301.0 Scope
This chapter covers general requirements for heating, ventilating, air conditioning, refrigeration, miscellaneous heat-producing, and energy-utilizing equipment. Such equipment Systems and equipment shall conform to the requirements of this code. Equipment shall not be installed or altered in violation of this code, nor shall the fuel input rate to equipment be increased in excess of the approved Btu/h (kW) rating at the altitude where it is being used.

Defective material or parts shall be replaced in such a manner as not to invalidate any approval to preserve an approval or a listing.
303.1 **Gas utilization equipment** shall be connected to the bldg piping in compliance w/ Section 1312.4 by one of the following:

1. Rigid metallic pipe and fittings.

2. Semi-rigid metallic tubing and metallic fittings. Aluminum alloy tubing shall not be used in exterior locations.

3. Listed connectors used in accordance with the terms of their listing that are completely in the same room as the equipment.

4. Listed in accordance w/ Sect. 303.2.
(5) Gas-fired food service (commercial cooking) equipment listed for use with casters or otherwise subject to movement for cleaning, and other large and heavy gas utilization equipment than can be moved, shall be connected in accordance with the connector manufacturer's installation instructions using a listed appliance connector complying with ANSI Z21.69, Standard for Connectors for Movable Gas Appliances.

(6) In Sections 303.1(2), (3), and (5), the connector or tubing shall be installed so as to be protected against physical and thermal damage. Aluminum alloy tubing and connectors shall not be used. Be coated to protect against external corrosion where they are in contact with masonry, plaster, or insulation or are subject to repeated wettings by such liquids as water (except rainwater), detergents, or sewage.
303.2 Use of Gas Hose Connectors. Listed gas hose connectors shall be used in accordance with the terms of their listing and as follows:

(A) Indoor. Indoor gas hose connectors shall be permitted to be used with laboratory, shop, or ironing equipment that requires mobility during operation. An equipment shutoff valve shall be installed where the connector is attached to the building piping. The connector shall be of minimum length and shall not exceed 3 ft. The connector shall not be concealed and shall not extend from one room to another or pass through wall partitions, ceilings, or floors.

Exception: Listed metal appliance connectors shall have an overall length not to exceed three (3) ft, except range and domestic clothes dryer connectors, which may not exceed six (6) feet.
303.2 Use of Gas Hose Connectors.

(B) Outdoor. Outdoor gas hose not to exceed 15 feet with connectors shall be permitted to be used to connect portable outdoor gas-fired equipment. An equipment shutoff valve, a listed quick-disconnect device, or a listed gas convenience outlet shall be installed where the connector is attached to the supply piping and in such a manner so as to prevent the accumulation of water or foreign matter. This connection shall only be made in the outdoor area where the equipment is to be used.
304.0 Installation.

304.1 Listed Appliances. Except as otherwise provided in the code, the installation of appliances regulated by this code shall conform to the conditions of listing. The appliance installer shall leave the manufacturer's installation and operating instructions attached to the appliance. Clearances of listed appliances from combustible materials shall be as specified in the listing or on the rating plate.

304.2 Room Large in Comparison to Size of Equipment. Central-heating furnaces not listed for closet or alcove installation shall be installed in a room or space having a volume at least 12 times the total volume of the furnace; central-heating boilers not listed for closet or alcove installation shall be installed in a room or space having a volume 16 times the volume of the boiler.
304.4 Anchorage of Appliances. Appliances designed to be fixed in position shall be securely fastened in place. Supports for appliances shall be designed and constructed to sustain vertical and horizontal loads within the stress limitations specified in the Building Code for the minimum basic wind speed. **Exception:** requirements of the equipment being replaced. Replacement of appliances in kind need only match the fastening.

304.5 Identification of Equipment. When more than one heating, cooling, ventilating, or refrigerating system is installed on the roof of a building or within a building, it shall be permanently identified as to the area or space served by the equipment.
304.6 LPG Appliances. Liquefied petroleum gas-burning appliances shall not be installed in a pit, basement or similar location where heavier-than-air gas might collect. Appliances so fueled shall not be installed in an above-grade under-floor space or basement unless such location is provided with an approved means for removal of unburned gas.
305.2 Access to Appliances and Equipment on Roofs.
305.2.1 Appliances and equipment located on roofs or other elevated locations shall be accessible.
305.2.2 In buildings where the point of access is more than 14 feet above grade, an inside means of access to the roof shall be provided.
305.2.3 The inside means of access shall be a permanent or foldaway inside stairway or ladder, terminating in an enclosure, scuttle, or trapdoor. Such scuttles or trapdoors shall be at least 22” X 24” in size, shall open easily and safely under all conditions, and shall be constructed so as to permit access from the roof side unless deliberately locked on the inside. At least six 6 feet of clearance shall be available between the access opening and the edge of the roof or similar hazard..........
An attic or furred space in which a warm-air furnace is installed shall be provided with a 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 30” by 30” continuous from the opening to the furnace and its controls.
the **BUILDING CODE** section 1209 for any attic space (even if no mech equipment): **1209.2 Attic spaces.** An opening not less than 20 inches by 30 inches shall be provided to any attic area having a clear height of over 30 inches. A 30-inch minimum clear headroom in the attic space shall be provided at or above the access opening. When the opening is located in a one-hour rated assembly, the opening shall be 5/8 inch Type X gypsum or permitted to be constructed as in Section 406.1.4 for attic disappearing stairs.
305.2.4 Permanent ladders providing roof access shall:
1. Have side railings that extend at least 30 inches above the roof edge or parapet wall.
2. Have landings less than eighteen 18 feet apart measured from the finished grade.
3. Be at least fourteen 14 inches in width.
4. Have rungs not more than fourteen 14 inches on center.
5. Have a minimum of six 6 inches toe space.
305.2.5 Platform. A furnace located on a roof shall be installed on a substantial, level platform. When the roof has a slope greater than one 1 in 12, a level working platform at least 30 inches in depth and width shall be provided along the firebox and control sides of the furnace. Sides of a working platform facing the roof edge below shall be protected by a substantial railing 42 inches in height with vertical rails not more than 21 inches apart, except that parapets at least 24 inches in height may be utilized in lieu of rails or guards.
306.0 Automatic Control Devices.
Heating appliances shall be equipped with a listed device or devices that will shut off the fuel supply to the main burner or burners in the event of pilot or ignition failure....that will shut off the flow of gas to the pilot in event of ignition failure. Exceptns..

Heating appliances whose manual fuel controls are not readily accessible from the main portion of the building being heated shall be equipped with remote controls. Forced-air and gravity-type warm-air furnaces shall be equipped with a listed air outlet temperature limit control .....Electric duct heaters shall be equipped with an approved automatic reset air outlet temperature limit control that will limit the outlet air temp.......
307.0 Labeling.

307.1 Fuel-Burning Appliances. Fuel-burning heating appliances shall bear a permanent and legible factory-applied nameplate on which shall appear:

307.1.1 The manufacturer's name.
307.1.2 The approved fuel input rating of the appliance, expressed in Btu/h (W).
307.1.3 The model and serial number.
307.1.4 Instructions for the lighting, operation, and shutdown of the appliance.
307.1.5 The type of fuel approved for use with the appliance.
307.1.6 The symbol of an approved agency certifying compliance of the equipment with recognized standards.
307.1.7 Required clearances from combustible surfaces on which or adjacent to which it may be mounted.

307.2 Electric Heating Appliances. Electric
307.0 Labeling.

307.2 Electric Heating Appliances. Electric heating appliances shall bear a permanent and legible factory-applied nameplate:

307.2.1 The name or trademark of the manufacturer.
307.2.2 The catalog (model) number or equivalent.
307.2.3 The electrical rating in volts, amperes (or watts), and, for other than single phase, the number of phases.
307.2.4 The output rating in Btu/h or kW.
307.2.5 The electrical rating in volts, amperes, or watts of each field-replaceable electrical component.
307.2.6 The symbol of an approved agency certifying compliance of equipment with recognized standards.
307.2.7 Required clearances from combustible surfaces on which or adjacent to which it may be mounted.
307.0 Labeling.

307.3.6 Instructions and Clearances. Appliances shall be accompanied by clear and complete installation instructions, including required clearances from combustibles other than mounting or adjacent surfaces, and temperature rating of field-installed wiring connections if over 140°F (60°C).

CHAPTER 2 DEFINITIONS
APPLIANCE – a device that utilizes fuel or other forms of energy to produce light, heat, power, refrigeration, ventilation or air-conditioning. This definition also shall include a vented decorative appliance.
308.0 Location.
308.1 Protection Against 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. Heating & cooling equipmmt located in a garage & that generates a glow, spark, or flame capable of igniting flammable vapors shall be installed with the pilots and burners or heating elements and switches at least 18 inches above the floor level. Where such appliances installed within a garage are enclosed in a separate, approved compartment having access only from outside of the garage, such appliances may be installed at flr level, provided req’d combustion air is taken from & discharged to exterior of the garage.
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. For provisions regarding flood provisions see Chapter 19 of the City Code. This means the Code of Ordinances, not the Bldg Code.
309.0 Electrical Connections.
Equipment regulated by this code requiring electrical connections of more than fifty (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 twenty-five (25) feet (7,620 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.
310.1 Condensate Disposal. Condensate from air washers, air-cooling coils, fuel-burning condensing appliances, and the overflow from evaporative coolers and similar water-supplied equipment or similar air-conditioning equipment shall be collected and discharged to an approved plumbing fixture or disposal area. If discharged into the drainage system, equipment shall drain by means of an indirect waste pipe. The waste pipe shall have a slope of not less than 1/8 inch per foot or 1 percent slope and shall be of approved corrosion-resistant material not smaller than the outlet size as required in either Section 310.3 or 310.4 for air-cooling coils or condensing fuel-burning appliances, respectively. Condensate or wastewater shall not drain over a public way.
APPROVED CONDENSATE TERMINATION POINTS

OPEN SIGHT SANITARY DRAIN

ROOF DRAIN OR GUTTER - BUT ONLY IF DOESN’T SPILL ONTO A PUBLIC WAY (LIKE A SIDE WALK OR DRIVE)

BACK OF TUB DRAIN

DOUBLE WASHER WALL DRAIN BOX

FRENCH DRAINS

TAIL PIECE OF A LAVATORY IN A TOILET ROOM, BUT CANNOT GO TO CONNECTION IN TAIL PIECE OF A SINK; (HOWEVER YOU COULD ADD A DEDICATED P TRAP (VENTED AND TRAP PRIMED) OFF THE WASTE RISER UNDER THE SINK)
310.2 Condensate Control. When a cooling coil or cooling unit is located in an attic or furred space, or in any area where damage may result 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 may be provided in lieu of the secondary drain pan. The additional pan or the standing overflow shall be provided with a drain pipe, minimum ¾ inch nominal pipe size, discharging at a point that can be readily observed.

**Exception:** The additional watertight pan may be of corrosion resistant material other than metal, when approved by the Authority Having Jurisdiction.
THE PRIMARY DRAIN
THE STANDING OVERFLOW - IS A BIT HIGHER

FLOAT SWITCH
The proper method of clearing a clogged drain
310.2.1 Water-Level Sensing Devices. On units and other coils on a roof or above a ceiling that do not have a secondary drain or means to install a secondary drain pan, a water level sensing device shall be installed inside the primary drain pan. This device shall shut off the appliance in the event that the primary drain becomes restricted. Inline overflow devices installed in the primary drain line shall not be permitted.
### 310.3 Condensate Waste Sizing

Condensate waste pipes from air-cooling coils shall be sized in accordance with equipment capacity as follows:

<table>
<thead>
<tr>
<th>Equipment Capacity in</th>
<th>Minimum Condensate Pipe Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tons of Refrigeration</td>
<td></td>
</tr>
<tr>
<td>Up to 10-20</td>
<td>Inches 3/4, 1, 1-1/4, 1-1/2, 2</td>
</tr>
<tr>
<td>Over 10-21-40</td>
<td>(mm) 20, 25, 32, 40, 50</td>
</tr>
<tr>
<td>Over 40-41-90</td>
<td></td>
</tr>
<tr>
<td>Over 90-94-125</td>
<td></td>
</tr>
<tr>
<td>Over 125-126-250</td>
<td></td>
</tr>
</tbody>
</table>

The size of condensate waste pipes may be for one unit or a combination of units, or as recommended by the manufacturer. The capacity of waste pipes assumes a 1/8 inch
311.0 Personnel Protection. A suitable and substantial metal guard shall be provided around exposed flywheels, fans, pulleys, belts, and moving machinery that are portions of a heating, ventilating, or refrigerating system.
312.0 Air Filters.

312.1 Air filters shall be installed in a heating, cooling or makeup air system. Such filters shall comply with the standard, Air Filter Units, Test Performance of, that is referenced in Chapter 17, as Class I or II filters.

Exception: Systems serving single guest rooms or dwelling units shall not require a listed filter.
312.2 Filters for Direct Gas-fired Makeup-air Heaters. Air passing through or over the burners of direct gas fired makeup air heaters shall be outside air and screened or filtered to prevent leaves, papers, or other objects from being picked up from the outside, ignited, and discharged into the heated space.

312.3 Filters for Direct Gas-fired Industrial Air Heaters. Industrial gas-fired air heaters employing recirculation shall have filters installed in both the outside air inlet and the recirculating system.

312.4 Filters for Ventilation Systems. Air filters shall be listed units. Liquid adhesive coatings used on filters shall have a flash point of 350ºF (or higher, as determined by ASTM D-93..)
## CHAPTER 3: GENERAL REQUIREMENTS

**CLEARANCES**

### TABLE 3-1

Standard Installation Clearances in Inches for Unlisted Heat-Producing Appliances

See Section 304.0.

<table>
<thead>
<tr>
<th>APPLIANCE</th>
<th>ABOVE TOP OF CASING OR APPLIANCE</th>
<th>FROM TOP AND SIDES OF WARM-AIR BONNET OR PLENUM</th>
<th>FROM FRONT</th>
<th>FROM BACK</th>
<th>FROM SIDES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RESIDENTIAL-TYPE APPLIANCES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boilers and Water Heaters</td>
<td>Automatic Oil or Comb. Gas-Oil</td>
<td>6</td>
<td>24</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Steam Boilers—15 psi (103.4 kPa)</td>
<td>Automatic Gas</td>
<td>6</td>
<td>18</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Water Boilers—250°F (121°C)</td>
<td>Solid</td>
<td>6</td>
<td>48</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Water Heaters—200°F (93°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Water Walled or Jacketed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furnaces—Central, or Heaters</td>
<td>Automatic Oil or Comb. Gas-Oil</td>
<td>6²</td>
<td>24</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Electric</td>
<td>Automatic Gas</td>
<td>6²</td>
<td>18</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Electric Central Warm-Air Furnaces</td>
<td>Solid</td>
<td>18³</td>
<td>48</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Gravity, Upflow, Downflow, Horizontal and Duct Warm-Air—250°F (121°C) max.</td>
<td>Electric</td>
<td>6²</td>
<td></td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Furnaces—Floor</td>
<td>Automatic Oil or Comb. Gas-Oil</td>
<td>36</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>For Mounting in Combustible Floors</td>
<td>Automatic Gas</td>
<td>36</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Heat Exchangers</td>
<td>Steam—15 psi (103.4 kPa) max.</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hot Water—250°F (121°C) max.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room Heaters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating Type</td>
<td>Oil or Solid</td>
<td>36</td>
<td>24</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Radiant or Other Type</td>
<td>Gas</td>
<td>36</td>
<td>24</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Room Heaters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Gas with double metal or ceramic back</td>
<td>36</td>
<td>36</td>
<td>12</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Fireplace Stove</td>
<td>Solid</td>
<td>48⁶</td>
<td>54</td>
<td>48⁶</td>
<td>48⁶</td>
</tr>
</tbody>
</table>
707.2 Shaft enclosure required.

Exceptions: Openings through a floor/ceiling assembly shall be protected by a shaft enclosure complying with this Section.

1. A shaft enclosure is not required for openings totally within an individual residential dwelling unit and connecting four stories or less.

4. A shaft enclosure is not required for penetrations by ducts protected in accordance with Section 712.4. Grease ducts shall be protected in accordance with the International Mechanical Code.
## TABLE 716.5
### FIRE AND SMOKE DAMPER LOCATIONS

<table>
<thead>
<tr>
<th>Location</th>
<th>Fire Dampers</th>
<th>Smoke Dampers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Walls</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Fire Barriers - separated uses, incidental use areas, horizontal exits, atrium enclosures, exit passageways, and elevator lobbies, etc.</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Shaft enclosures</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Fire Partitions - R-1/R-2 unit separations, and mall tenant separations, etc.</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Corridors - when required to be rated by Table 1017.1</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Smoke barriers</td>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>Horizontal assemblies</td>
<td>Through penetrations</td>
<td>Required</td>
</tr>
<tr>
<td>Membrane penetrations</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Nonfire-resistance-rated assemblies</td>
<td>Required</td>
<td></td>
</tr>
</tbody>
</table>

---

1. Not required for penetrations tested in accordance with ASTM E 119 as part of the rated assembly.
2. Not required for ducts used as a part of an approved smoke control system in accordance with Section 909.
3. Not required in sprinklered building of other than Group H penetrated by ducted HVAC systems.
4. Not required for steel exhaust subducts extending at least 22 inches vertically in exhaust shafts having continuous airflow upward to the outside.
5. Not required in parking garage supply or exhaust shafts that are separated from other building shafts by a minimum of 2-hour fire-resistance-rated construction.
6. Not required in sprinklered buildings of other than Group H for tenant separations and corridor walls.
7. Not required in buildings of other than Group H where duct penetration is limited to 100 square inches; is of minimum 0.0217-inch steel; does not have communicating openings between a corridor and adjacent spaces; is installed above a ceiling; and does not terminate at a wall register of the fire-resistance-rated wall.
1013.- Mechanical equipment. Guards shall be provided when appliances, equipment, fans roof hatch openings or other components that require service are located within 10 feet of a roof edge or open side of a walking surface & such edge or open side is located more than 30 inches above the floor, roof or grade below. The guard shall be constructed so as to prevent the passage of a 21-inch-diameter sphere. The guard shall extend not less than 30 inches beyond each end of such appliance, equipment, fan or component.
1017.4 Air movement in corridors. Corridors shall not serve as supply, return, exhaust, relief or ventilation air ducts or plenums. Exceptions:

1. Use of a corridor as a source of makeup air for exhaust systems in rooms that open directly onto such corridors, including toilet rooms, sleeping units, dormitory rooms, bathrooms, dressing rooms, smoking lounges and janitor closets, shall be permitted, provided that each such corridor is directly supplied with outdoor air at a rate greater than the rate of makeup air taken from the corridor.

2. Where located within a dwelling unit, the use of corridors for conveying return air shall not be prohibited.

3. Where located within tenant spaces of 1,000 square feet or less in area, utilization of corridors for conveying return air is permitted.

4. Air induced from the corridor into rooms required to be maintained under negative pressure with respect to the corridor by this code, other regulatory authorities, or standards, shall be limited to the quantity required to maintain the required room pressure.

5. Air leakage into the corridor from rooms required to be maintained under positive pressure with respect to the corridor by this code, other regulatory authorities, or standards, shall be limited to the quantity reqd to maintain the required room pressure.
1017.4.1 Corridor ceiling. Use of the space between the corridor ceiling and the floor or roof structure above as a return air plenum is permitted for one or more of the following conditions:

1. The corridor is not required to be of fire-resistance-rated construction;
2. The corridor is separated from the plenum by fire-resistance-rated construction;
3. The air-handling system serving the corridor is shut down upon activation of the air-handling unit smoke detectors required by the *Mechanical Code*.
4. The air-handling system serving the corridor is shut down upon detection of sprinkler waterflow where the building is equipped throughout with an automatic sprinkler system; or
5. The space between the corridor ceiling and the floor or roof structure above the corridor is used as a component of an approved engineered smoke control system.
1024.6 Access to a public way. The exit discharge shall provide a direct and unobstructed access to a public way.

DON'T PUT YOUR CONDENSING UNIT IN THE EXIT PATH

Figure 1024.5
EXAMPLES OF EXIT DISCHARGE
1609.3 Basic wind speed. The basic wind speed, in mph, for the determination of the wind loads shall be 110 mph (3 second gust).

1613.5.6 Determination of seismic design category. This jurisdiction is classified as Seismic Design Category A.
NEXT-- CHAPTER 4
401.0 General. This chapter contains requirements for ventilation air supply and exhaust, evaporative cooling systems and makeup air requirements for direct-gas-fired heaters, industrial air heaters and miscellaneous heaters. Ventilation air supply requirements for specific occupancies are found in Part III of this chapter.

Part I – Ventilation Air  {EDITOR’S NOTE: DELETE SECTION 402 IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING.}

402.0 Makeup Air: Makeup air requirements for direct gas-fired heaters, industrial air heaters, and miscellaneous heaters are found in Chapters 5 and 9.
403.0 General. Evaporative cooling systems shall comply with this chapter. Except for Section 906.0, evaporative cooling systems shall be provided with outside air as specified for cooling systems in this code. Air ducts and fire dampers which are a portion of an evaporative cooling system shall comply with this code.

404.0 Location. Evaporative cooling systems shall be installed so as to minimize the probability of damage from an external source.

405.0 Access, Inspection and Repair. Evaporative coolers shall be accessible for inspection, service and replacement without removing permanent construction.
406.0 Installation. An evaporative cooler supported by the building structure shall be installed on a substantial level base and shall be secured directly or indirectly to the building structure by suitable means to prevent displacement of the cooler. Modifications made to the supporting framework of buildings as a result of the installation shall be in accordance with the requirements of the Building Code. Openings in exterior walls shall be flashed in an approved manner in accordance with the requirements of the Building Code. An evaporative cooler supported directly by the ground shall be isolated from the ground by a level concrete slab extending not less than 3 inches above the adjoining ground level. An evaporative cooler supported on an above-ground platform shall be elevated at least six inches above adjoining ground level.
PART III Ventilation Requirements

407.0 Scope
Buildings and structures enclosing spaces intended for human occupancy shall be provided with ventilation in accordance with this chapter.
408.0 Ventilation

408.1 General. Enclosed portions of buildings and structures in occupancies other than the locations specified in Sections 408.3 through 408.7 shall be provided with natural ventilation through openable exterior exterior openings with an area of not less than 1/20 of the total floor area of such portions or shall be provided with a mechanically operated ventilating system. The mechanically operated ventilating system shall be capable of supplying ventilation air in accordance with Table 4-1 during such time as the building or space is occupied.
408.2 Applicability. Outside air quantities listed in Table 4-1 are minimum requirements and are not necessarily adequate for all occupancy conditions.

408.3 Toilet Rooms. Toilet rooms shall be provided with a fully openable exterior window at least 3 square feet in area; a vertical duct not less than 100 square inches in area for the first toilet facility, with 50 additional square inches for each additional facility; or a mechanically operated exhaust system capable of exhausting 50 cubic feet of air per minute for each water closet or urinal installed in the toilet room. Such systems shall be connected directly to the outside. The point of discharge shall be at least 3 feet from any openable window.
408.4 Ventilation in Hazardous Locations. Rooms, areas, or spaces in which explosive, corrosive, combustible, flammable, or highly toxic dusts, mists, fumes, vapors, or gases are or may be emitted due to the processing, use, handling, or storage of materials shall be mechanically ventilated as required by the Fire Code and other parts of this code.

Emissions generated at work stations shall be confined to the area in which they are generated as specified in the Fire Code and other parts of this code. Supply and exhaust openings shall be in accordance with this code. Exhaust air contaminated by highly toxic material shall be treated in accordance with the Fire Code.
408.5 Group B Occupancies. In Group B Occupancies, or portions thereof, where Class I, II or IIIA liquids are used, mechanical exhaust shall be provided sufficient to produce six air changes per hour. Such mechanical exhaust shall be taken from a point at or near the floor level.

SEE FIRE CODE; CLASS RATING IS BASED ON FLAMMABILITY
408.6 Group S Parking Garages. In parking garages, other than open parking garages as defined in the Building Code, used for storing or handling of automobiles operating under their own power and on loading platforms in bus terminals, ventilation shall be provided capable of exhausting a minimum of 0.75 cubic feet per minute (cfm) per square foot of gross floor area. The building official may approve an alternate ventilation system designed to exhaust a minimum of 14,000 cfm for each operating vehicle. Such system shall be based on the anticipated instantaneous movement rate of vehicles, but not less than 2.5 percent (or one vehicle) of the garage capacity.
Automatic carbon monoxide-sensing devices may be employed to modulate the ventilation system to maintain a maximum average concentration of carbon monoxide of 50 parts per million during any eight-hour period, with a maximum concentration not greater than 200 parts per million for a period not exceeding one hour.

Exception: In repair garages and motor vehicle fuel-dispensing stations without lubrication pits, in storage garages, and in aircraft hangars, the ventilating system may be omitted when, in the building official's opinion, the building is supplied with unobstructed openings to the outer air that are sufficient to provide the necessary ventilation.

Connecting offices, waiting rooms, ticket booths and similar uses shall be supplied with conditioned air under positive pressure.
408.7 Group S Repair Garages. In buildings used for the repair or handling of motor vehicles operating under their own power, mechanical ventilation shall be provided capable of exhausting a minimum of 1.0 cfm per square foot of floor area. Each engine repair stall shall be equipped with an exhaust pipe extension duct that extends to the outside of the building, and if over 10 feet in length, shall mechanically exhaust 300 cfm. Connecting offices and waiting rooms shall be supplied with conditioned air under positive pressure.

Exception: In repair garages and aircraft hangars, the building official may authorize the omission of such ventilating equipment when, in his or her opinion, the building is supplied with unobstructed openings to the outer air that are well distributed and sufficient in size to provide the necessary ventilation. Doors providing adequate cross ventilation may serve to satisfy this requirement.
## TABLE 4-1
Outdoor Air Requirements for Ventilation

<table>
<thead>
<tr>
<th>APPLICATIONS(^{(1)})</th>
<th>OUTDOOR VENTILATION AIR (cfm per square foot of area unless noted)(^{(2)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft Hangers</td>
<td>0.02 No Requirement</td>
</tr>
<tr>
<td>- for Repair</td>
<td></td>
</tr>
<tr>
<td>- for Storage</td>
<td></td>
</tr>
<tr>
<td>Animal Housing Areas</td>
<td>1.00</td>
</tr>
<tr>
<td>Art Classrooms / Studios</td>
<td>0.25</td>
</tr>
<tr>
<td>Assembly Rooms</td>
<td>0.50(^{(6)})</td>
</tr>
<tr>
<td>- Auditoriums</td>
<td></td>
</tr>
<tr>
<td>- Multi-purpose</td>
<td>0.50(^{(8)})</td>
</tr>
<tr>
<td>Autopsy Rooms</td>
<td>0.50(^{(4)})</td>
</tr>
<tr>
<td>Ballrooms and Discos</td>
<td>1.67</td>
</tr>
<tr>
<td>- Where smoking is permitted</td>
<td></td>
</tr>
<tr>
<td>- Where smoking is prohibited</td>
<td>0.50</td>
</tr>
<tr>
<td>Bank Vaults</td>
<td>0.08</td>
</tr>
<tr>
<td>- Greater than 200 square feet</td>
<td></td>
</tr>
</tbody>
</table>
### Transportation Waiting Rooms

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Warehouses</td>
<td>0.20</td>
</tr>
<tr>
<td>Wood and Metal Shops</td>
<td>0.25</td>
</tr>
</tbody>
</table>

### FOOTNOTES FOR TABLE 4-1

1. Applications may not be unique to a single occupancy group. Where specific use is not listed, judgment as to similarity shall be made by the Authority Having Jurisdiction.
2. Based on net occupiable space. The minimum amount of outdoor air supplied during occupancy shall be permitted to be based on the rate per square foot (m²) of floor area indicated in Table 4-1 or cfm (L/s) per person in accordance with nationally recognized standards. Controls shall be permitted to adjust outdoor air ventilation rates to provide equivalent rates per person under different conditions of occupancy.
3. The exhaust air minus the sum of the outdoor air and transfer air from adjacent spaces shall be sufficient to provide a negative pressure with respect to adjoining spaces.
4. Normally supplied by transfer air with local mechanical exhaust with no recirculation.
5. Independent of room size.
6. Where there is fixed seating, use 6 cfm/seat.
7. Not less than 15 cfm (7.08 L/s) per person. Occupancy shall be based on the number of bedrooms: first bedroom = two persons, each additional bedroom = one person. Air quantities from natural ventilation are considered adequate if operable window option is provided.
8. Conformance to applicable state and federal licensing standards will be acceptable in complying with this code.
9. Natural ventilation provided as per Chapter 12 of the Houston Building Code is an acceptable alternative.
10. The rates in this table are allowed to be intermittent operation.
NEXT-- CHAPTER 5