CHAPTER 64

HEATING AND COOLING EQUIPMENT

SECTION 6401 GENERAL

6401.1 Installation. Heating and cooling equipment and appliances shall be installed in accordance with the manufacturer's installation instructions and the requirements of this code *or the Massachusetts Specialized Code (248 CMR, 522CMR, 527 CMR and/or 528 CMR), as applicable.*

6401.2 Access. Heating and cooling equipment shall be located with respect to building construction and other equipment to permit maintenance, servicing and replacement. Clearances shall be maintained to permit cleaning of heating and cooling surfaces; replacement of filters, blowers, motors, controls and vent connections; lubrication of moving parts; and adjustments *[refer to the manufacturer's requirements and this code or the Massachusetts Specialized Codes (248 CMR or 527 CMR), as applicable].*

6401.3 Sizing. Heating and cooling equipment shall be sized based on building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies *(refer to Chapter 61 of this code for detailed requirements).*

6401.4 Exterior installations. Equipment installed outdoors shall be listed and labeled for outdoor installation. Supports and foundations shall prevent excessive vibration, settlement or movement of the equipment. Supports and foundations shall be level and conform to the manufacturer's installation instructions.

6401.5 Flood hazard. In areas prone to flooding as established by Table 5301.2(1), heating and cooling equipment and appliances shall be located or installed in accordance with Section 5323.1.5.

SECTION 6402 CENTRAL FURNACES

6402.1 General. *Gas-fired furnaces shall conform to the requirements of 248 CMR and the efficiency and sizing requirements of this code. Oil-fired central furnaces shall conform to requirements of 527 CMR 4 and the efficiency and sizing requirements of this code. Electric furnaces shall conform to the requirements of 527 CMR 12.*

6402.2 Clearances. Clearances shall be provided in accordance with the listing and the manufacturer's installation instructions; *the requirements of 248 CMR or 527 CMR, as applicable, or this code when applicable.*

6402.3 Combustion air. Combustion air shall be supplied in accordance with Chapter 67. Combustion air openings shall be unobstructed for a distance of not less than 6 inches (152 mm) in front of the openings.

SECTION 6403 HEAT PUMP EQUIPMENT

6403.1 Heat pumps. The minimum unobstructed total area of the outside and return air ducts or openings to a heat pump shall be not less than 6 square inches per 1,000 Btu/h (13 208 mm²/kW) output rating or as indicated by the conditions of the listing of the heat pump. Electric heat pumps shall conform to *the requirements of 527 CMR 12 or UL 1995, as applicable.*

6403.2 Foundations and supports. Supports and foundations for the outdoor unit of a heat pump shall be raised at least 3 inches (76 mm) above the ground to permit free drainage of defrost water, and shall conform to the manufacturer's installation instructions.

SECTION 6404 REFRIGERATION COOLING EQUIPMENT

6404.1 Compliance. Refrigeration cooling equipment shall comply with Section 6411.

SECTION 6405 BASEBOARD CONVECTORS

6405.1 General. Electric baseboard convectors shall be installed in accordance with the manufacturer's installation instructions and *527 CMR 12.*

SECTION 6406 RADIANT HEATING SYSTEMS

6406.1 General. Electric radiant heating systems shall be installed in accordance with the manufacturer's installation instructions and *527 CMR 12.*

6406.2 Clearances. Clearances for radiant heating panels or elements to any wiring, outlet boxes and junction boxes used for installing electrical devices or mounting lighting fixtures shall comply with *the requirement of 527 CMR 12 and the manufacturer's requirements.*

6406.3 Installation of radiant panels. *Unless controlled by 527 CMR 12,* radiant panels installed on wood framing shall conform to *the manufacturer's installation requirements and* the following requirements:

1. Heating panels shall be installed parallel to framing members and secured to the surface of framing members or mounted between framing members.
2. Panels shall be nailed or stapled only through the unheated portions provided for this purpose and shall not be fastened at any point closer than 1/4 inch (6.4 mm) from an element.
3. Unless listed and labeled for field cutting, heating panels shall be installed as complete units.

6406.4 Installation in concrete or masonry. Radiant heating systems installed in concrete or masonry shall conform to the following requirements:

1. Radiant heating systems shall be identified as being suitable for the installation, and shall be secured in place, as specified in the manufacturer's installation instructions.
2. Radiant heating panels or radiant heating panel sets shall not be installed where they bridge expansion joints unless protected from expansion and contraction.

6406.5 Gypsum panels. Where radiant heating systems are used on gypsum assemblies, operating temperatures shall not exceed 125°F (52°C).

6406.6 Finish surfaces. Finish materials installed over radiant heating panels or systems shall be installed in accordance with the manufacturer's installation instructions. Surfaces shall be secured so that nails or other fastenings do not pierce the radiant heating elements.

SECTION 6407 DUCT HEATERS

6407.1 General. Electric duct heaters shall be installed in accordance with the manufacturer's installation instructions and 527 CMR 12. Electric furnaces shall be tested in accordance with *the requirements of 527 CMR 12 or UL 1995, as applicable*.

6407.2 Installation. Electric duct heaters shall be installed so that they will not create a fire hazard. Class 1 ducts, duct coverings and linings shall be interrupted at each heater to provide the clearances specified in the manufacturer's installation instructions. Such interruptions are not required for duct heaters listed and labeled for zero clearance to combustible materials. Insulation installed in the immediate area of each heater shall be classified for the maximum temperature produced on the duct surface.

6407.3 Installation with heat pumps and air conditioners. Duct heaters located within 4 feet (1219 mm) of a heat pump or air conditioner shall be listed and labeled for such installations. The heat pump or air conditioner shall additionally be listed and labeled for such duct heater installations.

6407.4 Access. Duct heaters, in accordance with manufacturer's requirements and 527 CMR 12 shall be accessible for servicing, and clearance shall be maintained to permit adjustment, servicing and replacement of controls and heating elements.

6407.5 Fan interlock. The fan circuit shall be provided with an interlock to prevent heater operation when the fan is not operating (*also see Chapter 61 of this code*).

SECTION 6408 VENTED FLOOR FURNACES

6408.1 General. Vented floor furnaces shall conform to the requirements of the *Massachusetts Specialized Codes (248 CMR or 527 CMR)*, as applicable, and be installed in accordance

with their listing, the manufacturer's installation instructions and the requirements of this code, if applicable.

6408.2 Clearances. Vented floor furnaces shall be installed in accordance with their listing and the manufacturer's installation instructions, *any applicable requirements of the Massachusetts Specialized Codes and the requirements of this code (see Section 6408.3 of this code), if applicable.*

6408.3 Location. Location of floor furnaces shall conform to the following requirements:

1. Floor registers of floor furnaces shall be installed not less than 6 inches (152 mm) from a wall.
2. Wall registers of floor furnaces shall be installed not less than 6 inches (152 mm) from the adjoining wall at inside corners.
3. The furnace register shall be located not less than 12 inches (305 mm) from doors in any position, draperies or similar combustible objects.
4. The furnace register shall be located at least 5 feet (1524 mm) below any projecting combustible materials.
5. The floor furnace burner assembly shall not project into an occupied under-floor area.
6. The floor furnace shall not be installed in concrete floor construction built on grade.
7. The floor furnace shall not be installed where a door can swing within 12 inches (305 mm) of the grill opening.

6408.4 Access. An opening in the foundation not less than 18 inches by 24 inches (457 mm by 610 mm), or a trap door not less than 22 inches by 30 inches (559 mm by 762 mm) shall be provided for access to a floor furnace. The opening and passageway shall be large enough to allow replacement of any part of the equipment.

6408.5 Installation. Floor furnace installations shall conform to the following requirements:

1. Thermostats controlling floor furnaces shall be located in the room in which the register of the floor furnace is located.
2. Floor furnaces shall be supported independently of the furnace floor register.
3. Floor furnaces shall be installed not closer than 6 inches (152 mm) to the ground. Clearance may be reduced to 2 inches (51 mm), provided that the lower 6 inches (152 mm) of the furnace is sealed to prevent water entry.
4. Where excavation is required for a floor furnace installation, the excavation shall extend 30 inches (762 mm) beyond the control side of the floor furnace and 12 inches (305 mm) beyond the remaining sides. Excavations shall slope outward from the perimeter of the base of the excavation to the surrounding grade at an angle not exceeding 45 degrees (0.39 rad) from horizontal.
5. Floor furnaces shall not be supported from the ground.

SECTION 6409 VENTED WALL FURNACES

6409.1 General. Vented wall furnaces shall conform to the requirements of the *Massachusetts Specialized Codes (248 CMR or 527 CMR)*, as applicable, and be installed in accordance with their listing, the manufacturer's installation instructions and the requirements of this code, if applicable (see Section 6409.2 of this code).

6409.2 Location. The location of vented wall furnaces shall conform to the following requirements:

1. Vented wall furnaces shall be located so as not to cause a fire hazard to walls, floors, combustible furnishings or doors. Vented wall furnaces installed between bathrooms and adjoining rooms shall not circulate air from bathrooms to other parts of the building.
2. Vented wall furnaces shall not be located where a door can swing within 12 inches (305 mm) of the furnace air inlet or outlet measured at right angles to the opening. Doorstops or door closers shall not be installed to obtain this clearance.

6409.3 Installation. Vented wall furnace installations shall conform to the following requirements:

1. Required wall thicknesses shall be in accordance with the manufacturer's installation instructions.
2. Ducts shall not be attached to a wall furnace. Casing extensions or boots shall only be installed when listed as part of a listed and labeled appliance.
3. A manual shut off valve shall be installed ahead of all controls.

6409.4 Access. Vented wall furnaces shall be provided with access for cleaning of heating surfaces; removal of burners; replacement of sections, motors, controls, filters and other working parts; and for adjustments and lubrication of parts requiring such attention. Panels, grilles and access doors that must be removed for normal servicing operations shall not be attached to the building construction.

SECTION 6410 VENTED ROOM HEATERS

6410.1 General. Vented room heaters shall be tested in accordance with UL 6482 or UL 896 and installed in accordance with their listing, the manufacturer's installation instructions, the requirements of the *Massachusetts Specialized Codes (248 CMR or 527 CMR)*, as applicable, and the requirements of this code, if applicable.

6410.2 Floor mounting. Room heaters shall be installed on noncombustible floors or approved assemblies constructed of noncombustible materials that extend at least 18 inches (457 mm) beyond the appliance on all sides.

Exceptions:

1. Listed room heaters shall be installed on non-combustible floors, assemblies constructed of non-combustible materials or listed floor protectors with

materials and dimensions in accordance with the appliance manufacturer's instructions.

2. Room heaters listed for installation on combustible floors without floor protection shall be installed in accordance with the appliance manufacturer's instructions.

SECTION 6411 REFRIGERATION COOLING EQUIPMENT

6411.1 Approved refrigerants. Refrigerants used in direct refrigerating systems shall conform to the applicable provisions of ANSI/ASHRAE 34.

6411.2 Refrigeration coils in warm-air furnaces. Where a cooling coil is located in the supply plenum of a warm-air furnace, the furnace blower shall be rated at not less than 0.5-inch water column (124 Pa) static pressure unless the furnace is listed and labeled for use with a cooling coil. Cooling coils shall not be located upstream from heat exchangers unless listed and labeled for such use. Conversion of existing furnaces for use with cooling coils shall be permitted provided the furnace will operate within the temperature rise specified for the furnace *and such conversions otherwise conform to any applicable requirements of the Massachusetts Specialized Codes (248 CMR or 527 CMR)*.

6411.3 Condensate disposal. Condensate from all cooling coils or evaporators shall be conveyed from the drain pan outlet an approved place of disposal (*approved disposal per the requirements of 248 CMR when applicable*). Condensate shall not discharge into a street, alley or other areas so as to cause a nuisance.

6411.3.1 Auxiliary and secondary drain systems. In addition to the requirements of Section 6411.3, a secondary drain or auxiliary drain pan shall be required for each cooling or evaporator coil where damage to any building components will occur as a result of overflow from the equipment drain pan or stoppage in the condensate drain piping. Drain piping shall be a minimum of 3/4-inch (19.1 mm) nominal pipe size. One of the following methods shall be used:

1. An auxiliary drain pan with a separate drain shall be provided under the coils on which condensation will occur. The auxiliary pan drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The pan shall have a minimum depth of 1.5 inches (38 mm), shall not be less than 3 inches (76 mm) larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion resistant material. Metallic pans shall have a minimum thickness of not less than 0.0276-inch (0.7 mm) galvanized sheet metal. Non-metallic pans shall have a minimum thickness of not less than 0.0625 inch (1.6 mm).
2. A separate overflow drain line shall be connected to the drain pan provided with the equipment. Such overflow drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line

shall connect to the drain pan at a higher level than the primary drain connection.

3. An auxiliary drain pan without a separate drain line shall be provided under the coils on which condensate will occur. Such pan shall be equipped with a water level detection device that will shut off the equipment served prior to overflow of the pan. The auxiliary drain pan shall be constructed in accordance with Item 1 of this section.

6411.3.2 Drain pipe materials and sizes. *Drain pipe materials shall be selected to be compatible with the condensate product carried.* Components of the condensate disposal system shall be cast iron, galvanized steel, copper, polybutylene, polyethylene, ABS, CPVC or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. Condensate waste and drain line size shall be not less than $\frac{3}{4}$ -inch (91mm) internal diameter and shall not decrease in size from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method. All horizontal sections of drain piping shall be installed in uniform alignment at a uniform slope.

6411.4 Insulation of refrigerant piping. Piping and fittings for refrigerant vapor (suction) lines shall be insulated with insulation having a thermal resistivity of at least $R = 4.0 \text{ hr} \cdot \text{ft}^2 \cdot ^\circ\text{F}/\text{Btu}$ and having external surface permeance not exceeding 0.05 perms [$2.87 \text{ ng}/(\text{s} \cdot \text{m}^2 \cdot \text{Pa})$] when tested in accordance with ASTM E 96 (*also see Chapter 61 of this code*).

SECTION 6412 ABSORPTION COOLING EQUIPMENT

6412.1 Approval of equipment. Absorption systems shall be installed in accordance with the manufacturer's installation instructions; *the applicable requirements of the Massachusetts Specialized Codes (248 CMR and/or 522 CMR and/or 527 CMR and/or 528 CMR), or otherwise in accordance with this code.*

6412.2 Condensate disposal. Condensate from the cooling coil shall be disposed of as provided in Section 6411.3.

6412.3 Insulation of piping. Refrigerant piping, brine piping and fittings within a building shall be insulated to prevent condensation from forming on piping (*also see Chapter 61 of this code*).

6412.4 Pressure-relief protection. Absorption systems shall be protected by a pressure-relief device *in accordance with the requirements of 522 CMR and the manufacturer of such absorption systems.* Discharge from the pressure-relief device shall be located so as not to create a hazard to persons or property.

SECTION 6413 EVAPORATIVE COOLING EQUIPMENT

6413.1 General. Cooling equipment that utilizes evaporation of water for cooling shall be installed in accordance with the manufacturer's installation instructions; *the applicable requirements of the Massachusetts Specialized Codes (248 CMR or 522 CMR or 527 CMR), or otherwise in accordance with this code.* Evaporative coolers shall be installed on a level platform or base not less than 3 inches (76 mm) above the adjoining ground and secured to prevent displacement. Openings in exterior walls shall be flashed in accordance with Section R5703.8.

6413.2 Protection of potable water. The potable water system shall be protected from backflow in accordance with the provisions of 310 CMR.

SECTION 6414 FIREPLACE STOVES

6414.1 General. *See Chapter 60, Section 6008 of this code.*

6414.2 Hearth extensions. *See Chapter 60, Section 6008 of this code.*

SECTION 6415 MASONRY HEATERS

6415.1 General. *See Chapter 60, Section 6006 of this code.*