

CITY OF HOUSTON
BUILDING CODE ENFORCEMENT



2012 UMC

HOUSTON AMENDMENT PACKAGE

CHAPTER 2

DEFINITIONS

203.0

- A -

Authority Having Jurisdiction – ~~The jurisdiction's Director of the Public Works and Engineering Department, who is appointed to administer and enforce the provisions of this code, organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, installations, or procedures. The Authority Having Jurisdiction shall be a federal, state, local, or other regional department or an individual such as a plumbing official, mechanical official, labor department official, health department official, building official, or others having statutory authority. In the absence of a statutory authority, the Authority Having Jurisdiction may be some other responsible party. This definition shall include the Authority Having Jurisdiction's duly authorized representatives.~~

204.0

- B -

Building Code. The building code that is adopted by this jurisdiction, also known as the *City of Houston Building Code*.

Building Official. The Authority Having Jurisdiction.

Building Thermal Envelope. The basement walls, exterior walls, floor, roof, and any other building elements that enclose conditioned space or provides a boundary between conditioned space and exempt or unconditioned space.

205.0

- C -

City Code. The Code of Ordinances, Houston, Texas.

206.0

- D -

Design Flood Elevation. See Chapter 19 of the City Code for provisions regarding the flood plain. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. In areas designated as Zone AO, the design flood elevation is the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number is taken as being equal to 2 feet (610 mm).

207.0

- E -

Electrical Code. The National Electrical Code promulgated by the National Fire Protection Association, as adopted by this jurisdiction, also known as the *City of Houston Electrical Code*.

208.0

- F -

Fire Code. The fire code adopted by this jurisdiction, also known as the *City of Houston Fire Code*.

Flood Hazard Area. ~~The greater of the following two areas:~~

~~(1) The area within a floodplain subject to a 1 percent or greater chance of flooding in any given year.~~

~~(2) The area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated. See Chapter 19 of the City Code for provisions regarding the flood plain.~~

~~**Flood Hazard Area Subject To High Velocity Wave Action.** An area within the flood hazard area that is subject to high velocity wave action, and shown on a Flood Insurance Rate Map or other flood hazard map as Zone V, VO, VE, or VI-30. See Chapter 19 of the City Code for provisions regarding the flood plain.~~

215.0

- M -

~~**Mechanical Integrity.** The physical installation of products, systems, or equipment in accordance with their intended purpose and according to the manufacturer's specifications and manufacturer's installation instructions.~~

218.0

- P -

~~**Plumbing Code.** The plumbing code adopted by this jurisdiction, also known as the City of Houston Uniform Plumbing Code promulgated by the International Association of Plumbing and Mechanical Officials, adopted by this jurisdiction.~~

220.0

- R -

~~**International Residential Code.** The residential code that is adopted by this jurisdiction, also known as the *City of Houston Residential Code* based on the *International Residential Code for One- and Two-Family Dwellings*, as adopted by the State of Texas in Subchapter G of Chapter 214 of the Texas Local Government Code, with amendments adopted by this jurisdiction.~~

{**EDITOR'S NOTE:** ALL OTHER PORTIONS OF **CHAPTER 2** REMAIN AS SET FORTH IN THE *2012 UNIFORM MECHANICAL CODE.*}

CHAPTER 3

GENERAL REQUIREMENTS

304.2.1 Access from Inside. Buildings exceeding 15 feet (4572 mm) in height shall have an inside means of access to the roof, ~~unless other means acceptable to the Authority Having Jurisdiction are used.~~ [NFPA 54:9.4.3.2]

304.2.1.1 Door or Scuttle. The inside means of access shall be a permanent or foldaway inside stairway or ladder, ~~terminating in an enclosure, scuttle, or trap door. Such scuttles or trap doors shall be not less than 22 inches by 24 inches (559 mm by 610 mm) in size, shall open easily and safely under all conditions, especially snow, and shall be constructed so as to permit access on the inside.~~ with a clear pathway not less than 22 inches in width and a load capacity of not less than 350 pounds and an unobstructed passageway as large as the largest piece of equipment and in no case less than thirty (30) inches by thirty (30) inches (762 mm × 762 mm) continuous from the equipment and its controls."

Not less than ~~6-10~~ 6-10 feet (1829 ~~3048~~ mm) of clearance shall be between the access opening and the edge of the roof or similar hazard within 10 feet, or rigidly fixed rails or guards not less than 42 inches (1067 mm) in height with vertical rails not more than twenty-one (21) inches (533 mm) apart, shall be provided on the exposed side. Where parapets or other building structures are utilized in lieu of guards or rails, they shall be not less than 42 inches (1067 mm) in height. [NFPA 54:9.4.3.3]

304.2.1.3 Attics and underfloor spaces. An attic or furred space in which a warm-air furnace is installed shall be provided with a permanent or pull down stairway with a clear opening not less than 22 inches in width and a load capacity of not less than 350 pounds and an unobstructed passageway as large as the largest piece of the furnace and in no case less than thirty (30) inches by thirty (30) inches (762 mm × 762 mm) continuous from the opening to the furnace and its controls.

308.1 Protection Against Damage. ~~Gas utilization a~~ Appliances in garages and in adjacent spaces that open to the garage and are not part of the living space of a dwelling unit shall be installed so that burners, ignition sources and burner-ignition devices are located not less than 18 inches (457 mm) above the floor unless listed as flammable vapor ignition resistant. [NFPA 54:9.1.10.1]

308.1.1 Physical Damage. Appliances installed in garages, warehouses, or other areas subject to mechanical damage shall be guarded against such damage by being installed behind protective barriers or by being elevated or located out of the normal path of vehicles.

308.2 Protection Against Flood Damage. ~~For buildings located in flood hazard areas, heating, ventilating, air conditioning, refrigeration, miscellaneous heat producing, and energy utilizing equipment and appliances shall be elevated at or above the design flood elevation~~ See Chapter 19 of the City Code for provisions regarding the flood plain.

Exception: ~~Equipment and appliances are permitted to be located below the design flood elevation provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and~~

~~stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in compliance with the flood resistant construction requirements of the Building Code.~~

~~**308.2.1 Walls Below Buildings in Flood Hazard Areas Subject to High Velocity Wave Action.** In flood hazard areas subject to high velocity wave action, equipment and appliances, including piping, shall not be mounted on or penetrate walls intended to break away under flood loads.~~

~~**308.2.2 Air Exhaust and Intake Openings.** Outside air exhaust openings and air intake openings shall be located at or above the design flood elevation.~~

310.0 Electrical Connections.

310.1 General. Equipment regulated by this code requiring electrical connections of more than 50 volts shall have a positive means of disconnect in accordance with the Electrical code, adjacent to and in sight from the equipment served. ~~A 120 volt receptacle shall be located within 25 feet (7620 mm) of the equipment for service and maintenance purposes. The receptacle need not be located on the same level as the equipment.~~ Low-voltage wiring of 50 volts or less within a structure shall be installed in a manner to prevent physical damage.

312.2 Condensate Control. Where a cooling coil or cooling unit is located in an attic or furred space, or in any area where damage is capable of resulting from condensate overflow, an additional watertight pan of corrosion-resistant metal shall be installed beneath the cooling coil or unit top to catch the overflow condensate due to a clogged primary condensate drain, or one pan with a standing overflow and a separate secondary drain shall be permitted to be provided in lieu of the secondary drain pan. The additional pan or the standing overflow shall be provided with a drain pipe, not less than 3/4 of an inch (20 mm) nominal pipe size, discharging at a point that is readily observed.

Exception: The additional watertight pan may be of corrosion resistant material other than metal, when approved by the Authority Having Jurisdiction.

This requirement is in addition to the requirements in Section 312.3 and Section 312.4.

314.5 Wood members in plenum. Floor joists or trusses shall not be located within a return air plenum.

CHAPTER 4

VENTILATION AIR SUPPLY

TABLE 402.1

MINIMUM VENTILATION RATES IN BREATHING ZONE ^{1,2}

[ASHRAE 62.1:TABLE 6-1]

OCCUPANCY CATEGORY ⁴	PEOPLE OUTDOOR Air Rate R _p (cfm/pe)	AREA OUTDOOR Air Rate R _A (cfm/ft ²)	DEFAULT OCCUPANT Density ³ (people/1000 ft ²)
CORRECTIONAL FACILITIES			
Booking/waiting	7	0.0	50
Cell	5	0.1	25
Day room	5	0.0	30
Guard stations	5	0.0	15
DRY CLEANERS / LAUNDRIES			
Coin-operated dry cleaner	15	—	20
Coin-operated laundries	7.5	—	20
Commercial dry cleaner	30	0.06	30
Commercial laundry	25	—	10
Storage, pick up	7.5	0.12	30
EDUCATIONAL FACILITIES			
Art classroom	1	0.18	20
Classrooms (ages 5-8)	1	0.1	25
Classrooms (age 9 plus)	10	0.1	35
Computer lab	1	0.	25
Day care (through age 4)	1	0.18	25
Day care sickroom	1	0.1	25
Lecture classroom	7	0.0	65
Lecture hall (fixed seats)	7.5	0.0	150
Media center ^a	1	0.1	25
Music/theater/dance	1	0.0	35
Multi-use assembly	7	0.0	100
Science laboratories ^e	1	0.1	25
University/college laboratories	1	0.18	25
Wood/metal shop	1	0.1	20
FOOD AND BEVERAGE SERVICE			
Bars, cocktail lounges	7	0.18	100
Cafeteria/fast food dining	7	0.1	100
Kitchen (cooking)	7	0.1	20
Restaurant dining rooms	7	0.18	70
GENERAL			
Break rooms	5	0.0	25
Coffee stations	5	0.0	20
Conference/meeting	5	0.0	50
Corridors	—	0.0	—
Occupiable storage rooms for liquids or gels ^b	5	0.12	2
HOSPITALS, NURSING AND CONVALESCENT			
Autopsy rooms	—	—	0.5
Medical Procedure rooms	15	20	—
Operating rooms	30	20	—
Patient rooms	25	10	—
Physical therapy	15	20	—
Recovery and ICU	15	20	—
HOTELS, MOTELS, RESORTS, DORMITORIES			

Bedroom/living room	5	0.0	10
Barracks sleeping areas	5	0.0	20
Dormitory sleeping areas	5	0.06	—
Gambling casinos	7	0.16	—
Laundry rooms, central	5	0.12	10
Laundry rooms with in dwelling units	5	0.1	10
Lobbies/pre-function	7	0.06	30
Multipurpose assembly	5	0.06	120
OFFICE BUILDINGS			
Breakrooms	5	0.1	50
Conference rooms	5	0.0	50
Occupiable storage rooms for dry materials	5	0.0	2
Office space	5	0.0	5
Main entry lobbies	5	0.06	10
Reception areas	5	0.06	30
Telephone/data entry	5	0.06	60
MISCELLANEOUS SPACES			
Bank or bank lobbies	7	0.0	15
Bank vaults/safe deposit	5	0.0	5
Computer (not printing)	5	0.06	4
General manufacturing (excludes heavy industrial and	1	0.1	7
Pharmacy (prep. area)	5	0.1	10
Photo studios	5	0.1	10

TABLE 402.1 (continued)
MINIMUM VENTILATION RATES IN BREATHING ZONE 1• 2
[ASHRAE 62.1: TABLE 6-1]

OCCUPANCY CATEGORY ⁴	PEOPLE OUTDOOR	AREA OUTDOOR	DEFAULT OCCUPANT
	Air Rate R _P	Air Rate R _A (cfm/ft ²)	Density ³ (people/1000 ft ²)
Shipping/receiving ^b	1	0.12	2
Sorting, packing, light assembly	7	0.12	7
Telephone closets	-	0.00	-
Transportation waiting	7	0.06	100
Warehouses ^b	1	0.06	-
PUBLIC ASSEMBLY SPACES			
Auditorium seating area	5	0.06	150
Courtrooms	5	0.06	70
Legislative chambers	5	0.06	50
Libraries	5	0.12	10
Lobbies	5	0.06	150
Museums (children's)	7.5	0.12	40
Museums/galleries	7	0.06	40
Places of religious worship	5	0.06	120
Smoking lounges	60		70
RESIDENTIAL			
Common corridors	-	0.06	-
Dwelling unit ^{f,g}	5	0.06	See footnote f
RETAIL			
Sales (except as below)	7	0.12	15
Barber shop	7	0.06	25
Beauty and nail salons	2	0.12	25
Coin-operated laundries	7	0.12	20
Mall common areas	7	0.06	40
Pet shops (animal areas)	7	0.18	10

Supermarket	7	0.06	8
SPORTS AND ENTERTAINMENT			
Bowling alley (seating)	10	0.12	40
Disco/dance floors	2	0.06	100
Gambling casinos	7	0.18	120
Game arcades	7	0.18	20
Gym, stadium (play area)	-	0.30	30
Health club/aerobics room	2	0.06	40
Health club/weight rooms	2	0.06	10
Sports arena (play area)	-	0.30	-
Spectator areas	7.5	0.06	150
Stages, studios ^d	1	0.06	70
Swimming (pool & deck) ^c	-	0.48	-

For SI units: 1 cubic foot per minute= 0.0283 m³/min, 1 square foot= 0.0929 m²

Notes:

¹ ~~This table applies to no-smoking areas. Rates for smoking permitted spaces must be determined using other methods.~~

² 1 Volumetric airflow rates are based on an air density of 0.075 pounds of dry air per cubic foot (lb_{da}/ft³) (1.201 kg_{da}/m³), which corresponds to dry air at a barometric pressure of 1 atm (101 kPa) and an air temperature of 70°F (21°C). Rates shall be permitted to be adjusted for actual density but such adjustment is not required for compliance with this chapter.

³ 2 The default occupant density shall be used where actual occupant density is not known.

⁴ 3 Where the occupancy category for a proposed space or zone is not listed, the requirements for the listed occupancy category that is most similar in terms of occupant density, activities, and building construction shall be used.

ITEM-SPECIFIC NOTES FOR TABLE 402.1

^a For high school and college libraries, use values shown for Public Spaces- Library.

^b Rate is capable of not being sufficient where stored materials include those having potentially harmful emissions.

^c Rate does not allow for humidity control. Additional ventilation or dehumidification shall be permitted to be required to remove moisture.

^d Rate does not include special exhaust for stage effects, (e.g., dry ice vapors, smoke).

^e No class of air has been established for this occupancy category.

^f Default occupancy for dwelling units shall be two persons for studio and one-bedroom units, with one additional person for each additional bedroom.

^g Air from one residential dwelling shall not be recirculated or transferred to other space outside of that dwelling.

CHAPTER 5

EXHAUST SYSTEMS

504.2 Domestic Range Vents. Ducts used for domestic kitchen range ventilation shall be of metal and shall have smooth interior surfaces. Ducts for domestic range hoods shall serve cooking appliances.

Exception: Ducts for domestic kitchen downdraft grill-range ventilation installed under a concrete slab floor may be of approved Schedule 40 PVC provided:

- (1) The under-floor trench in which the duct is installed shall be completely backfilled with sand or gravel.
- (2) Not more than one (1) inch (25.4 mm) of a six (6) inch diameter (152 mm) PVC coupling may protrude above the concrete floor surface.
- (3) PVC pipe joints shall be solvent cemented to provide an air- and grease-tight duct.
- (4) The duct shall terminate a minimum of 12 inches above grade outside the building and shall be equipped with a backdraft damper.

504.3 Clothes Dryers. Moisture exhaust ducts shall terminate on the outside of the building a minimum of 9 inches above grade and shall be equipped with a back-draft damper. Screens shall not be installed at the duct termination. Ducts for exhausting clothes dryers shall not be connected or installed with sheet metal screws or other fasteners that will obstruct the flow. Clothes dryer moisture exhaust ducts shall not be connected to a gas vent connector, gas vent, or chimney, and shall serve clothes dryers. Clothes dryer moisture exhaust ducts under positive pressure shall not extend into or through ducts or plenums.

504.3.1.2 Length Limitation. Unless otherwise permitted or required by the dryer manufacturer's instructions and approved by the Authority Having Jurisdiction, domestic dryer moisture exhaust ducts shall not exceed a total combined horizontal and vertical length of fourteen (14) feet (4267 mm), including two 90 degree (1.57 rad) elbows. A length of 2 feet (610 mm) shall be deducted for each 90 degree (1.57 rad) elbow in excess of two. Where the exhaust duct is concealed within the building construction and exceeds the length limitation of this Section a permanent label or tag shall be located within 6 feet of the exhaust duct connection identifying the length of the exhaust duct.

504.6 Gypsum Wallboard Ducts. Bathroom and laundry room exhaust ducts and other environmental air ducts shall not ~~shall be permitted to be constructed~~ of gypsum wallboard subject to the limitations of Section 602.1.

507.1 Exhaust System. Cooking equipment used in processes producing smoke or grease-laden vapors shall be equipped with an exhaust system in accordance with the equipment and performance requirements of this chapter. [NFPA 96:4.1.1] Such equipment and performance shall be maintained in accordance with this chapter during periods of operation of the cooking equipment. Specifically, the following equipment shall be kept in good working condition:

- (1) Cooking equipment
- (2) Hoods

- (3) Ducts (where applicable)
- (4) Fans
- (5) Fire suppression systems
- (6) Special effluent or energy control equipment [NFPA 96:4.1.2, 4.1.3]

Airflows shall be maintained. [NFPA 96:4.1.4] Maintenance and repairs shall be performed on components at intervals necessary to maintain these conditions [NFPA 96:4.1.3 .1]: "-"

- (1) The responsibility for inspection, maintenance, and cleanliness of the ventilation control and fire protection of the commercial cooking operations shall be the ultimate responsibility of the owner of the system provided that this responsibility has not been transferred in written form to a management company or other party. [NFPA 96:4.1.5]
- (2) Solid-fuel cooking equipment shall comply with the requirements of Section 517 .0. [NFPA 96:4.1.6]
- (3) Multiple-tenancy applications shall require the concerted cooperation of design, installation, operation, and maintenance responsibilities by tenants and by the building owner. [NFPA 96:4.1.7]
- (4) Interior surfaces of the exhaust system shall be accessible for cleaning and inspection purposes. [NFPA 96:4.1.8]
- ~~(5) Cooking equipment used in fixed, mobile, or temporary concessions, such as trucks, buses, trailers, pavilions, tents, or a form of roofed enclosure, shall be in accordance with this chapter unless all or part of the installation is exempted by the Authority Having Jurisdiction. [NFPA 96:4.1].~~

508.1 Where Required. Type 1 hHoods shall be installed at or above commercial-type deep-fat fryers, broilers, fry grills, steam-jacketed kettles, hot-top ranges, ovens, barbecues, solid-fuel burning appliances, rotisseries, dishwashing machines, and similar equipment that produces comparable amounts of steam, smoke, grease, or heat in a food-processing establishment to collect and remove the grease and smoke. For the purpose of this section, a food processing establishment shall include any building or portion thereof used for the processing of food, but shall not include a dwelling unit.

Type 2 hoods shall be installed at or above other commercial-type ovens, rotisseries, and dishwashing machines.

Exceptions:

- (1) Cooking appliance that has been listed in accordance with EPA 202 for reduced emissions where the grease discharge does not exceed 2.9 E-09 ounces per cubic inch (oz/in³) (5.0 E-06 kg/m³) where operated with a total airflow of 500 cubic feet per minute (cfm) (0.236 m³/s).
- (2) Recirculating systems listed in accordance with UL 710B and installed in accordance with Section 516.0.
- (3) Under counter, and enclosed single-batch low temperature chemical dishwashers (maximum 135° F).

508.4.1.1 Capacity of Hoods. Canopy-type commercial cooking hoods shall exhaust through the hood a quantity of air not less than determined by application of the following formulas:

Where:

A = the horizontal surface area of the hood, in square feet (m^2).

P = that part of the perimeter of the hood that is open, in feet (mm).

D = distance in feet (mm) between the lower lip of the hood and the cooking surface.

Q = quantity of air, in cubic feet per minute (m^3/s).

Where cooking equipment is installed back to back and is covered by a common island-type hood, the airflow required shall be calculated using the formula for three sides exposed. Type II hood airflow requirements shall be in accordance with the requirements for low-temperature appliance hoods. When all appliances are electric, the airflow required may be reduced to 80 percent of the formula value.

510.1.3 Duct Installation. Ducts shall be installed without forming dips or traps that might collect residues. [NFPA 96:7.1.4] In manifold (common duct) systems, the lowest end of the main duct shall be connected flush on the bottom with the branch duct. [NFPA 96:7.1.4.1] Duct systems serving a Type I hood shall be so constructed and installed that grease cannot become pocketed in a portion thereof, and the system shall slope not less than $\frac{1}{4}$ inch per lineal foot (20.8 mm/m) toward the hood or toward an approved grease reservoir. ~~Where horizontal ducts exceed 75 feet (22 860 mm) in length, the slope shall be not less than 1 inch per lineal foot (83.3 mm/m).~~

510.1.7 Ducts, Non-Grease. Ducts and plenums serving Type II hoods shall be constructed of rigid metallic materials as set forth in Chapter 6. Duct bracing and supports shall comply with Chapter 6. Ducts ~~subject to positive pressure~~ shall be adequately sealed. Ducts serving dishwasher exhaust shall be liquid tight and shall be constructed of aluminum or not less than 304 stainless steel.

510.5.2.2 Butt-weld, welded flange or overlapping duct connections of either the telescoping or the bell type shall be used for welded field joints, ~~not butt-weld connections~~. The inside duct section shall always be uphill of the outside duct section. The difference between inside dimensions of overlapping sections shall not exceed $\frac{1}{4}$ inch (6.4 mm). The overlap shall not exceed two (2) inches (50.8 mm). (See Figure 5-3.)

510.7.2.2 Protection from Physical Damage ~~Measures shall be taken to prevent physical damage to a covering or enclosure material. A damage to the covering or enclosure shall be repaired and the covering or enclosure shall be restored to meet its intended listing and fire-resistive rating and to be acceptable to the Authority Having Jurisdiction. [NFPA 96:7.7.3.1, 7.7.3.2]~~

CHAPTER 6

DUCT SYSTEMS

602.1 General. Supply air, return air, and outside air for heating, cooling, or evaporative cooling systems shall be conducted through duct systems constructed of metal as set forth in Tables 6-1, 6-2, 6-3, 6-4, 6-7, 6-8, 6-9, and 6-10, or metal ducts complying with UMC Standard No. 6-2 or the referenced HVAC duct construction standard in Chapter 17. Rectangular ducts in excess of two (2) inches w.g. shall comply with UMC Standard No. 6-2 or the referenced HVAC duct construction standard in Chapter 17. Ducts, plenums, and fittings may be constructed of concrete, clay, or ceramics when installed in the ground or in a concrete slab, provided the joints are tightly sealed.

Corridors shall not be used to convey air to or from rooms if the corridor is required to be of fire resistive construction per the Building Code.

Concealed building spaces or independent construction within buildings may be used as ducts or plenums.

When gypsum products are exposed in ducts or plenums, the air temperature shall be restricted to a range from 50°F (10°C) to 125°F (52°C), and moisture content shall be controlled so that the material is not adversely affected. For the purpose of this section, gypsum products shall not be ~~exposed in~~ used as ducts ~~serving as supply from evaporative coolers, and in other air handling systems regulated by this chapter when the temperature of the gypsum product will be below the dew point temperature.~~

See Chapter 8 for limitations on combustion products venting systems extending into or through ducts or plenums.

See Chapter 5 for limitations on environmental air systems exhaust ducts extending into or through ducts or plenums.

Exhaust ducts under positive pressure and venting systems shall not extend into or pass through ducts or plenums. For appliance vents and chimneys, see Chapter 8.

602.2 Combustibles Within Ducts or Plenums. Materials exposed within ducts or plenums shall be noncombustible or shall have a flame spread index not greater than twenty-five (25) and a smoke developed index not greater than fifty (50), when tested as a composite product in accordance with one of the following test methods: NFPA 255, Method of Test of Surface Burning Characteristics of Building Materials, ASTM E84, Surface Burning Characteristics of Building Materials, or UL 723, Test for Surface Burning Characteristics of Building Materials, except as indicated below.

Exceptions:

- (1) Return-air and outside-air ducts, plenums, or concealed spaces that serve a dwelling unit shall be permitted to be of combustible construction.
- (2) Air filters meeting the requirements of Sections 312.0 and 503.3.
- (3) Water evaporation media in an evaporative cooler.
- (4) Charcoal filters when protected with an approved fire suppression system.

- (5) Electrical wiring in plenums shall comply with NFPA 70, National Electrical Code. Electrical wires and cables and optical fiber cables shall be listed and labeled as suitable for use in plenums and shall have a flame spread distance not greater than five (5) feet (1,524 mm), an average optical density not greater than 0.15, and a peak optical density not greater than 0.5, when tested in accordance with NFPA 262, Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
- (6) Nonmetallic fire-sprinkler-piping in plenums shall be listed and labeled as suitable for use in plenums and shall have a flame spread distance not greater than five (5) feet (1,524 mm), an average optical density not greater than 0.15, and a peak optical density not greater than 0.5, when tested in accordance with UL 1887, Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics.
- (7) Nonmetallic pneumatic tubing in plenums shall be listed and labeled as suitable for use in plenums and shall have a flame spread distance not greater than five (5) feet (1,524mm), an average optical density not greater than 0.15, and a peak optical density not greater than 0.5, when tested in accordance with UL 1820, Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics.
- (8) Loudspeakers and recessed lighting fixtures, including their assemblies and accessories, in plenums shall be listed and labeled as suitable for use in plenums and shall have a peak rate of heat release not greater than 100 kilowatts, an average optical density not greater than 0.15, and a peak optical density not greater than 0.5, when tested in accordance with UL 2043, Fire Test for Heat and Visible Smoke Release for Discrete Products and their Accessories Installed in Air-Handling Spaces.
- (9) Smoke detectors.
- (10) Duct insulation, coverings, and linings and other supplementary materials complying with Section 605.0.
- (11) Materials in a Group H-5, ~~Division 6~~, HPM fabrication area including the areas above and below the fabrication area sharing a common air recirculation path with the fabrication area.

606.5 Access and Identification. Dampers shall be provided with an approved means of access large enough to permit inspection and maintenance of the damper and its operating parts. The access shall not impair fire-resistive construction. Access shall not require the use of tools, keys, or special knowledge. Access points shall be permanently identified visibly on the exterior of the duct and at the ceiling level by a label with letters not less than 1 ½-inch (25.4 42.7-mm) in height reading: **SMOKE DAMPER** or **FIRE DAMPER**. Access doors in ducts shall be tight fitting and suitable for the required duct construction. Access doors shall be not more than 2 inches less than the size of the duct up to 24 inches, and 24 inch by 24 inch in ducts of 28-inch dimension or larger.

608.1 General. Air-moving systems supplying air in excess of 2,200 2,000 cubic feet per minute (ftl/min) (~~0.9439~~ 1038.2834 m³/s) to enclosed spaces within buildings shall be equipped with an automatic shutoff. Automatic shutoff shall be accomplished by interrupting the power source of the air-moving equipment upon detection of smoke in the main supply-air duct or return-air duct served by such equipment. Smoke detectors shall be labeled by an approved agency for air duct installation and shall be installed in accordance with the manufacturer's

installation instructions. Such devices shall be compatible with the operating velocities, pressures, temperatures, and humidities of the system. Where fire-detection or alarm systems are provided for the building, the smoke detectors required by this section shall be supervised by such systems.

Exceptions:

- (1) (l) Where the space supplied by the air-moving equipment is served by a total coverage smoke-detection system in accordance with the fire code, interconnection to such system shall be permitted to be used to accomplish the required shutoff.
- (2) Automatic shutoff is not required where occupied rooms served by the air-handling equipment have direct exit to the exterior and the travel distance does not exceed 100 feet (30 480 rom). For the purpose of this exception, occupied rooms shall not include rooms that have less than 300 square feet and are ancillary to the function of the space served by the air-handling system, such as restrooms, storerooms, or cashier or manager offices.
- (3) Automatic shutoff is not required for Group R, Division 3 and Group U Occupancies.
- (4) Automatic shutoff is not required for approved smoke control systems or where analysis demonstrates shutoff would create a greater hazard, such as shall be permitted to be encountered in air-moving equipment supplying specialized portions of Group H Occupancies. Such equipment shall be required to have smoke detection with remote indication and manual shutoff capability at an approved location.
- (5) Smoke detectors that are factory installed in listed air moving equipment shall be permitted to be used in lieu of smoke detectors installed in the main supply-air duct served by such equipment.

CHAPTER 9

INSTALLATION OF SPECIFIC APPLIANCES

902.8 Prohibited installation: Air handling units shall not be located in the same room with gas utilization equipment.

Exception: Listed central heating furnaces.

~~904.4 Temperature- or Pressure-Limiting Devices. Steam and hot water boilers, respectively, shall be provided with approved automatic limiting devices for shutting down the burner(s) to prevent boiler steam pressure or boiler water temperature from exceeding the maximum allowable working pressure or temperature. Safety limit controls shall not be used as operating controls. [NFPA 54:10.3.4] See Chapter 10 of this code.~~

~~904.5 Low-Water Cutoff. See Chapter 10 of this code. Hot water boilers installed above the radiation level and steam boilers shall be provided with an automatic means to shut off the fuel supply to the burner(s) where the boiler water level drops to the lowest safe water line. [NFPA 54:10.3.5]~~

~~904.6 Steam Safety and Pressure-Relief Valves. See Chapter 10 of this code. Steam and hot water boilers shall be equipped, respectively, with listed or approved steam safety or pressure-relief valves of discharge capacity and shall comply with ASME requirements. A shutoff valve shall not be placed between the relief valve and the boiler or on discharge pipes between such valves and the atmosphere. [NFPA 54:10.3.6]~~

~~904.6.1 Discharge. Relief valves shall be piped to discharge near the floor. [NFPA 54: 10.3.6.1]~~

~~904.6.2 Size. The entire discharge piping shall be not less than the same size as the relief valve discharge piping. [NFPA 54: 10.3.6.2]~~

~~904.6.3 End Connections. Discharge piping shall not contain a threaded end connection at its termination point. [NFPA 54:10.3.6.3]~~

~~924.1 Prohibited Installations. Unless specifically permitted by the Authority Having Jurisdiction, unvented room heaters shall not be installed as primary heat sources. Unvented room heaters shall not be permitted in spaces that do not have the required volume of indoor air as defined in section 701.2.~~

~~924.1.1 Unvented room heaters shall not be installed in bathrooms or bedrooms. [NFPA 54: 10.23.1] This subsection shall not apply to portable oil fired unvented heating appliances used as supplemental heating in Group S, Divisions 3, 4, and 5, and Group U Occupancies, and regulated by the Fire Code.~~

Exceptions:

~~(1) Where approved by the Authority Having Jurisdiction, one listed wall-mounted unvented room heater equipped with an oxygen depletion safety shutoff system shall be permitted to be~~

~~installed in a bathroom provided that the input rating shall not exceed 6,000 Btu/hr. (1760 W/hr) and combustion and ventilation air is provided as specified in Section 701.2. [NFPA 54:10.23.1]~~

~~(2) Where approved by the Authority Having Jurisdiction, one listed wall-mounted unvented room heater equipped with an oxygen depletion safety shutoff system shall be permitted to be installed in a bedroom provided that the input rating shall not exceed 10,000 Btu/hr. (2930 W/hr.) and combustion and ventilation air is provided as specified in Section 701.2. [NFPA 54:10.23.1]~~

924.1 Vented Freestanding. Vented freestanding room heaters shall be installed with clearances from combustibile material as set forth in Table 3-1.

Exception: Heaters listed for reduced clearances may be installed at the clearances specified on the required manufacturer's label.

Vented freestanding room heaters shall not be located so that a door can swing within less than twelve (12) inches (305 mm) of a warm-air outlet of the heater, measured at right angles to the outlet. Doorstops or door closers shall not be installed to obtain such clearance.

Vented freestanding room heaters shall be located at least thirty-six (36) inches (914 mm) below any part of a structure projecting over the heater. This projection shall include doors or windows that could project over the heater.

Vented freestanding room heaters shall be safely and securely installed to prevent accidental displacement.

924.2 Installations in Institutions. Room heaters shall not be installed in the following occupancies:

~~(1) residential board and care; and (2) health care. [NFPA 54:9.23.2]~~

924.2 Vented Overhead. Vented overhead room heaters shall be safely and securely supported with hangers and brackets of noncombustible material and shall be installed with clearances from combustibile material as specified on the required manufacturer's label.

Exception: Installation of overhead heaters in aircraft storage or servicing areas of aircraft hangars shall comply with requirements of Section 911.0.

924.3 Clearance. ~~A room heater shall be placed so as not to cause a hazard to walls, floors, curtains, furniture, doors when open, and so on, and to the free movements of persons within the room. Heaters designed and marked, "For use in noncombustible fireplace only," shall not be installed elsewhere. Listed room heaters shall be installed in accordance with their listings and the manufacturers' instructions. In no case shall the clearances be such as to interfere with combustion air and accessibility. Unlisted room heaters shall be installed with clearances from combustibile material not less than the following:~~

(A) Circulating Type. ~~Room heaters having an outer jacket surrounding the combustion chamber, arranged with openings at top and bottom so that air circulates between the inner and outer jacket, and arranged without openings in the outer jacket to permit direct radiation, shall have clearance at sides and rear of not less than twelve (12) inches (300 mm).~~

(B) Radiating Type. ~~Room heaters other than those of the circulating type described in Section 924.3(a) shall have clearance at sides and rear of not less than eighteen (18) inches (460 mm), except that heaters that make use of metal, asbestos, or ceramic material to direct radiation to the front of the heater shall have a clearance of thirty six (36) inches (910 mm) in front and, if~~

~~constructed with a double back of metal or ceramic, shall be permitted to be installed with a clearance of eighteen (18) inches (460 mm) at sides and twelve (12) inches (300 mm) at rear. Combustible floors under unlisted room heaters shall be protected in an approved manner. [NFPA 54:9.23.3]~~

924.3 Unvented. Unvented fuel-burning room heaters and decorative appliances shall be prohibited.

924.4 Wall-Type Room Heaters. Wall-type room heaters shall not be installed in or attached to walls of combustible material unless listed for such installation. [NFPA 54:9.23.4]

924.4 Overhead Radiant Heaters. Listed or approved unvented overhead room heaters may be installed in a Group A, B, F, M, S or U occupancy, provided the installation conforms to all the following requirements:

924.4.1 All portions of the heater are located at least eight (8) feet (2438 mm) above the floor.

924.4.2 At least two (2) unobstructed permanent openings are provided to the room or space containing such heaters. These openings shall open directly to the outside of the building through the floor, roof or wall. The minimum combined total area of these openings shall be at least one (1) square inch (645 mm²) for each 1000 Btu/h (293 W) input of the heater or heaters, with a minimum total area of 100 square inches (64516 mm²). One-half of the required openings shall be above the heater or heaters and one-half shall be located below the heater or heaters.

Exception: When approved by the Authority Having Jurisdiction, provisions may be made to exhaust the products of combustion to the exterior by mechanical means.

924.4.3 Heaters shall be safely and securely supported with hangers and brackets of noncombustible material and installed with clearances from combustible material as specified on the required manufacturer's label.

926.2 Mounting-Installation on Combustible Floors. Listed gas-fired toilets installed on combustible floors shall be listed for such installation.

CHAPTER 10

STEAM AND HOT-WATER BOILERS

1001.2 Definitions.

ALTERATION. A change in an original design or configuration.

DETACHED BOILER. Any class of boiler that remains in its original installed location and has been permanently disconnected from its energy source (i.e. natural gas, electricity, etc.)

NATIONAL BOARD INSPECTION CODE. The manual for boiler and pressure vessel inspectors published by the National Board of Boiler and Pressure Vessel Inspectors.

NON-STANDARD BOILER. A boiler that does not qualify as a standard boiler.

PORTABLE BOILER. A boiler primarily intended for temporary use at a location.

REPAIR. The work necessary to restore a boiler or a pressure vessel to a safe and satisfactory operating condition, provided there is no deviation from the original design.

SAFETY APPLIANCES. Safety devices such as safety valves or safety relief valves (within the jurisdictional limits as prescribed by the Authority Having Jurisdiction) provided for the purposes of diminishing the danger of accidents.

SECONDHAND BOILER. A boiler for which both the location and ownership have changed.

STANDARD BOILER. A boiler that bears the Texas stamp, the ASME stamp, or the stamp of any jurisdiction that has adopted a standard of construction equivalent to that required by the State of Texas.

1004.6 Potable Water Boilers. Permits and inspections pertaining to boilers used exclusively for the production of potable hot water shall be administered by the Plumbing Inspection Section staff of the Authority Having Jurisdiction. Reference Section 1002.0, Exception 1. Permits and inspections pertaining to boilers used for other than the production of potable hot water shall be administered by the Mechanical Inspection Section staff of the Authority Having Jurisdiction.

1004.7 Permit Required. Except for work exempted by Section 112.2 of this code, a permit shall be obtained from the Authority Having Jurisdiction prior to installation, re-installation, alteration, repair or replacement of boilers and pressure vessels related to steam and hot water boiler systems. Alteration of safety control systems on automatic boilers or replacement, repair, or alteration of breeching, vent connector, vent pipe or chimney, and the conversion of solid fuel-fired boilers as permitted by Section 1013.0 shall also require a permit. See Chapter 1 for requirements for obtaining permits.

1004.8 Moving Boilers. Any owner, user, or person desiring to remove, transfer, or relocate any boiler in the jurisdiction shall first obtain a new permit to install and have that same boiler inspected or tested by the Authority Having Jurisdiction.

1004.9 Reinstallation. Any installed boiler in the jurisdiction may be reinstalled, provided an application is filed with the Authority Having Jurisdiction and a permit is granted. A permit to

install shall be issued provided that the boiler shall be inspected internally, a hydrostatic pressure test will be applied if deemed necessary by the Authority Having Jurisdiction, and the Authority Having Jurisdiction determines that the boiler meets inspection and test requirements.

Exception: A horizontal return tubular boiler having continuous lap seam of more than 12 feet in length shall not be reinstalled for a gauge pressure in excess of 15 psi.

1004.10 Boiler Nameplate. A boiler nameplate shall be attached to each boiler. Lost or destroyed nameplates shall be replaced in accordance with The National Board Inspection Code.

1004.11 Automatic Controls. No low-pressure gas-fired boilers or furnace capable of consuming 200,000 Btu or more per hour shall be installed, and no boiler designed for other fuels having that Btu capacity shall be converted to the use of gas fuel unless equipped with either a thermostatic pilot light or other approved equipment constructed and adjusted so that no gas can flow through the main burner unless the pilot light is burning.

In the case of a steam boiler, it shall be equipped with a low-water cutoff and an excess pressure switch to close the main gas supply valve on a low-water condition or an excess pressure condition. In the case of a hot-water boiler, it shall be equipped with a low-water fuel cutoff and an excess temperature switch to close the main gas supply valve on a low-water condition or an excess temperature condition. In the case of a forced or mechanical draft boiler, a means to prove airflow shall be provided to prevent gas flow to the main burner in the absence of airflow.

The operation of the pilot safety device shall not depend on the closing of an electrical circuit to shut off the main gas supply to the boiler.

1005.2 Systems with Open Expansion Tanks. Systems equipped with an open expansion tank to satisfy thermal water expansion shall be provided with an indoor overflow from the upper portion of the expansion tank in addition to an open vent. The indoor overflow shall be carried within the building to a suitable plumbing fixture or plumbing drain ~~to the basement~~.

1006.0 Safety and Safety Relief Valves Discharge.

1006.1 Safety and Safety Relief Valves. All safety valves used on boilers in the jurisdiction shall conform to the prescribed or recommendatory rules of the ASME Code and the State of Texas Boiler Law and shall have the necessary provisions so that the safety valve can be sealed in such a manner that the pressure-relieving mechanism of the safety valve cannot be changed, altered or adjusted unless the seal is broken.

1006.2 Authority to Set and Seal Safety Appliances. All safety and safety relief valves for ASME Section I, Section IV, and Section VIII Division 1 boilers must be repaired, tested, set, and sealed by one of the following, provided the scope of the issued certificate of authorization covers the work to be performed:

- 1.** An organization holding a valid V, HV, or UV certificate of authorization, as appropriate, issued by the American Society of Mechanical Engineers (ASME);

2. An organization holding a valid VR certificate of authorization issued by the National Board of Boiler and Pressure Vessel Inspectors; or
3. An organization holding a valid owner/operator certificate of authorization issued by the Texas Department of Licensing and Regulation.

1006.3 General. The discharge from relief valves shall be piped to an approved location within eighteen (18) inches (457 mm) of the floor or to an open receptacle, and where the operating temperature is in excess of 212°F (100°C), shall be equipped with a splash shield or centrifugal separator. When the discharge from safety valves would result in a hazardous discharge of steam inside the boiler room, such discharge shall be extended outside the boiler room. No valve shall be placed between the safety or relief valve and the boiler, nor on the discharge pipe between the safety valve and the atmosphere. Discharge piping shall not be connected to any other piping system, and the cross-sectional area shall not be less than the full area of the valve outlet, or the total areas of the valve outlets discharging thereinto, whichever is greater. See also Section 1011. Discharges from relief valves on industrial boilers shall be discharged to an approved location.

1007.0 Gas Shutoff Valves.

1007.1 General. An approved manual shutoff valve with handle shall be installed within 3 feet of the boiler gas train, upstream of all control devices on the main burner of a gas-fired boiler. The takeoff point for the gas supply to the pilot shall be upstream of the gas shutoff valve of the main burner and shall be valved separately. A union or other approved means of disconnect shall be provided immediately down-stream of these shutoff valves

1009.2 Low-Water Fuel Cut Off and Feed Water Pump Control Combined in a Single Device. Where such a device is used, an additional separate low-water fuel cutoff with manual reset shall be installed. The additional control shall be wired in series electrically with the existing low-water fuel cutoff.

1009.3 Low-Water Fuel Cutoff Housed in Either the Water Column or Separate Chamber. The installation shall be provided with a blow down pipe and valve not less than 3/4 inch pipe size. The arrangement shall be such that when the water column is blown down, the water level in it will be lowered sufficiently to activate the low-water fuel cutoff device.

1009.4 Newly Installed Automatically Fired Hot Water Heating Boilers. Such boilers, when installed in a forced circulation system, shall be equipped in the manner described in this section and Sections 1010.1 and 1010.2. A coil-type boiler or a water-tube boiler requiring forced circulation to prevent overheating of the coils or tubes shall have a device to prevent burner operation if the flow rate becomes inadequate to protect the boiler unit from overheating.

1009.5 Water Feed Device. Where a water feed device is used, it shall be constructed to prevent feed water from entering the boiler through the water column or separate chamber of the low-water fuel cutoff.

1011.0 Automatic Boilers.

1011.1 General. Automatic boilers shall be equipped with controls and limit devices in accordance with Table 1011.1. Automatic boilers shall be equipped with the following gauges, as applicable:

- (1) Oil temperature
- (2) Oil suction pressure
- (3) High and low gas pressure
- (4) Stack temperature
- (5) Windbox pressure

Except as otherwise specified, all gas-fired boilers ~~exceeding 400,000 Btu/h (117 kW) input~~ shall comply with nationally recognized standards approved by the Authority Having Jurisdiction. The Authority Having Jurisdiction shall have the authority to approve solid-fuel-fired boilers that comply with the safety requirements for automatic gas- or oil-fired boilers

1020.0 Operating Adjustments and Instructions.

1020.1 General. ~~Hot water boiler installations,~~ Upon completion, all boiler installations shall have controls set, adjusted, and tested by the installing contractor. A complete control diagram of a permanent legible type, together with complete boiler operating instructions, shall be furnished by the installer for each installation.

1020.2 Manufacturer's Instructions. The installation of each boiler covered by this chapter shall conform to the conditions of approval as specified in the manufacturer's installation instructions pertaining to safety and to the requirements of this chapter. The installer shall leave the manufacturer's instructions attached to the boiler or readily available for the benefit of the inspector.

1021.0 Inspections and Tests.

1021.1 General An installation for which a permit is required shall not be put into service until it has been inspected and approved by the Authority Having Jurisdiction.

It shall be the duty of the owner or his authorized representative to notify the Authority Having Jurisdiction that the installation is ready for inspection and test. It also shall be the duty of the owner or his authorized representative post in a conspicuous position on the installation a notice in substantially the following form: "Warning! This installation has not been inspected and approved by the Authority Having Jurisdiction and shall not be covered or concealed until so inspected and approved," and it shall be unlawful for anyone other than the Authority Having Jurisdiction to remove such notice. The Authority Having Jurisdiction shall require such tests as it deems necessary to determine that the installation complies with the provision of this section. Such tests shall be made by the owner or his authorized representative in the presence of the Authority Having Jurisdiction.

Exception: On installations designed and supervised by a registered professional engineer, the Authority Having Jurisdiction ~~shall have the authority to permit inspection and testing by~~

such engineer may accept the written report bearing the engineer's seal of a hydrostatic test performed and/or witnessed by said engineer.

~~When the owner or his authorized representative requests inspection of a boiler prior to its installation, the Authority Having Jurisdiction shall make such inspection.~~

1021.2 Inspection Codes and Standards. All inspections or tests shall be made in compliance with the prescribed or recommendatory rules or instructions of this code, the ASME Code and the National Board Inspection Code as applicable. The installation or repair of gas and potable water piping and/or accessories shall be subject to the provisions of the Plumbing Code.

1021.3 Hydrostatic tests. A hydrostatic test is required for each secondhand boiler or detached boiler being placed back into service. Such boilers shall be tested by hydraulic pressure, in accordance with the National Board Inspection Code, at 50 percent greater than their allowed safe working pressure. If for any reason or on account of leakage the boiler will not hold this pressure, the owner shall have all repairs made before the boiler is placed into service and the inspector shall witness a second test upon receipt of notification that repairs have been made. If upon making the second test, the boiler is still defective, the Authority Having Jurisdiction shall, for each subsequent test, collect an additional inspection fee as herein provided for, but in no case shall the Authority Having Jurisdiction approve the boiler for use until fully satisfied of safe condition of such boiler. The installer or owner shall supply the equipment and labor to conduct the hydrostatic test on the boiler.

When there is a question or doubt about the condition of a boiler, the inspector may require a hydrostatic test, as follows:

1021.3.1 In preparing a boiler for a hydrostatic test, the boiler shall be filled with water to the stop valve and all air vented off. If the boiler to be tested is connected with other boilers that are under pressure, such connections shall be blanked off unless they have double stop valves on all connection pipes with a drain between.

1021.3.2 During a hydrostatic test of a boiler, the safety valve or valves shall be removed or each valve disc shall be held to its seat by means of a testing clamp and not by screwing down the compression screw under the spring.

1021.3.3 The temperature of the water used to apply a hydrostatic test shall be between 70° and 120°F.

1022.3.4 When a hydrostatic test is to be applied, the pressure shall be as follows:

1021.3.4.1 For all cases involving the question of tightness, the pressure shall be equal to the set pressure of the safety valve or valves having the lowest setting.

1021.3.4.2 For all cases involving the question of safety, the pressure shall be equal to one and one-half times the maximum allowable working pressure.

1021.3.4.3 The pressure applied for a hydrostatic test shall not exceed one and one-half times the maximum allowable working pressure. In no case shall the test pressure be exceeded by more than 2 percent.

1022.0 Temporary Operating Permit.

1022.1 General. ~~It shall be unlawful to operate a boiler or pressure vessel without first obtaining a valid operating permit to do so from the Authority Having Jurisdiction. Such permit shall be displayed in a conspicuous place adjacent to the boiler or vessel. The operating permit shall not be issued until the equipment has been inspected and approved by the Authority Having Jurisdiction.~~

Exception: ~~The operation only of steam heating boilers, low pressure hot water heating boilers, hot water supply boilers, and pressure vessels in Group R Occupancies of less than six dwelling units and in Group U Occupancies~~

An installer of a boiler installed by authority of a permit issued under the provisions of this code may operate a temporary boiler and its appurtenances for a limited period of time for the purpose of cleaning, testing and adjusting, prior to passing final inspection, upon the following conditions:

1. The installer in whose name the permit is issued shall request the Authority Having Jurisdiction to inspect the system for approval of such operation.
2. If upon inspection the system is approved for operation as described herein, the Authority Having Jurisdiction shall indicate in writing on said permit that a temporary operation is approved for the purpose of cleaning, testing, and adjusting for a period 30 working days from date of inspection.
3. On or before the expiration date of the temporary operating permit, the system shall be given a final inspection and if the system fails to be approved, a reinspection fee will be charged for each subsequent inspection until the system is finally approved as complying with the requirements of this code.
4. Should the cleaning, testing, and adjusting of a boiler system not be completed within the time stipulated on the temporary operating permit, the Authority Having Jurisdiction may extend the time for just cause.

1023.0 Maintenance Inspection Repairs.

1023.1 General. ~~The Authority Having Jurisdiction shall inspect all boilers and pressure vessels operated under permit at such intervals as deemed necessary, but not less frequently than noted below:~~ Repairs, changes, or alterations made on a boiler shall conform with the prescribed or recommended rules of the ASME Code and the National Board Inspection Code and shall be subject to inspection (visual and/or hydrostatic test) by the Authority Having Jurisdiction before the boiler is coated with paint or other preservatives.

1023.2 Power and Miniature Boilers. ~~Power boilers and miniature boilers shall be inspected externally annually. Where construction and operating conditions permit, they shall, in addition, be subject to inspection internally annually.~~ **Major Repair.** The term "major repair" as used herein shall be considered as one upon which the strength of a boiler would depend. Where a major repair is necessary, it shall be subject to the approval of the Authority Having Jurisdiction. Repairs to all boilers and their appurtenances shall conform as nearly as practicable to the requirements of the National Board Inspection Code. See Section 1023.6.

1023.3 Steam and Water Heating Boilers. ~~Steam heating boilers and hot water heating boilers shall be inspected externally annually. Where construction and operating conditions permit, they shall, in addition, be subject to inspection internally annually.~~ **Repairs by Welding**

Fusion. All repairs by welding shall be completed in accordance with the recommended rules for repair by fusion welding to power boilers published in the National Board Inspection Code.

~~**1023.4 Automatic Steam-Heating Boilers.** Automatic steam-heating boilers shall be inspected externally biennially. Where construction and operating conditions permit, they shall, in addition, be subject to inspection internally biennially.~~ **Re-ending and Piecing Tube.** Re-ending or piecing tubes or pipes in either fire-tube or water-tube boilers is permitted, provided the thickness of the tube or pipe has not been reduced by more than 10 percent from that required by the ASME Code for the pressure to be carried.

~~**1023.5 Unfired Pressure Vessels.** Unfired pressure vessels shall be inspected externally biennially. When subject to corrosion and construction permits, they shall, in addition, be subject to inspection internally biennially.~~

~~Inspection of boilers and pressure vessels covered by insurance may be made by employees of the insuring company holding commissions from the National Board of Boiler and Pressure Vessel Inspectors, subject to approval of the Authority Having Jurisdiction. Approved insuring company inspectors shall make reports on prescribed forms on inspections authorized by the Authority Having Jurisdiction. The reports shall be filed in the Authority Having Jurisdiction office. Company inspectors shall notify the Authority Having Jurisdiction of suspension of insurance because of dangerous conditions, new insurance in effect, and discontinuance of insurance coverage.~~ **Repairs and Renewal of Fittings and Appliances.** Whenever repairs are made to fittings or appliances or it becomes necessary to replace them, the work must comply with this Code and ASME Code and National Board Inspection Code for new installations.

1023.6 Repair/Alteration Forms. Completed State of Texas R-1 welder forms for a boiler repair and/or alteration shall be submitted to the inspector before final approval.

1023.7 Leaks or Cracks. If there is evidence of a leak or crack, or any defect, the covering of the boiler shall be removed to satisfy the inspector as to the safety of the boiler. If the covering cannot be removed at that time, the inspector may order operation of the boiler to be discontinued until such time as the covering can be removed and a proper examination made.

1025.0 Electrical Boilers

1025.1 Installation. Installation shall comply with the provisions of this chapter. All electrical wiring, devices, and components shall be in compliance with the Electrical Code and the State of Texas Boiler Law.

1025.2 Safety Relief Capacity. The minimum safety or safety relief valve relieving capacity for electric boilers shall be 3 ½ pounds of steam per hour per kilowatt input.

1026.0 New and Existing Boiler Installations.

1026.1 New installations. New boiler installations, including reinstalled boilers, shall be in

accordance with the requirements of the latest revision of the applicable section of the ASME Code and this code. Secondhand boilers shall meet all the requirements for new installations, including code construction and stamping requirements and shall be hydrostatically tested if deemed necessary by the Authority Having Jurisdiction.

1026.2 Existing installations. The maximum allowable working pressure for standard boilers shall be determined in accordance with the applicable provisions of the edition of the ASME Code under which they were constructed and stamped. In no case shall the maximum pressure of an existing nonstandard boiler be increased to a greater pressure than would be allowed for a new boiler of the same construction.

1026.3 Makeup water connection to steam boilers. Approved backflow preventers shall be installed in accordance with the Plumbing Code.

1026.4 Boiler Discharge to Plumbing Systems. No steam pipe shall connect to any part of a drainage or plumbing system, nor shall any water above 140°F (60°C) be discharged into any part of a drainage system. Such pipes shall be indirectly connected by discharging into an interceptor, blowoff pit or similar appurtenances prior to delivery into the drainage system.

FOOTNOTES FOR TABLE 1011.1 (Continued)

- ⁹ Every automatic low-pressure steam-heating boiler, ~~small power boiler,~~ and power steam boiler shall 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 shall be provided with a manual reset device and independent of the feed water controller. Coil-type flash steam boilers may use two high-temperature limit controls, one of which shall be manually reset in the hot water coil section of the boiler instead of the low-water level limit control.

{**EDITOR'S NOTE: NO CHANGE** TO THE REMAINDER OF **TABLE 1011.1** AND FOOTNOTES NOT LISTED.}

CHAPTER 11

REFRIGERATION

1101.0 General.

1101.1 Applicability. Part I of this chapter covers refrigeration systems. Refrigeration systems, equipment, and devices ~~for new buildings, including the replacement of parts, alterations, and substitution of a different refrigerant,~~ shall conform to the requirements of this chapter and other applicable provisions of this code. Replacement of existing refrigeration systems, conversion to a different refrigerant or installation of a new refrigeration system into an existing building shall conform to the requirements of this chapter as modified by Section 1126.

Occupied spaces within refrigerated areas shall comply with this chapter and the applicable portions of the Building Code.

Part II covers cooling towers.

1106.8 Prohibited Locations. Refrigeration systems or portions thereof shall not be located within a required exit enclosure. Refrigeration compressors exceeding five (5) horsepower (3.7 kW) rating, and replacements of existing systems that contain other than A1 refrigerants, shall be located not less than ten (10) feet (3048 mm) from an exit opening in a Group A; Group B; Group E; Group F; Group H; Group I; Group R, Division 1 or 2; or Group S Occupancy, unless separated by a one-hour fire-resistive ~~occupancy fire barrier separation.~~

The installation of air handling and refrigeration units within the same room is prohibited.

1106.10 Condensate. Condensate from air-cooling coils shall be collected and drained to an approved location. Drain pans and coils shall be arranged to allow thorough drainage and access for cleaning. Where temperatures can drop below freezing, heat tracing and insulation of condensate drains shall be installed. Primary drain piping inside buildings shall be insulated for the first 15 feet horizontally from the drain pan. The insulation shall be a minimum of ½ inch in thickness.

1106.14 Refrigerant Port Protection. Air conditioning refrigerant circuit access ports located outdoors shall be protected from unauthorized access with locking-type tamper resistant caps or in a manner approved by the Authority Having Jurisdiction.

Exception: Refrigerant ports in secure locations protected by walls or fencing and requiring key-access.

1108.3 Distribution of Ventilation. Exhaust inlets or permanent openings shall be located to provide ventilation throughout the entire refrigeration machinery room. Emergency exhaust intakes shall be located within 12 inches of the floor unless the refrigerant is lighter than air.

1110.1.1 For refrigerant pipe insulation see Table 1110.1.1.

TABLE 1110.1.1
Minimum Pipe Insulation^a

<u>Fluid</u>	<u>≤1.5 inch</u>	<u>>1.5-inch – 4-inch^d</u>	<u>>4 inch^d</u>
<u>Steam and Steam Condensate</u>	<u>1 ½"</u>	<u>3</u>	<u>4</u>
<u>Heating Hot Water</u>	<u>1 ½"</u>	<u>2</u>	<u>2</u>
<u>Service Hot Water</u>	<u>1"</u>	<u>2</u>	<u>2</u>
<u>Chilled Water, Brine or Refrigerant</u>	<u>1"</u>	<u>1 ½"</u>	<u>2</u>
Footnotes:			
a	Based on insulation having a conductivity (k) not exceeding 0.27 Btu per inch/hour•ft ² ° F.		
b	These thicknesses are based on energy efficiency considerations only. Additional insulation is sometimes required relative to safety issues/surface temperatures.		
c	These thicknesses are based on energy efficiency considerations only. Issues such as water vapor permeability or surface condensation sometimes require vapor retarders or additional insulation.		
d	Nominal pipe size.		

1123.3 Permanent Sign. In a refrigeration machinery room and for a direct refrigerating system of more than ten horsepower (7.5 kW), there shall be a permanent sign at an approved location located on or adjacent to the primary machinery room door and on each condensing unit in ½ inch high letters giving the following information:

- (1) Name of contractor installing the equipment.
- (2) Name and number designation of refrigerant in system.
- (2) Pounds of refrigerant in system.

1127.0 Requirements for Modifications to Existing Buildings.

1127.1 General. The requirements of this section shall apply retroactively to existing refrigeration systems, equipment or devices where a substitution of a different refrigerant, or replacement or addition of a refrigeration system or equipment occurs, and:

- (1) The quantity of refrigerant in the largest system in the room exceeds the allowable quantities per Table 11-1; or
- (2) The replaced, converted or altered system contains Group A1 refrigerant and has an aggregate horsepower of 100 or more for a single refrigerant system; or
- (3) The system contains other than Group A1 refrigerant.

Exception: Absorption systems, see Section 1128.

1127.2 Permits. Regardless of exemptions to the permit requirement set forth in Section 112, a mechanical permit shall be obtained for the replacement or addition of equipment or for conversion to another Group A1 refrigerant if mechanical refrigerating equipment is greater than 25 horsepower or conversion to a refrigerant other than Group A1 refrigerant in a system of any size.

1127.3 System Selection. Refrigerants used in replaced, added or refrigerant-converted systems shall be limited in application in accordance with Table 11-2 and the requirements of Section 1105.

1127.4 Refrigerant Sensor and Alarms. A refrigerant vapor detection system and alarm system for the specific refrigerant shall be installed in accordance with Section 1107.4 and shall utilize alarm signaling. The refrigerant sensor shall energize the emergency ventilation system upon detection of refrigerant levels as specified in Section 1108.5.

1127.5 Ventilation. Both continuous and emergency ventilation shall be provided in accordance with Section 1108 to serve the machinery room.

Exception: In the event that compliance with Sections 1108.7 and 1108.9 are physically impractical, a system designed to minimize the hazard of contaminated exhaust shall be prepared and submitted for approval to the building official by a registered professional engineer licensed to practice as such in the State of Texas. Such design is subject to the provisions of Sections 105, 106, and 107 of this code.

1127.6 Over pressure Protection. Pressure vessels of replaced, added or refrigerant-converted refrigeration machinery shall be provided with over-pressure protection as specified in this chapter.

1127.7 Machinery Room Construction. Construction joints and penetrations shall be sealed to restrict passage of refrigerant vapor in accordance with Section 1107.5.

Exception: Where it is found to be physically impractical to rehabilitate a machinery room to comply with the above requirement (one or two hour construction), an evaluation and report by a registered professional engineer or registered architect licensed to practice in the State of Texas shall be submitted to the building official for approval, clearly stating measures necessary to attain a reasonably complete fire-rated separation and to minimize the possibility of refrigerant escaping the machinery room into other parts of the building. Such design is subject to the provisions of Sections 105, 106, and 107 of this code.

1127.8 Equipment Identification. Equipment in the machinery rooms shall be identified as indicated in Section 1123 of this chapter.

1127.9 Ductwork. New ductwork, except for ventilation as required by this chapter and combustion air, is not permitted in an existing refrigeration machinery room. Where it is impractical to relocate existing duct or where it is necessary to add ductwork for combustion air, all joints and seams in both new and existing ductwork shall be sealed substantially air tight. Refer to Section 602.4.

1128.0 Boilers in Existing Machinery Rooms

1128.1 Isolation. Boilers and other heat-producing appliances shall be isolated from the machinery room by walls or partitions that create a reasonably distinct and separate atmosphere from the refrigeration machinery room. Combustion air shall be taken from other than refrigeration machinery rooms in accordance with Chapter 7 of this code. Partitions, doors and other components of the structure shall be made of materials as required for not less than a one-hour occupancy separation.

Exceptions:

- (1) Where it is physically impractical to comply with the above requirement, an evaluation report by a registered engineer or registered architect licensed to practice in the State of Texas shall be presented to the building official for approval. The walls, partitions and doors need not comply with the requirements set forth for a fire barrier, but may consist of one hour material designed and constructed to isolate the machinery room from the boilers to create a reasonably distinct and separate atmosphere within the respective rooms.
- (2) Where it is found to be physically impractical to construct a separation of boilers and refrigeration machinery containing Group A1 or Group B1 refrigerant, a registered professional engineer licensed to practice in the State of Texas shall evaluate the effect that ventilation, both emergency and continuous, will have on the operation of boilers within the refrigeration machinery room. A report, including a statement clearly indicating that a boiler will operate safely shall be submitted to the building official for review and approval prior to placing the boilers and ventilation into operation simultaneously. If the registered professional engineer determines that the required continuous ventilation will not have a detrimental effect on the operation of boilers but that emergency ventilation will have a detrimental effect on boiler operation, an electrical interlock designed to shut off the fuel supply to boilers when emergency ventilation is energized may be used in lieu of isolation of the boilers from the machinery room.

1128.2 Engines in Existing Refrigeration Machinery Rooms. Engines are permitted in refrigeration machinery rooms provided:

1. The refrigerant classification is Group A1 or Group B1 only;
2. Combustion air is taken from outside the building and to the engine in substantially sealed ducts or pipes;
3. Insulation is provided for all hot surfaces subject to a temperature of 800° F or higher;
4. Ventilation is provided to dissipate the radiant heat from the engines to keep the room below 120° F; and
- (5) There is no open flame or spark.

1128.3 Switchgear and Related Equipment in Machinery Room. Switchgear and related equipment may remain in an existing machinery room provided:

1. The refrigerant classification is Group A1 or Group B1 only.
2. The switchgear or related equipment possesses no clearance or work hazard in regard to the refrigeration machinery or the electrical switchgear.

1128.4 Emergency Control. Emergency control in accordance with Section 1109.4 shall be provided for the refrigeration equipment and existing air-handling equipment except machinery room ventilation fans.

1129.0 Absorption Refrigeration.

1129.1 Lithium Bromide Absorption Refrigeration. Lithium bromide absorption refrigeration equipment using water as the refrigerant and steam or hot water as the energy source is exempt from refrigeration machinery room requirements and may be located in the same room with refrigeration equipment requiring a machinery room.

1129.2 Direct Fired Absorption Refrigeration. Direct fired absorption refrigeration equipment shall be installed in a room constructed as required for a boiler of similar Btu input. This equipment shall not be installed in a refrigeration machinery room.

1129.3 Ammonia Absorption Refrigeration. Ammonia absorption refrigeration equipment larger than 5 tons shall be installed in a refrigeration machinery room with the relief piped in accordance with Section 1120.

Part II – Cooling Towers

~~1127.0-1130.0~~ General.

~~1127.4~~ 1130.1 Applicability. Cooling towers, evaporative condensers, and fluid coolers shall be readily accessible. When located on roofs, such equipment having combustible exterior surfaces shall be protected with an approved automatic fire-extinguishing system.

~~1128.0-1131.0~~ Support and Anchorage.

~~1128.4~~ 1131.1 General. Cooling towers, evaporative condensers, and fluid coolers shall be supported on noncombustible grillage designed in accordance with the building code. Seismic restraints shall be as required by the building code.

~~1129.0-1132.0~~ Drainage.

~~1129.4~~ 1132.1 General. Drains, overflows, and blow-down provisions shall have indirect connection to an approved disposal location. Discharge of chemical waste shall be as approved by the regulatory authority.

~~1130.0-1133.0~~ Chemical Treatment Systems.

~~1130.4~~ 1133.1 General. Chemical treatment systems shall comply with the fire code. Where chemicals used present a contact hazard to personnel, approved emergency eye-wash and shower facilities shall be installed.

~~4131.0~~ 1134.0 Location.

~~4131.4~~ 1134.1 General. Cooling towers, evaporative condensers, and fluid coolers shall be located such that their plumes cannot enter occupied spaces. Plume discharges shall be not less than 25 feet (7620 mm) away from a ventilation inlet to a building. Location on the property shall be as required for buildings by the building code.

~~4132.0~~ 1135.0 Electrical.

~~4132.4~~ 1135.1 General. Electrical systems shall be in accordance with the electrical code. Equipment shall be provided with a vibration switch to shut off fans operating with excessive vibration. In climates commonly subject to electrical storms, lightning protection shall be provided on roof-mounted equipment.

~~4133.0~~ 1136.0 Refrigerants and Hazardous Fluids.

~~4133.4~~ 1136.1 General. Equipment containing refrigerants as a part of a closed-cycle refrigeration system shall comply with Part I of this chapter. Equipment containing other fluids that are flammable, combustible, or hazardous shall be in accordance with the fire code.

CHAPTER 13

FUEL GAS PIPING

1301.0 ~~Scope of Gas Piping. General.~~ For provisions pertaining to Fuel Gas piping, refer to Chapter 12 of the Plumbing Code.

{EDITOR'S NOTE: DELETE THE REMAINDER OF THIS CHAPTER IN ITS ENTIRETY.}

CHAPTER 14

PROCESS PIPING

{EDITOR'S NOTE: DELETE AND RESERVE THIS CHAPTER IN ITS ENTIRETY.}

CHAPTER 15

SOLAR SYSTEMS

{EDITOR'S NOTE: DELETE AND RESERVE THIS CHAPTER IN ITS ENTIRETY.}

{EDITOR'S NOTE: INSERT THE FOLLOWING TABLE.}

TABLE D 2.1 METRIC / INCH CONVERSIONS

Metric / Inch Conversion Chart					
Millimeters	Fractions	Inches	Millimeters	Fractions	Inches
<u>.397</u>	<u>1/64</u>	<u>.015625</u>	<u>13.097</u>	<u>33/64</u>	<u>.515625</u>
<u>.794</u>	<u>1/32</u>	<u>.03125</u>	<u>13.494</u>	<u>17/32</u>	<u>.53125</u>
<u>1.191</u>	<u>3/64</u>	<u>.046875</u>	<u>13.891</u>	<u>35/64</u>	<u>.546875</u>
<u>1.588</u>	<u>1/16</u>	<u>.0625</u>	<u>14.288</u>	<u>9/16</u>	<u>.5625</u>
<u>1.984</u>	<u>5/64</u>	<u>.078125</u>	<u>14.684</u>	<u>37/64</u>	<u>.573125</u>
<u>2.381</u>	<u>3/32</u>	<u>.09375</u>	<u>15.081</u>	<u>19/32</u>	<u>.59375</u>
<u>2.778</u>	<u>7/64</u>	<u>.109375</u>	<u>15.478</u>	<u>39/64</u>	<u>.609375</u>
<u>3.175</u>	<u>1/8</u>	<u>.125</u>	<u>15.875</u>	<u>5/8</u>	<u>.625</u>
<u>3.572</u>	<u>9/64</u>	<u>.140625</u>	<u>16.272</u>	<u>41/64</u>	<u>.640625</u>
<u>3.969</u>	<u>5/32</u>	<u>.15625</u>	<u>16.669</u>	<u>21/32</u>	<u>.65625</u>
<u>4.366</u>	<u>11/64</u>	<u>.171875</u>	<u>17.066</u>	<u>43/64</u>	<u>.671875</u>
<u>4.762</u>	<u>3/16</u>	<u>.1875</u>	<u>17.462</u>	<u>11/16</u>	<u>.6875</u>
<u>5.159</u>	<u>13/64</u>	<u>.203125</u>	<u>17.859</u>	<u>45/64</u>	<u>.703125</u>
<u>5.556</u>	<u>7/32</u>	<u>.21875</u>	<u>18.256</u>	<u>23/32</u>	<u>.71875</u>
<u>5.953</u>	<u>15/64</u>	<u>.234375</u>	<u>18.653</u>	<u>47/64</u>	<u>.734375</u>
<u>6.350</u>	<u>1/4</u>	<u>.25</u>	<u>19.050</u>	<u>3/4</u>	<u>.75</u>
<u>6.747</u>	<u>17/64</u>	<u>.265625</u>	<u>19.447</u>	<u>49/64</u>	<u>.765625</u>
<u>7.144</u>	<u>9/32</u>	<u>.28125</u>	<u>19.844</u>	<u>25/32</u>	<u>.78125</u>
<u>7.541</u>	<u>19/64</u>	<u>.296875</u>	<u>20.241</u>	<u>51/64</u>	<u>.796875</u>
<u>7.938</u>	<u>5/16</u>	<u>.3125</u>	<u>20.638</u>	<u>13/16</u>	<u>.8125</u>
<u>8.334</u>	<u>21/64</u>	<u>.328125</u>	<u>21.034</u>	<u>53/64</u>	<u>.828125</u>
<u>8.731</u>	<u>11/32</u>	<u>.34375</u>	<u>21.431</u>	<u>27/32</u>	<u>.84375</u>
<u>9.128</u>	<u>23/64</u>	<u>.359375</u>	<u>21.828</u>	<u>55/64</u>	<u>.859375</u>
<u>9.525</u>	<u>3/8</u>	<u>.375</u>	<u>22.225</u>	<u>7/8</u>	<u>.875</u>
<u>9.922</u>	<u>25/64</u>	<u>.390625</u>	<u>22.622</u>	<u>57/64</u>	<u>.890625</u>

{EDITOR'S NOTE: REMAINDER OF APPENDIX D TO REMAIN AS SET FORTH IN 2012 UMC.}