

**ORDINANCE NO.**

**AN ORDINANCE REPEALING AND REPLACING ARTICLE 5 OF CHAPTER 25-12 TO ADOPT THE 2015 UNIFORM MECHANICAL CODE AND LOCAL AMENDMENTS.**

**BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF AUSTIN:**

**PART 1.** City Code Chapter 25-12 is amended to repeal Article 5 (*Mechanical Code*) and replace it with a new Article 5 to read as follows:

***ARTICLE 5. MECHANICAL CODE.***

**§ 25-12-131 MECHANICAL CODE.**

- (A) The Uniform Mechanical Code, 2015 edition, published by the International Association of Plumbing and Mechanical Officials (2015 Mechanical Code) is adopted and incorporated into this section, including all appendices, with deletions and amendments in Subsection (B) of this section and Section 25-12-133 (*Local Amendments to the Mechanical Code*).
- (B) The following provisions of the 2015 Mechanical Code are deleted. All subsections contained within a deleted section are also deleted, even if not specifically listed below.

|                 |                   |                   |
|-----------------|-------------------|-------------------|
| Section 104.1   | Section 104.2     | Section 104.3     |
| Section 104.4.3 | Section 104.4.4   | Section 104.5     |
| Table 104.5     | Section 107.0     | Section 301.4     |
| Section 303.8.4 | Section 303.8.5   | Section 304.3.1.1 |
| Section 310.3   | Section 401.1     | Section 402.4     |
| Table 403.7     | Section 504.4.2.1 | Section 504.6     |
| Section 605.0   | Section 1126.0    | Chapter 13        |
| Section 1403.0  |                   |                   |

The city clerk shall file a copy of the 2015 Mechanical Code with the official ordinances of the City.

**§ 25-12-132 CITATIONS TO THE MECHANICAL CODE.**

In the City Code, “Mechanical Code” means the 2015 Mechanical Code adopted by Section 25-12-131 (*Mechanical Code*) of the City Code as amended by Section 25-12-133 (*Local Amendments to the Mechanical Code*).

**§ 25-12-133 LOCAL AMENDMENTS TO THE MECHANICAL CODE.**

- (A) The following provisions are local amendments to the 2015 Mechanical Code. Each provision in this section is a substitute for the identically numbered provision deleted by Section 25-12-131(B) (*Mechanical Code*) or is an addition to the 2015 Mechanical Code.
- (B) The following provisions of the local amendments are adopted from the International Mechanical Code, 2015 edition, published by the International Code Council, Inc., with modifications: Sections 504.8.4, 510, and 607

**104.1 Permit Required.** Except as provided in Sections 104.2(*Exempt Work*), 104.5(*Homestead Permit*), and 108.0 (*Registered Industrial Plant Program*), a person shall obtain a mechanical permit before the person installs, alters, repairs, replaces, or remodels or causes to be installed, altered, repaired, replaced, or remodeled a mechanical system regulated by the Mechanical Code. A separate mechanical permit is required for each separate building or structure.

**104.1.1 Special Inspections Program for Timed Inspections.** The building official may establish by rule an inspection program for commercial mechanical components identified in this section in buildings not covered under the International Residential Code and the Special Inspections Programs covered under other technical or building codes. The buildings shall be within the zoning jurisdiction of the City and outside of the zoning jurisdiction under agreement with a municipal utility district or where the City provides electrical service. The special inspection program applies to the replacement of existing:

- (1) Roof Top Equipment
- (2) Refrigeration or HVAC equipment

**104.2 Exempt Work.** A mechanical permit shall not be required for the following:

- (1) A portable heating appliance, portable ventilating equipment, a portable cooling unit, or a portable evaporative cooler.

- (2) Replacement of any component part or assembly of an appliance that does not alter its original approval and complies with other applicable requirements of this code.
- (3) Refrigerating equipment that is part of the equipment for which a permit has been issued pursuant to the requirements of this code.
- (4) Exemption from the permit requirements of this code shall not be deemed to grant authorization for work to be done in violation of the provisions of this code or other laws or ordinances of this jurisdiction.

**104.3 Offense.** A person who violates Section 104.0(*Permits Required*) commits an offense. An offense under this section is a class C misdemeanor. Each day a person commits an offense or remains in violation of Section 104.0(*Permits Required*) is a separate occurrence. Proof of a culpable mental state is not required for conviction of an offense under this section.

**104.5 Homestead Permit.** A person who is not licensed to perform mechanical work may perform mechanical work within a residence owned by the person if all of the requirements of this subsection are met.

- (1) The residence is the person's homestead.
- (2) The work does not include mechanical work that involves reclaiming and charging of a system containing refrigerant.
- (3) The residence is the person's principal residence.
- (4) The person has not secured a homestead permit for another residence within the prior 12 month period.
- (5) The person must have owned and occupied the property as of January 1 of the tax year in which the person applies for a homestead permit.
- (6) A person must obtain a homestead permit and pay required permit fees before beginning any mechanical work. A person must apply for a homestead permit in person and must file an affidavit stating that the location at which the work is to be done is the person's homestead.
- (7) A person who has obtained a homestead permit may not allow or cause any other person to perform mechanical work under the permit.
- (8) A person may not transfer a permit to another person.
- (9) A person performing mechanical work under a homestead permit shall present a picture identification to verify that the person is authorized to perform work under the homestead permit, when requested by the building official or his designee.

- (10) A homestead permit shall not be issued for mechanical work on a mobile, modular or manufactured home unless the homeowner owns the land on which the mobile, modular, or manufactured home is located. A homestead permit shall not be issued if the mobile, modular, or manufactured home is located in a mobile home park, mobile home community, or other commercial premises.

**104.6 Registration of Air Conditioning and Refrigeration Contractor.** An air conditioning and refrigeration contractor shall register with the City before performing work regulated by the Mechanical Code. A contractor shall pay a registration fee, established by separate ordinance, for initial registration, registration after a license suspension, and registration after a license expiration. A new registration fee is not required for renewal of an unexpired license. The registration shall contain the name and license number of the air conditioning and/or refrigeration contractor who is licensed by the State of Texas and registered with the City to perform the work.

**104.7 Permit Fees and Plan Review Fees.** Permit fees and plan review fees shall be established under a separate ordinance by the City Council.

**104.8 Payment of Plan Review Fees.** An applicant shall pay plan review fees when plans and specifications are submitted to the building official for review.

**104.9 Time Limitation on Application; Permit Expiration and Reactivation.** Time limits on permit applications and requirements for permit expiration and reactivation, including a review fee for expired permits, are set forth in Chapter 25-12, Article 13 (*Administration of Technical Codes*).

**104.10 Continuance of Work Inspection.** Where structural or other conditions exist that do not allow for inspections to be performed at intervals less than 180 days, the permit holder may schedule a continuance of work inspection. If it is determined by the inspector, that work has been performed, the expiration date will automatically extend 180 days. If it is determined by the inspector that no work has begun or continued, the permit will expire and the permit holder will be required to submit for a new plan review and or new permit.

**104.11 Persons Authorized to Obtain Permits.** An air conditioning and/or refrigeration contractor licensed by the State of Texas to perform mechanical work and registered with the City may obtain permits required by the Mechanical Code.

**107.0 Appeals.** A person aggrieved by an order, decision, or determination of the building official relating to the application or interpretation of the Mechanical Code may appeal the order, decision, or determination to the Mechanical, Solar, and Plumbing Board in accordance with Chapter 25-1, Article 7, Division 1 (*Appeals*). The Mechanical, Solar, and Plumbing Board is established in Section 2-1-161 (*Mechanical, Plumbing, and Solar Board*).

## **108.0 Registered Industrial Plant Program.**

**108.1 Program.** A licensed air conditioning and/or refrigeration contractor may perform the following mechanical installations in a Registered Industrial Plant, as defined by this code and the building code without obtaining a permit required by Section 104.0 (*Permits Required*):

- (1) Replacement, modification, or relocation of existing ductwork, fan coil units, VAV boxes volume dampers, environmental make-up air systems and related equipment; and
- (2) Modification of existing hazardous production material (HPM) supply systems, HPM drain systems and HPM exhaust systems in H occupancy areas, as defined in the Building Code, and in exterior areas to accommodate the installation or relocation of equipment.

**108.2 Fees.** Plan review fees and permit fees are not required if records are maintained in accordance with Section 108.0 (*Registered Industrial Plant*) of the Building Code.

**301.4 Electrical Connections.** Equipment regulated by this code requiring electrical connections of more than 50 volts shall have a positive means of disconnect. Disconnects shall be installed in accordance to NFPA 70 and the Electrical Code. 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 shall be installed in a manner as to prevent physical damage. Electrical wiring, controls, and connections to equipment and appliances regulated by this code shall be in accordance with NFPA 70 and the Electrical Code.

**303.8.4 Roof Drainage and Rails.** Equipment shall be installed on a well-drained surface of the roof. Guards shall be provided where appliances, equipment, fans or other components require service and are located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or walking surface is located 30 inches above the grade below. Rigidly fixed rails or guards not less than 42 inches (1067 mm) in height shall be provided on the exposed side. The guard shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter. The Guard shall extend not less than 30 inches (762 mm) beyond each end of such appliance, equipment, fan or component. 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.

**303.8.5 Electrical Power.** Equipment and appliances requiring an external source of electrical power for its operation shall be provided with the following:

- (1) A readily accessible electrical disconnecting means within sight of the equipment and appliance that will completely de-energize the equipment and

appliance. Disconnect shall be installed as per NFPA70 and the Electrical Code.

- (2) A 120-VAC grounding-type receptacle outlet on the roof adjacent to the equipment and appliance. The receptacle outlet shall be located within 25 feet of the equipment for service and maintenance purposes.

**304.1.1 Access to Appliances.** Appliances which are capable of being inspected, serviced, repaired, and replaced by removing a dropped grid system ceiling shall be considered to have adequate access.

**304.3.1.1 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. Not less than 10 feet (1829 mm) of clearance shall be between the access opening and the edge of the roof or similar hazard, and such edge or walking surface is located 30 inches above the grade below. If the access opening is located 30 inches above the grade below, then rigidly fixed rails or guards not less than 42 inches (1067 mm) in height shall be provided on the exposed side. The guard shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter. 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.

**304.3.3** Permanent ladders for equipment access on roofs shall be provided at parapet walls exceeding 30 inches in height.

**305.2.3 Gas and Oil-Fired Furnaces.** A heating system using a gas or oil-fired furnace shall have a float-operated automatic control valve installed in the fuel supply line that shall be set to operate when floodwaters reach an elevation equal to the floor level of the space where furnace equipment is installed. A manually operated gas valve that can be operated from a location above the RFD shall be provided in the fuel supply line to serve as a supplementary safety provision for fuel cutoff.

**310.3 Drain Pipe Materials and Sizes.** Components of the condensate disposal system shall be cast iron, galvanized steel, copper, cross-linked polyethylene, polybutylene, polyethylene, ABS, CPVC or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. Joints and connections shall be made in accordance with the applicable provisions of Chapter 7 of the Plumbing Code relative to the material type. Condensate waste and drain line size shall be not less than 3/4-inch (19 mm) internal diameter and shall not decrease in size from the drain pan connection to the place of condensate disposal. Condensate pipe or tubing shall be sized in accordance with Table 310.3. Condensate drain sizing for other slopes and other conditions shall be approved by the Authority Having Jurisdiction.

**310.3.1 Clean-Outs** Condensate drain lines shall be configured or provided with a clean-out to permit the clearing of blockages and for maintenance without requiring the drain line to be cut.

**310.8 Traps.** Condensate drains shall be trapped as required by the *equipment* or *appliance* manufacturer.

**310.9 Water-Level Monitoring Devices.** On down-flow units and all other coils that do not have a secondary drain or provisions to install a secondary or auxiliary drain pan, a water-level monitoring device shall be installed inside the primary drain pan. This device shall shut off the *equipment* served in the event that the primary drain becomes restricted.

**310.10 Standards for AC Condensate Recovery Systems for New Development.**

Effective January 1, 2017, newly constructed commercial and multi-family facilities installing air conditioning systems with a combined cooling capacity equal to or greater than 200 tons shall have a single and independent condensate wastewater line to collect and use condensate wastewater for authorized beneficial purposes including:

- (1) process water;
- (2) cooling tower make-up;
- (3) indoor toilet flushing;
- (4) landscape irrigation water; or
- (5) other approved non-potable water uses.

**Exception:** Condensate for air conditioning systems may be discharged in accordance with Section 310.1 only if:

- (1) The condensate exceeds current irrigation, cooling tower make-up, or other non-potable water needs at the facility; or
- (2) for systems less than 200 tons of cooling capacity where condensate is not being recovered and used for beneficial use.
- (3) Potable water may be used for makeup water for cooling towers only when there is insufficient condensate to meet the needs for cooling tower make-up water.

**318.0 Protection of Openings.** Duct openings, such as exhaust and/or outdoor air intakes, that terminate outdoors shall be protected with corrosion-resistant screens, louvers or grilles. Openings in louvers, grilles and screens shall be sized in accordance with Table 402.4, and shall be protected against local weather conditions. Louvers that protect air intake openings in structures located in Hurricane prone regions, as defined in the *International Building Code*, shall comply with AMCA 550. Duct openings located in

exterior walls shall meet the provisions for exterior wall opening protectives in accordance with the *International Building Code*.

**319.0 Compliance with the Energy Code.** Replacement electrical equipment shall comply with the Energy Code. New heating, ventilating, and air-conditioning systems of all structures shall be designed and installed for efficient utilization of energy in accordance with the current adopted energy code.

## **320.0 Requirements for Flood Plain Areas.**

### **320.1 Definitions.**

**Regulatory Flood Datum (RFD)** - an established plane of reference from which elevations and depth of flooding may be determined for specific locations of the flood plain in accordance with the Building Code.

**W-1 Spaces**- spaces that must remain completely dry during flooding to the RFD. Walls must be impermeable to water and water vapor in accordance with the Building Code.

**W-2 Spaces** -spaces that remain essentially dry during flooding to the RFD. Walls must be impermeable to water, but may pass some water vapor or seep slightly in accordance with the Building Code.

**320.2 Establishment of Flood Hazard Areas.** Flood hazard areas are established to include the following:

- (1) The flood hazard areas identified by the Federal Emergency Management Agency in a scientific and engineering report entitled, "The Flood Insurance Study for Austin, Texas," dated September 26, 2008, with accompanying Flood Insurance Rate Maps and Flood Boundary-Floodway Maps (FIRM and FBFM) and related supporting data along with any amendments or revisions thereto are hereby adopted by reference and declared to be a part of this section.
- (2) The 100-year and 25-year floodplains based on projected full development as specified in the Austin City Code and Drainage Criteria Manual are adopted by reference and declared to be part of this section.

**401.1 Applicability.** This chapter contains requirements for ventilation air supply, exhaust, and makeup air requirements for occupiable spaces within a building.

**Exception:** Ventilation for acceptable indoor air quality may be designed in accordance with the current ASHRAE 62.1 standard.

**401.2 When Required.** Ventilation shall be provided during the periods that the room or space is occupied.

**402.3.1 Intake Opening Location.** Air intake openings shall comply with all of the following and Table 402.3.1

- 1) Intake openings shall be located a minimum of 10 feet (3048 mm) from lot lines or buildings on the same lot.
- 2) Mechanical and gravity outdoor air intake openings shall be located not less than 10 feet (3048 mm) horizontally from any hazardous or noxious contaminant source, such as vents, streets, alleys, parking lots and loading docks, except as specified in Item 3 or table 402.3.1. Outdoor air intake openings shall be permitted to be located less than 10 feet (3048 mm) horizontally from streets, alleys, parking lots and loading docks provided that the openings are located not less than 25 feet (7620 mm) vertically above such locations. Where openings front on a street or public way, the distance shall be measured from the closest edge of the street or public way.
- 3) Intake openings shall be located not less than 3 feet (914 mm) below contaminant sources where such sources are located within 10 feet (3048 mm) of the opening, or as per table 402.3.1.
- 4) Intake openings on structures in flood hazard areas shall be at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment.

**Table 402.3.1 Air Intake Minimum Separation Distance**  
**{ASHRAE 62.1: Table 5.5.1}**

| <b>Object</b>   | <b>Minimum Distance, ft.</b> |
|---|------------------------------|
| Class 2 air exhaust/relief outlet (Note 1) Class 2 air exhaust – air with moderate contamination concentrations, mild sensory-irritation, or mildly offensive odors (class 2 air also includes air that is not necessarily harmful or objectionable but that is inappropriate for transfer or recirculation to spaces used for different purposes.) | 10                           |
| Class 3 air exhaust/relief outlet (Note 1) Class 3 air exhaust- air with significant contamination concentration, significant sensory-irritation intensity, or offensive odor   | 15                           |
| Class 4 air exhaust/relief outlet (Note 2) Class 4 exhaust air – air with highly objectionable fumes or gases, or with potentially dangerous particles, bioaerosols, or gases, at concentrations high enough to be considered harmful.  | 30                           |
| Plumbing vents terminating less than 3 ft. above the level of the outdoor air intake  | 10                           |

| <b>Object</b>   | <b>Minimum Distance, ft.</b> |
|---|------------------------------|
| Plumbing vents terminating at least 3 ft. above the level of the outdoor intake | 3                            |
| Vents, chimneys, and flues from combustion appliances and equipment (Note 3)    | 15                           |
| Garage entry, automobile loading area, or drive in queue (Note 4)               | 15                           |
| Truck loading area or dock, bus parking/idling area (Note 4)                    | 25                           |
| Driveway, street, or parking place (note 4)                                     | 10                           |
| Thoroughfare with high traffic volume   | 25                           |
| Roof, landscape grade, or other surface directly below intake (Note 5)          | 1                            |
| Garage storage/pick-up area, dumpsters  | 15                           |
| Cooling Tower intake or basin   | 15                           |
| Cooling tower exhaust   | 25                           |

Note 1: This requirement applies to the distance from the outdoor air intakes for one ventilation system to the exhaust/relief outlets for any other ventilation system.

Note 2: Minimum distance listed does not apply to laboratory fume hood exhaust air outlets. Separation criteria for fume hood exhaust shall be in compliance with NFPA 45 and ANSI/AIHA Z9.5. Information on separation criteria for industrial environments can be found in the ACGIH Industrial Ventilation Manual and in the ASHRAE Handbook – HVAC Applications.

Note 3; Shorter separation distances shall be permitted when determined in accordance with (a) ANSI Z 223.1/NFPA 54 for fuel gas burning appliances and equipment, (b) NFPA 31 for oil burning appliances and equipment, or (c) NFPA 211 for other combustion appliances and equipment.

Note 4: Distance measured to closest place that a vehicle exhaust is likely to be located

Note 5: Shorter separation distance shall be permitted where outdoor surfaces are sloped more than 45 degrees from horizontal or that are less than 1 in. wide

**402.4 Intake opening protection.** Air intake openings that terminate outdoors shall be protected with corrosion-resistant screens, louvers or grilles. Openings in louvers, grilles and screens shall be sized in accordance with Table 402.4, and shall be protected against local weather conditions. Louvers that protect air intake openings in structures located in hurricane-prone regions, as defined in the International Building Code, shall comply with AMCA 550. Outdoor air intake openings located in exterior walls shall meet the

provisions for exterior wall opening protectives in accordance with the International Building Code.

**403.7.3 Occupied Spaces Accessory to Public Garages.** Connecting offices, waiting rooms, ticket booths and similar uses that are accessory to a public garage shall be maintained at a positive pressure and shall be provided with ventilation in accordance with Section 405.2.

**Table 402.4  
Opening Sizes in Louvers, Grilles and Screens Protecting Exhaust and  
Outdoor Air Intake Openings**

| Outdoor Opening Type                           | Minimum and Maximum Opening Sizes in Louvers, Grilles and Screens Measured in Any Direction |
|--|---|
| Openings in residential occupancies            | Not < ¼ inch and not > ½ inch   |
| Openings in other than residential occupancies | Not < ¼ inch and not > 1 inch   |

**Table 403.7  
Minimum Exhaust Rates  
{ASHRAE 62.1: Table 6.5}**

| OCCUPANCY CATEGORY (Note 8)             | EXHAUST RATE (cfm/unit) | EXHAUST RATE (cfm/ft <sup>2</sup> ) | AIR CLASS |
|---|-------------------------|-------------------------------------|-----------|
| Arenas (Note 2)                         | -                       | 0.50                                | 1         |
| Auto repair rooms (Note 1)              | -                       | 1.50                                | 2         |
| Art classrooms                          | -                       | 0.70                                | 2         |
| Barber shops                            | -                       | 0.50                                | 2         |
| Beauty and nail salons (Note 9)         | -                       | 0.60                                | 2         |
| Cells with toilet                       | -                       | 1.00                                | 2         |
| Copy, printing rooms                    | -                       | 0.50                                | 2         |
| Darkrooms                               | -                       | 1.00                                | 2         |
| Educational science laboratories        | -                       | 1.00                                | 2         |
| Janitor closets, trash rooms, recycling | -                       | 1.00                                | 3         |
| Kitchens – commercial                   | -                       | 0.70                                | 2         |
| Kitchenettes                            | -                       | 0.30                                | 2         |

| <b>OCCUPANCY CATEGORY (Note 8)</b>     | <b>EXHAUST RATE (cfm/unit)</b> | <b>EXHAUST RATE (cfm/ft2)</b> | <b>AIR CLASS</b> |
|--|--------------------------------|-------------------------------|------------------|
| Locker rooms                           | -                              | 0.50                          | 2                |
| Locker/dressing rooms                  | -                              | 0.25                          | 2                |
| Paint spray booths                     | -                              | -                             | 4                |
| Parking Garages (Note 3)               | -                              | 0.75                          | 2                |
| Pet shops (animal areas)               | -                              | 0.90                          | 2                |
| Refrigeration machinery rooms (Note 6) | -                              | -                             | 3                |
| Residential – kitchens (Note 7)        | 50/100                         | -                             | 2                |
| Soiled laundry storage rooms           | -                              | 1.00                          | 3                |
| Storage rooms, chemical                | -                              | 1.50                          | 4                |
| Toilets – private (Note 5)             | 25/50                          | -                             | 2                |
| Toilets – public (Note 4)              | 50/70                          | -                             | 2                |
| Woodwork shop/classrooms               | -                              | 0.50                          | 2                |

Note 1: Stands where engines are run shall have exhaust systems that directly connect to the engine exhaust and prevent escape of fumes.

Note 2: Where combustion equipment is intended to be used on the playing surface, additional dilution ventilation, source control, or both shall be provided.

Note 3: Exhaust rate is not required for open parking garages as defined in accordance with the building code.

Note 4: Rate is per water closet, urinal, or both. Provide the higher rate where periods of heavy use are expected to occur, e.g., toilets in theatres, schools, and sports facilities. Otherwise the lower rate shall be permitted to be used.

Note 5: Rate is for a toilet room intended to be occupied by one person at a time. For continuous system operation during normal hours of use, the lower rate shall be permitted to be used. Otherwise the higher rate shall be used.

Note 6: For refrigeration machinery rooms, the exhaust rate shall comply with Chapter 11.

Note 7: For continuous system operation, the lower rates shall be permitted. Otherwise the higher rate shall be used.

Note 8: For unlisted occupancies for a proposed space not listed in the table, the requirements for the listed occupancy that is most similar in terms of occupant density and occupancy type shall be used.

Note 9: For nail salons, each manicure and pedicure station shall be provided with a *source capture system* capable of exhausting not less than 50 cfm per station. Exhaust inlets shall be located at floor level or within the floor itself. Where one or more required source capture systems operate continuously during occupancy, the exhaust rate from such systems shall be permitted to be applied to the exhaust flow rate required by Table 403.7 for the nail salon.

**504.1.2 Environmental Exhaust Ducts and Termination.** Exhaust ducts shall not extend into or through ducts or plenums Exhaust ducts shall be equipped with back draft dampers. Exhaust ducts shall terminate at the exterior of a building, in locations

such as exterior walls and roofs, and with a minimum of three feet from property lines and openings into the building. Exhaust ducts serving domestic clothes dryers shall not terminate over a covered walkway unless the duct is extended to the outer edge of the covered walkway. Exhaust ducts serving domestic ranges and bathroom exhaust fans shall not terminate over a covered walkway unless there are three sides open for dilution air movement. When adequate dilution air cannot be provided, exhaust ducts serving a domestic range or a bathroom exhaust fan shall be extended to the outer edge of the covered walkway. Environmental air ducts may terminate over a private use balcony if the balcony serves the same space as the duct and required clearances from openings are maintained. A duct under positive or negative pressure may be routed through a plenum when a longitudinal and traverse joint are sealed with listed materials for that use in accordance with acceptable methods. Hazardous fumes may not be run through a plenum under positive pressure unless the plenum is sealed and encased in another air tight enclosure, chase, or metal sleeve complete to connection and to point of discharge.

**504.4.2.1 Length Limitation.** The maximum allowable exhaust duct length shall be determined by one of the methods specified in 504.4.2.1.1 thru 504.4.2.1.3

**504.4.2.1.1 Specified Length.** The maximum length of the exhaust duct shall be 35 feet from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table 504.4.2.1.1

**Table 504.4.2.1.1  
Dryer Exhaust Duct Fitting Equivalent Length  
{International Mechanical Code 2015}**

| Dryer Exhaust Duct Fitting Type   | Equivalent Length |
|-----------------------------------|-------------------|
| 4" radius mitered 45-degree elbow | 2 feet 6 inches   |
| 4" radius mitered 90-degree elbow | 5 feet            |
| 6" radius smooth 45-degree elbow  | 1 foot            |
| 6" radius smooth 90-degree elbow  | 1 foot 9 inches   |
| 8" radius smooth 45-degree elbow  | 1 foot            |
| 8" radius smooth 90-degree elbow  | 1 foot 7 inches   |
| 10" radius smooth 45-degree elbow | 9 inches          |
| 10: radius smooth 90-degree elbow | 1 foot 6 inches   |

**504.4.2.1.2 Manufacturer's Installation Instructions.** The maximum length of the exhaust duct shall be determined by the dryer manufacturer's installation instructions. The code official shall be provided with a copy of the installation instructions for the make and model of the dryer. Where the exhaust duct is to be concealed, the installation instructions shall be provided to the code official prior

to the concealment inspection. In the absence of fitting equivalent length calculations from the clothes dryer manufacturer, Table 504.4.2.1.1 shall be used.

**504.4.2.1.2.1 Length Identification.** Where the exhaust duct is concealed within the building construction, the equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet (1829 mm) of the exhaust duct connection.

**504.4.2.1.3 Alternate Engineered Systems.** Dryer duct systems designed by a professional engineer. Such systems shall comply with ANSI Z21.5.1/CSA 7.1 and the design professional shall provide calculations and design criteria on plans submitted per Section 104.0 of this code. Professional designs shall demonstrate dryer vent equivalent to the mechanical code.

**519.8 Hazardous Materials—General Requirements.** Exhaust ventilation systems for structures containing hazardous materials shall be provided as required in Sections 519.8.1 through 519.8.7.

**519.8.1 Storage in Excess of the Maximum Allowable Quantities.** Indoor storage areas and storage buildings for hazardous materials in amounts exceeding the maximum allowable quantity per control area shall be provided with mechanical exhaust ventilation or natural ventilation where natural ventilation can be shown to be acceptable for the materials **as stored:**

**Exceptions:**

- 1) Storage areas for flammable solids complying with Section 5904 of the International Fire Code.
- 2) Storage areas and storage buildings for fireworks and explosives complying with Chapter 56 of the International Fire Code.

**519.8.1.1 System Requirements.** Exhaust ventilation systems shall comply with all of the following:

- 1) The installation shall be in accordance with this code.
- 2) Mechanical ventilation shall be provided at a rate of not less than 1 cfm per square foot [0.00508 m<sup>3</sup>/(s • m<sup>2</sup>)] of floor area over the storage area.
- 3) The systems shall operate continuously unless alternate designs are approved.

- 4) A manual shutoff control shall be provided outside of the room in a position adjacent to the access door to the room or in another approved location. The switch shall be a break-glass or other approved type and shall be labeled: “VENTILATION SYSTEM EMERGENCY SHUTOFF.”
- 5) The exhaust ventilation shall be designed to consider the density of the potential fumes or vapors released. For fumes or vapors that are heavier than air, exhaust shall be taken from a point within 12 inches (305 mm) of the floor. For fumes or vapors that are lighter than air, exhaust shall be taken from a point within 12 inches (305 mm) of the highest point of the room.
- 6) The location of both the exhaust and inlet air openings shall be designed to provide air movement across all portions of the floor or room to prevent the accumulation of vapors.
- 7) The exhaust air shall not be recirculated to occupied areas if the materials stored are capable of emitting hazardous vapors and contaminants have not been removed. Air contaminated with explosive or flammable vapors, fumes or dusts; flammable, highly toxic or toxic gases; or radioactive materials shall not be recirculated.

**519.8.2 Gas rooms, exhausted enclosures and gas cabinets.** The ventilation system for gas rooms, exhausted enclosures and gas cabinets for any quantity of hazardous material shall be designed to operate at a negative pressure in relation to the surrounding area. Highly toxic and toxic gases shall also comply with Sections 519.9.7.1, 519.9.7.2 and 519.9.8.4.

**519.8.3 Indoor Dispensing and Use.** Indoor dispensing and use areas for hazardous materials in amounts exceeding the maximum allowable quantity per control area shall be provided with exhaust ventilation in accordance with Section 519.8.1.

**Exception:** Ventilation is not required for dispensing and use of flammable solids other than finely divided particles.

**519.8.4 Indoor Dispensing and Use—Point Sources.** Where gases, liquids or solids in amounts exceeding the maximum allowable quantity per control area and having a hazard ranking of 3 or 4 in accordance with NFPA 704 are dispensed or used, mechanical exhaust ventilation shall be provided to capture gases, fumes, mists or vapors at the point of generation.

**Exception:** Where it can be demonstrated that the gases, liquids or solids do not create harmful gases, fumes, mists or vapors.

**519.8.5 Closed Systems.** Where closed systems for the use of hazardous materials in amounts exceeding the maximum allowable quantity per control area are designed to be opened as part of normal operations, ventilation shall be provided in accordance with Section 519.8.4.

**519.9 Hazardous Materials—Requirements for Specific Materials.** Exhaust ventilation systems for specific hazardous materials shall be provided as required in Section 519.8 and Sections 519.9.1 through 519.9.11.

**519.9.1 Compressed Gases—Medical Gas Systems.** Rooms for the storage of compressed medical gases in amounts exceeding the permit amounts for compressed gases in the International Fire Code, and that do not have an exterior wall, shall be exhausted through a duct to the exterior of the building. Both separate airstreams shall be enclosed in a 1-hour-rated shaft enclosure from the room to the exterior. Approved mechanical ventilation shall be provided at a minimum rate of 1 cfm/ft<sup>2</sup> [0.00508 m<sup>3</sup>/(s • m<sup>2</sup>)] of the area of the room. Gas cabinets for the storage of compressed medical gases in amounts exceeding the permit amounts for compressed gases in the International Fire Code shall be connected to an exhaust system. The average velocity of ventilation at the face of access ports or windows shall be not less than 200 feet per minute (1.02 m/s) with a minimum velocity of 150 feet per minute (0.76 m/s) at any point at the access port or window.

**519.9.2 Corrosives.** Where corrosive materials in amounts exceeding the maximum allowable quantity per control area are dispensed or used, mechanical exhaust ventilation in accordance with Section 519.8.4 shall be provided.

**519.9.3 Cryogenics.** Storage areas for stationary or portable containers of cryogenic fluids in any quantity shall be ventilated. Indoor areas where cryogenic fluids in any quantity are dispensed shall be ventilated in accordance with the requirements of Section 519.8.4 in a manner that captures any vapor at the point of generation.

**Exception:** Ventilation for indoor dispensing areas is not required where it can be demonstrated that the cryogenic fluids do not create harmful vapors.

**519.9.4 Explosives.** Squirrel cage blowers shall not be used for exhausting hazardous fumes, vapors or gases in operating buildings and rooms for the manufacture, assembly or testing of explosives. Only nonferrous fan blades shall be used for fans located within the ductwork and through which hazardous materials are exhausted. Motors shall be located outside the duct.

**519.9.5 Flammable and Combustible Liquids.** Exhaust ventilation systems shall be provided as required by Sections 519.9.5.1 through 519.9.5.5 for the storage, use, dispensing, mixing and handling of flammable and combustible liquids.

Unless otherwise specified, this section shall apply to any quantity of flammable and combustible liquids.

**Exception:** This section shall not apply to flammable and combustible liquids that are exempt from the International Fire Code.

**519.9.5.1 Vaults.** Vaults that contain tanks of Class I liquids shall be provided with continuous ventilation at a rate of not less than 1 cfm/ft<sup>2</sup> of floor area [0.00508 m<sup>3</sup>/(s • m<sup>2</sup>)], but not less than 150 cfm (4 m<sup>3</sup>/min). Failure of the exhaust airflow shall automatically shut down the dispensing system. The exhaust system shall be designed to provide air movement across all parts of the vault floor. Supply and exhaust ducts shall extend to a point not greater than 12 inches (305 mm) and not less than 3 inches (76 mm) above the floor. The exhaust system shall be installed in accordance with the provisions of NFPA 91. Means shall be provided to automatically detect any flammable vapors and to automatically shut down the dispensing system upon detection of such flammable vapors in the exhaust duct at a concentration of 25 percent of the LFL.

**519.9.5.2 Storage Rooms and Warehouses.** Liquid storage rooms and liquid storage warehouses for quantities of liquids exceeding those specified in the *International Fire Code* shall be ventilated in accordance with Section 519.8.1.

**519.9.5.3 Cleaning Machines.** Areas containing machines used for parts cleaning in accordance with the International Fire Code shall be adequately ventilated to prevent accumulation of vapors.

**519.9.5.4 Use, Dispensing and Mixing.** Continuous mechanical ventilation shall be provided for the use, dispensing and mixing of flammable and combustible liquids in open or closed systems in amounts exceeding the maximum allowable quantity per control area and for bulk transfer and process transfer operations. The ventilation rate shall be not less than 1 cfm/ft<sup>2</sup> [0.00508 m<sup>3</sup>/(s • m<sup>2</sup>)] of floor area over the design area. Provisions shall be made for the introduction of makeup air in a manner that will include all floor areas or pits where vapors can collect. Local or spot ventilation shall be provided where needed to prevent the accumulation of hazardous vapors.

**Exception:** Where natural ventilation can be shown to be effective for the materials used, dispensed or mixed.

**519.9.5.5 Bulk Plants or Terminals.** Ventilation shall be provided for portions of properties where flammable and combustible liquids are received by tank vessels, pipelines, tank cars or tank vehicles and which are stored or blended in bulk for the purpose of distributing such liquids by tank vessels,

pipelines, tank cars, tank vehicles or containers as required by Sections 519.9.5.5.1 through 519.9.5.5.3.

**519.9.5.5.1 General.** Ventilation shall be provided for rooms, buildings and enclosures in which Class I liquids are pumped, used or transferred. Design of ventilation systems shall consider the relatively high specific gravity of the vapors. Where natural ventilation is used, adequate openings in outside walls at floor level, unobstructed except by louvers or coarse screens, shall be provided. Where natural ventilation is inadequate, mechanical ventilation shall be provided.

**519.9.5.5.2 Basements and Pits.** Class I liquids shall not be stored or used within a building having a basement or pit into which flammable vapors can travel, unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.

**519.9.5.5.3 Dispensing of Class I Liquids.** Containers of Class I liquids shall not be drawn from or filled within buildings unless a provision is made to prevent the accumulation of flammable vapors in hazardous concentrations. Where mechanical ventilation is required, it shall be kept in operation while flammable vapors could be present.

**519.9.6 Highly Toxic and Toxic Liquids.** Ventilation exhaust shall be provided for highly toxic and toxic liquids as required by Sections 519.9.6.1 and 519.9.6.2.

**519.9.6.1 Treatment System.** This provision shall apply to indoor and outdoor storage and use of highly toxic and toxic liquids in amounts exceeding the maximum allowable quantities per control area. Exhaust scrubbers or other systems for processing vapors of highly toxic liquids shall be provided where a spill or accidental release of such liquids can be expected to release highly toxic vapors at normal temperature and pressure.

**519.9.6.2 Open and Closed Systems.** Mechanical exhaust ventilation shall be provided for highly toxic and toxic liquids used in open systems in accordance with Section 518.8. Mechanical exhaust ventilation shall be provided for highly toxic and toxic liquids used in closed systems in accordance with Section 519.8.5.

**Exception:** Liquids or solids that do not generate highly toxic or toxic fumes, mists or vapors.

**519.9.7 Highly Toxic and Toxic Compressed Gases— Any Quantity.**

Ventilation exhaust shall be provided for highly toxic and toxic compressed gases in any quantity as required by Sections 519.9.7.1 and 519.9.7.2.

**519.9.7.1 Gas Cabinets.** Gas cabinets containing highly toxic or toxic compressed gases in any quantity shall comply with Section 519.8.2 and the following requirements:

- 1) The average ventilation velocity at the face of gas cabinet access ports or windows shall be not less than 200 feet per minute (1.02 m/s) with a minimum velocity of 150 feet per minute (0.76 m/s) at any point at the access port or window.
- 2) Gas cabinets shall be connected to an exhaust system.
- 3) Gas cabinets shall not be used as the sole means of exhaust for any room or area.

**519.9.7.2 Exhausted Enclosures.** Exhausted enclosures containing highly toxic or toxic compressed gases in any quantity shall comply with Section 519.8.2 and the following requirements:

- 1) The average ventilation velocity at the face of the enclosure shall be not less than 200 feet per minute (1.02 m/s) with a minimum velocity of 150 feet per minute (0.76 m/s).
- 2) Exhausted enclosures shall be connected to an exhaust system.
- 3) Exhausted enclosures shall not be used as the sole means of exhaust for any room or area.

**519.9.8 Highly Toxic and Toxic Compressed Gases—Quantities Exceeding the Maximum Allowable Quantity per Control Area.** Ventilation exhaust shall be provided for highly toxic and toxic compressed gases in amounts exceeding the maximum allowable quantities per control area as required by Sections 519.9.8.1 through 519.9.8.6.

**519.9.8.1 Ventilated Areas.** The room or area in which indoor gas cabinets or exhausted enclosures are located shall be provided with exhaust ventilation. Gas cabinets or exhausted enclosures shall not be used as the sole means of exhaust for any room or area.

**519.9.8.2 Local Exhaust for Portable Tanks.** A means of local exhaust shall be provided to capture leakage from indoor and outdoor portable tanks. The local exhaust shall consist of portable ducts or collection systems designed to be applied to the site of a leak in a valve or fitting on the tank. The local exhaust system shall be located in a gas room. Exhaust shall be directed to a treatment system where required by the International Fire Code.

**519.9.8.3 Piping and Controls—Stationary Tanks.** Filling or dispensing connections on indoor stationary tanks shall be provided with a means of

local exhaust. Such exhaust shall be designed to capture fumes and vapors. The exhaust shall be directed to a treatment system where required by the International Fire Code.

**518.9.8.4 Gas Rooms.** The ventilation system for gas rooms shall be designed to operate at a negative pressure in relation to the surrounding area. The exhaust ventilation from gas rooms shall be directed to an exhaust system.

**518.9.8.5 Treatment System.** The exhaust ventilation from gas cabinets, exhausted enclosures and gas rooms, and local exhaust systems required in Sections 519.9.8.2 and 519.9.8.3 shall be directed to a treatment system where required by the International Fire Code.

**519.9.8.6 Process Equipment.** Effluent from indoor and outdoor process equipment containing highly toxic or toxic compressed gases which could be discharged to the atmosphere shall be processed through an exhaust scrubber or other processing system. Such systems shall be in accordance with the International Fire Code.

**519.9.9 Ozone Gas Generators.** Ozone cabinets and ozone gas-generator rooms for systems having a maximum ozone-generating capacity of 1/2 pound (0.23 kg) or more over a 24-hour period shall be mechanically ventilated at a rate of not less than six air changes per hour. For cabinets, the average velocity of ventilation at makeup air openings with cabinet doors closed shall be not less than 200 feet per minute (1.02 m/s).

## **520.0 Hazardous Exhaust Systems.**

**520.1 General.** This section shall govern the design and construction of duct systems for hazardous exhaust and shall determine where such systems are required. Hazardous exhaust systems are systems designed to capture and control hazardous emissions generated from product handling or processes, and convey those emissions to the outdoors. Hazardous emissions include flammable vapors, gases, fumes, mists or dusts, and volatile or airborne materials posing a health hazard, such as toxic or corrosive materials. For the purposes of this section, the health hazard rating of materials shall be as specified in NFPA 704. For the purposes of the provisions of Section 510, a laboratory shall be defined as a facility where the use of chemicals is related to testing, analysis, teaching, research or developmental activities. Chemicals are used or synthesized on a nonproduction basis, rather than in a manufacturing process.

**520.2 Where Required.** A hazardous exhaust system shall be required wherever operations involving the handling or processing of hazardous materials, in the absence of such exhaust systems and under normal operating conditions, have the potential to create one of the following conditions:

- 1) A flammable vapor, gas, fume, mist or dust is present in concentrations exceeding 25 percent of the lower flammability limit of the substance for the expected room temperature.
- 2) A vapor, gas, fume, mist or dust with a health-hazard rating of 4 is present in any concentration.
- 3) A vapor, gas, fume, mist or dust with a health-hazard rating of 1, 2 or 3 is present in concentrations exceeding 1 percent of the median lethal concentration of the substance for acute inhalation toxicity.

**Exception:** Laboratories, as defined in Section 510.1, except where the concentrations listed in Item 1 are exceeded or a vapor, gas, fume, mist or dust with a health hazard rating of 1, 2, 3 or 4 is present in concentrations exceeding 1 percent of the median lethal concentration of the substance for acute inhalation toxicity.

**520.2.1 Lumber Yards and Woodworking Facilities.** Equipment or machinery located inside buildings at lumber yards and woodworking facilities which generates or emits combustible dust shall be provided with an approved dust-collection and exhaust system installed in conformance with this section and the International Fire Code. Equipment and systems that are used to collect, process or convey combustible dusts shall be provided with an approved explosion-control system.

**510.2.2 Combustible Fibers.** Equipment or machinery within a building which generates or emits combustible fibers shall be provided with an approved dust-collecting and exhaust system. Such systems shall comply with this code and the International Fire Code.

**520.3 Design and Operation.** The design and operation of the exhaust system shall be such that flammable contaminants are diluted in non-contaminated air to maintain concentrations in the exhaust flow below 25 percent of the contaminant's lower flammability limit.

**520.4 Independent System.** Hazardous exhaust systems shall be independent of other types of exhaust systems.

**520.5 Incompatible Materials and Common Shafts.** Incompatible materials, as defined in the International Fire Code, shall not be exhausted through the same hazardous exhaust system. Hazardous exhaust systems shall not share common shafts with other duct systems, except where such systems are hazardous exhaust systems originating in the same fire area.

**Exception:** The provision of this section shall not apply to laboratory exhaust systems where all of the following conditions apply:

- 1) All of the hazardous exhaust ductwork and other laboratory exhaust within both the occupied space and the shafts are under negative pressure while in operation.
- 2) The hazardous exhaust ductwork manifold together within the occupied space must originate within the same fire area.
- 3) Hazardous exhaust ductwork originating in different fire areas and manifold together in a common shaft shall meet the provisions of Section 717.5.3, Exception 1, Item 1.1 of the International Building Code.
- 4) Each control branch has a flow regulating device.
- 5) Perchloric acid hoods and connected exhaust shall be prohibited from manifolding.
- 6) Radioisotope hoods are equipped with filtration and/or carbon beds where required by the registered design professional.
- 7) Biological safety cabinets are filtered.
- 8) Each hazardous exhaust duct system shall be served by redundant exhaust fans that comply with either of the following.
  1. The fans shall operate simultaneously in parallel and each fan shall be individually capable of providing the required exhaust rate.
  2. Each of the redundant fans is controlled so as to operate when the other fan has failed or is shut down for servicing.

**520.6 Design.** Systems for removal of vapors, gases and smoke shall be designed by the constant velocity or equal friction methods. Systems conveying particulate matter shall be designed employing the constant velocity method.

**520.6.1 Balancing.** Systems conveying explosive or radioactive materials shall be pre-balanced by duct sizing. Other systems shall be balanced by duct sizing with balancing devices, such as dampers. Dampers provided to balance airflow shall be provided with securely fixed minimum- position blocking devices to prevent restricting flow below the required volume or velocity.

**520.6.2 Emission Control.** The design of the system shall be such that the emissions are confined to the area in which they are generated by air currents, hoods or enclosures and shall be exhausted by a duct system to a safe location or treated by removing contaminants.

**520.6.3 Hoods Required.** Hoods or enclosures shall be used where contaminants originate in a limited area of a space. The design of the hood or enclosure shall be

such that air currents created by the exhaust systems will capture the contaminants and transport them directly to the exhaust duct.

**520.6.4 Contaminant Capture and Dilution.** The velocity and circulation of air in work areas shall be such that contaminants are captured by an airstream at the area where the emissions are generated and conveyed into a product conveying duct system. Contaminated air from work areas where hazardous contaminants are generated shall be diluted below the thresholds specified in Section 520.2 with air that does not contain other hazardous contaminants.

**520.6.5 Makeup air.** Makeup air shall be provided at a rate approximately equal to the rate that air is exhausted by the hazardous exhaust system. Makeup-air intakes shall be located in accordance with Chapter 4.

**520.6.6 Clearances.** The minimum clearance between hoods and combustible construction shall be the clearance required by the duct system.

**520.6.7 Ducts.** Hazardous exhaust duct systems shall extend directly to the exterior of the building and shall not extend into or through ducts and plenums.

**520.7 Penetrations.** Penetrations of structural elements by a hazardous exhaust system shall conform to Sections 520.7.1 through 520.7.4.

**Exception:** Duct penetrations within H-5 occupancies as allowed by the International Building Code.

**520.7.1 Fire Dampers and Smoke Dampers.** Fire dampers and smoke dampers are prohibited in hazardous exhaust ducts.

**520.7.1.1 Shaft Penetrations.** Hazardous exhaust ducts that penetrate fire-resistance-rated shafts shall comply with Section 714.3.1 or 714.3.1.2 of the International Building Code.

**520.7.2 Floors.** Hazardous exhaust systems that penetrate a floor/ceiling assembly shall be enclosed in a fire-resistance-rated shaft constructed in accordance with the International Building Code.

**520.7.3 Wall Assemblies.** Hazardous exhaust duct systems that penetrate fire-resistance-rated wall assemblies shall be enclosed in fire-resistance-rated construction from the point of penetration to the outlet terminal, except where the interior of the duct is equipped with an approved automatic fire suppression system. Ducts shall be enclosed in accordance with the International Building Code requirements for shaft construction and such enclosure shall have a minimum fire-resistance-rating of not less than the highest fire-resistance-rated wall assembly penetrated.

**520.7.4 Fire Walls.** Ducts shall not penetrate a fire wall.

**520.8 Suppression Required.** Ducts shall be protected with an approved automatic fire suppression system installed in accordance with the International Building Code.

**Exceptions:**

- 1) An approved automatic fire suppression system shall not be required in ducts conveying materials, fumes, mists and vapors that are nonflammable and noncombustible under all conditions and at any concentrations.
- 2) Automatic fire suppression systems shall not be required in metallic and noncombustible, nonmetallic exhaust ducts in semiconductor fabrication facilities.
- 3) An approved automatic fire suppression system shall not be required in ducts where the largest cross-sectional diameter of the duct is less than 10 inches (254 mm).
- 4) For laboratories, as defined in Section 520.1, automatic fire protection systems shall not be required in laboratory hoods or exhaust systems

**520.9 Duct Construction.** Ducts used to convey hazardous exhaust shall be constructed of materials approved for installation in such an exhaust system and shall comply with one of the following.

1. Ducts shall be constructed of approved G90 galvanized sheet steel, with a minimum nominal thickness as specified in Table 520.9.
2. Ducts used in systems exhausting nonflammable corrosive fumes or vapors shall be constructed of nonmetallic materials that exhibit a flame spread index of 25 or less and a smoke-developed index of 50 or less when tested in accordance with ASTM E 84 or UL 723 and that are listed and labeled for the application.

Where the products being exhausted are detrimental to the duct material, the ducts shall be constructed of alternative materials that are compatible with the exhaust.

**Table 520.9  
Minimum Duct Thickness**

| <b>Diameter of Duct or Maximum Side Dimension</b> | <b>Nonabrasive Materials</b> | <b>Nonabrasive/abrasive Materials</b> | <b>Abrasive Materials</b> |
|---|------------------------------|---------------------------------------|---------------------------|
| <b>0-8 inches</b>                                 | <b>24 gauge</b>              | <b>22 gauge</b>                       | <b>20 gauge</b>           |
| <b>9-18 inches</b>                                | <b>22 gauge</b>              | <b>20 gauge</b>                       | <b>18 gauge</b>           |
| <b>19-30 inches</b>                               | <b>20 gauge</b>              | <b>18 gauge</b>                       | <b>16 gauge</b>           |
| <b>Over 30 inches</b>                             | <b>18 gauge</b>              | <b>16 gauge</b>                       | <b>14 gauge</b>           |

**520.9.1 Duct Joints.** Ducts shall be made tight with lap joints having a minimum lap of 1 inch (25 mm). Joints used in ANSI/SMACNA Round Industrial Duct Construction Standards and ANSI/SMACNA Rectangular Industrial Duct Construction Standards are also acceptable.

**520.9.2 Clearance to combustibles.** Ducts shall have a clearance to combustibles in accordance with Table 520.9.2. Exhaust gases having temperatures in excess of 600°F (316°C) shall be exhausted to a chimney.

**Table 520.9.2  
Clearance to Combustibles**

| <b>Type of Exhaust or Temperature of Exhaust (*F)</b> | <b>Clearance to Combustibles (inches)</b> |
|---|---|
| <b>Less than 100</b>                                  | <b>1</b>                                  |
| <b>100-600</b>  | <b>12</b>                                 |
| <b>Flammable Vapors</b>                               | <b>6</b>                                  |

**520.9.3 Explosion Relief.** Systems exhausting potentially explosive mixtures shall be protected with an approved explosion relief system or by an approved explosion prevention system designed and installed in accordance with NFPA 69. An explosion relief system shall be designed to minimize the structural and mechanical damage resulting from an explosion or deflagration within the exhaust system. An explosion prevention system shall be designed to prevent an explosion or deflagration from occurring.

**520.10 Supports.** Ducts shall be supported at intervals not exceeding 10 feet (3048 mm). Supports shall be constructed of noncombustible material.

**521.0 Listed Recirculating Hoods.** Listed recirculation hoods are subject to approval by the administrative authority having jurisdiction.

**522.0 Smoke Control Systems.** Smoke control systems shall be designed and installed as specified in Section 909 of the Building Code as amended.

**604.2 Conflicts Between Codes.** When the requirements within the jurisdiction of this Mechanical Code conflict with the requirements of the International Energy Conservation Code, the most restrictive requirements shall apply.

**605.0 Smoke Dampers, Fire Dampers and Ceiling Radiation Dampers.**

**605.1 General.** The provisions of this section shall govern the protection of duct penetrations and air transfer openings in assemblies required to be protected.

**605.1.1 Ducts and Air Transfer Opening.** Ducts transitioning horizontally between shafts shall not require a shaft enclosure provided that the duct penetration into each associated shaft is protected with dampers complying with this section.

**605.1.2 Ducts That Penetrate Fire-Resistance-Rated Assemblies without Dampers.** Ducts that penetrate fire resistance- rated assemblies and are not required by this section to have dampers shall comply with the requirements of Sections 714.2 through 714.3.3 of the International Building Code. Ducts that penetrate horizontal assemblies not required to be contained within a shaft and not required by this section to have dampers shall comply with the requirements of Sections 714.4 of the International Building Code.

**605.1.2.1 Ducts That Penetrate Nonfire-resistance Rated Assemblies.** The space around a duct penetrating a nonfire-resistance-rated floor assembly shall comply with Section 717.6.3 of the International Building Code.

**605.2 Installation.** Fire dampers, smoke dampers, combination fire/smoke dampers and ceiling radiation dampers located within air distribution and smoke control systems shall be installed in accordance with the requirements of this section, and the manufacturer's installation instructions and listing.

**605.2.1 Smoke Control System.** Where the installation of a fire damper will interfere with the operation of a required smoke control system in accordance with Section 909 of the International Building Code, approved alternative protection shall be used. Where mechanical systems including ducts and dampers used for normal building ventilation serve as part of the smoke control system, the expected performance of these systems in smoke control mode shall be addressed in the rational analysis required by Section 909.4 of the International Building Code.

**605.2.2 Hazardous Exhaust Ducts.** Fire dampers for hazardous exhaust duct systems shall comply with Section 520.0.

**605.3 Damper Testing, Ratings and Actuation.** Damper testing, ratings and actuation shall be in accordance with Sections 605.3.1 through 605.3.3.

**605.3.1 Damper Testing.** Dampers shall be listed and labeled in accordance with the standards in this section. Fire dampers shall comply with the requirements of UL 555. Only fire dampers labeled for use in dynamic systems shall be installed in heating, ventilation and air-conditioning systems designed to operate with fans on during a fire. Smoke dampers shall comply with the requirements of UL 555S. Combination fire/smoke dampers shall comply with the requirements of both UL 555 and UL 555S. Ceiling radiation dampers shall comply with the requirements of UL 555C or shall be tested as part of a fire-resistance-rated floor/ceiling or roof/ceiling assembly in accordance with ASTM E119 or UL 263. Corridor dampers shall comply with requirements of both UL 555 and UL 555S. Corridor

dampers shall demonstrate acceptable closure performance when subjected to 150 feet per minute velocity across the face of the damper using UL 555 fire exposure test.

**605.3.2 Damper Rating.** Damper ratings shall be in accordance with Sections 605.3.2.1 through 605.3.2.3.

**605.3.2.1 Fire Damper Ratings.** Fire dampers shall have the minimum fire protection rating specified in Table 605.3.2.1 for the type of penetration.

**TABLE 605.3.2.1  
FIRE DAMPER RATING**

| TYPE OF PENETRATION (hour)                         | MINIMUM DAMPER RATING |
|--|-----------------------|
| Less than 3-hour fire-resistance-rated assemblies  | 1 1/2                 |
| 3-hour or greater fire-resistance-rated assemblies | 3                     |

**605.3.2.2 Smoke Damper Ratings.** Smoke damper leakage ratings shall be Class I or II. Elevated temperature ratings shall not be less than 250°F (121°C).

**605.3.2.3 Combination Fire/Smoke Damper Ratings.** Combination fire/smoke dampers shall have the minimum fire protection rating specified for fire dampers in Table 605.3.2.1 for the type of penetration and shall also have a minimum smoke damper rating as specified in Section 605.3.2.2.

**605.3.2.4 Corridor Damper Ratings** Corridor dampers shall have the following minimum ratings.

- 1) One hour fire-resistance rating
- 2) Class I or II leakage rating as specified in Section 605.3.2.2

**605.3.3 Damper Actuation.** Damper actuation shall be in accordance with Sections 605.3.3.1 through 605.3.3.4 as applicable.

**605.3.3.1 Fire Damper Actuation Device.** The fire damper actuation device shall meet one of the following requirements:

- 1) The operating temperature shall be approximately 50°F (28°C) above the normal temperature within the duct system, but not less than 160°F (71°C).

- 2) The operating temperature shall be not more than 350°F (177°C) where located in a smoke control system complying with Section 909 of the International Building Code.

**605.3.3.2 Smoke Damper Actuation.** The smoke damper shall close upon actuation of a listed smoke detector or detectors installed in accordance with Section 907.3 of the International Building Code and one of the following methods, as applicable:

- 1) Where a smoke damper is installed within a duct, a smoke detector shall be installed inside the duct or outside the duct with sampling tubes protruding into the duct. The detector or tubes within the duct shall be within 5 feet (1524 mm) of the damper. Air outlets and inlets shall not be located between the detector or tubes and the damper. The detector shall be listed for the air velocity, temperature and humidity anticipated at the point where it is installed. Other than in mechanical smoke control systems, dampers shall be closed upon fan shutdown where local smoke detectors require a minimum velocity to operate.
- 2) Where a smoke damper is installed above smoke barrier doors in a smoke barrier, a spot-type detector listed for releasing service shall be installed on either side of the smoke barrier door opening. The detector shall be listed for releasing service if used for direct interface with the damper.
- 3) Where a smoke damper is installed within an un-ducted opening in a wall, a spot-type detector shall be installed within 5 feet horizontally of the damper. The detector shall be listed for releasing if used for direct interface with the damper.
- 4) Where a smoke damper is installed in a corridor wall or ceiling, the damper shall be permitted to be controlled by a smoke detection system installed in the corridor.
- 5) Where a smoke detection system is installed in all areas served by the duct in which the damper will be located, the smoke dampers shall be permitted to be controlled by the smoke detection system.

**605.3.3.3 Combination Fire/Smoke Damper Actuation.** Combination fire/smoke damper actuation shall be in accordance with Sections 605.3.3.1 and 605.3.3.2. Combination fire/smoke dampers installed in smoke control system shaft penetrations shall not be activated by local area smoke detection unless it is secondary to the smoke management system controls.

**605.3.3.4 Ceiling Radiation Damper Actuation.** The operating temperature of a ceiling radiation damper actuation device shall be 50°F (28°C) above the normal temperature within the duct system, but not less than 160°F 71°C).

**605.3.3.5 Corridor Damper Actuation.** Corridor damper actuation shall be in accordance with sections 605.3.3.1 and 605.3.3.2

**605.4 Access and Identification.** Fire and smoke 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 affect the integrity of fire-resistance-rated assemblies. The access openings shall not reduce the fire-resistance rating of the assembly. Access points shall be permanently identified on the exterior by a label having letters not less than 0.5 inch (12.7 mm) in height reading: FIRE/SMOKE DAMPER, SMOKE DAMPER or FIRE DAMPER. Access doors in ducts shall be tight fitting and suitable for the required duct construction.

**605.5 Where Required.** Fire dampers, smoke dampers and combination fire/smoke dampers shall be provided at the locations prescribed in Sections 605.5.1 through 605.5.7. Where an assembly is required to have both fire dampers and smoke dampers, combination fire/smoke dampers or a fire damper and smoke damper shall be required.

**605.5.1 Fire walls.** Ducts and air transfer openings permitted in fire walls in accordance with Section 706.11 of the International Building Code shall be protected with listed fire dampers installed in accordance with their listing.

**605.5.1.1 Horizontal Exits.** A listed smoke damper designed to resist the passage of smoke shall be provided at each point that a duct or air transfer opening penetrates a fire wall that serves as a horizontal exit.

**605.5.2 Fire Barriers.** Ducts and air transfer openings that penetrate fire barriers shall be protected with listed fire dampers installed in accordance with their listing. Ducts and air transfer openings shall not penetrate exit enclosures and exit passageways except as permitted by Sections 1022.5 and 1023.6, respectively, of the International Building Code.

**Exception:** Fire dampers are not required at penetrations of fire barriers where any of the following apply:

- 1) Penetrations are tested in accordance with ASTM E 119 or UL 263 as part of the fire-resistance rated assembly.
- 2) Ducts are used as part of an approved smoke control system and where the fire damper would interfere with the operation of the smoke control system.
- 3) Such walls are penetrated by ducted HVAC systems, have a required fire-resistance rating of 1 hour or less, are in areas of other than Group H and are

in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 of the International Building Code. For the purposes of this exception, a ducted HVAC system shall be a duct system for the structure's HVAC system. Such a duct system shall be constructed of sheet steel not less than 26 gage [0.0217 inch (0.55 mm)] thickness and shall be continuous from the air-handling appliance or equipment to the air outlet and inlet terminals.

**605.5.2.1 Horizontal Exits.** A listed smoke damper designed to resist the passage of smoke shall be provided at each point that a duct or air transfer opening penetrates a fire barrier that serves as a horizontal exit.

**605.5.3 Fire Partitions.** Ducts and air transfer openings that penetrate fire partitions shall be protected with listed fire dampers installed in accordance with their listing.

**Exception:** In occupancies other than Group H, fire dampers are not required where any of the following apply:

- 1) Corridor walls in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 of the International Building Code and the duct is protected as a through penetration in accordance with Section 714 of the International Building Code.
- 2) The partitions are tenant partitions in covered and open mall buildings where the walls are not required by provisions elsewhere in the International Building Code to extend to the underside of the floor or roof sheathing, slab or deck above.
- 3) The duct system is constructed of approved materials in accordance with Section 603 and the duct penetrating the wall complies with all of the following requirements:
  1. The duct shall not exceed 100 square inches (0.06 m<sup>2</sup>).
  2. The duct shall be constructed of steel a minimum of 0.0217 inch (0.55 mm) in thickness. (26 gauge)
  3. The duct shall not have openings that communicate the corridor with adjacent spaces or rooms.
  4. The duct shall be installed above a ceiling.
  5. The duct shall not terminate at a wall register in the fire-resistance-rated wall.
  6. A minimum 12-inch-long (305mm) by 0.060-inch-thick (1.52mm) steel sleeve shall be centered in each duct opening. The sleeve shall be

secured to both sides of the wall and all four sides of the sleeve with minimum 1 ½-inch by 1 ½-inch by 0.060-inch (38 mm by 38 mm by 1.52 mm) steel retaining angles. The retaining angles shall be secured to the sleeve and the wall with No. 10 (M5) screws. The annular space between the steel sleeve and the wall opening shall be filled with rock (mineral) wool batting on all sides.

- 4) Such walls are penetrated by ducted HVAC systems, have a required fire-resistance rating of 1 hour or less, and are in areas of other than Group H and are in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 of the International Building Code. For the purposes of this exception, a ducted HVAC system shall be a duct system for conveying supply, return or exhaust air as part of the structure's HVAC system. Such a duct system shall be constructed of sheet steel not less than 26 gage in thickness and shall be continuous from the air-handling appliance or equipment to the air outlet and inlet terminals.

**605.5.4 Corridors/Smoke Barriers.** A listed smoke damper designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a smoke barrier wall or a corridor enclosure required to have smoke and draft control doors in accordance with the International Building Code.

A corridor damper shall be provided where corridor ceilings, constructed as required for the corridor walls as permitted in Section 708.4, Exception 3, of the International Building Code, are penetrated.

A ceiling radiation damper shall be provided where the ceiling membrane of a fire-resistance-rated floor/ceiling or roof/ceiling assembly, constructed as permitted in Section 708.4, Exception 2, of the International Building Code, is penetrated.

Smoke dampers and smoke damper actuation methods shall comply with Section 605.5.4.1.

**Exceptions:**

- 1) Smoke dampers are not required in corridor penetrations where the building is equipped throughout with an approved smoke control system in accordance with Section 522 and smoke dampers are not necessary for the operation and control of the system.
- 2) Smoke dampers are not required in smoke barrier penetrations where the openings in ducts are limited to a single smoke compartment and the ducts are constructed of steel.

- 3) Smoke dampers are not required in corridor penetrations where the duct is constructed of steel not less than 0.019 inch (0.48 mm) in thickness and there are no openings serving the corridor.
- 4) Smoke dampers are not required in smoke barriers by Section 407.5 of the International Building Code for Group I-2 Condition 2 where the HVAC system is fully ducted in accordance with section 603 and where the buildings are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 of the International Building Code and equipped with quick-response sprinklers in accordance with Section 903.3.2 of the International Building Code.

**605.5.4.1 Smoke Damper.** The smoke damper shall close as required by Section 605.3.3.2.

**605.5.5 Shaft Enclosures.** Shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with approved fire and smoke dampers installed in accordance with their listing.

**Exceptions:**

- 1) Fire dampers are not required at penetrations of shafts where:
  1. Steel exhaust sub ducts extend at least 22 inches (559 mm) vertically in exhaust shafts provided that there is a continuous airflow upward to the outdoors.
  2. Penetrations are tested in accordance with ASTM E 119 or UL 263 as part of the fire-resistance-rated assembly.
  3. Ducts are used as part of an approved smoke control system in accordance with Section 909 of the International Building Code, and where the fire damper will interfere with the operation of the smoke control system.
  4. The penetrations are in parking garage exhaust or supply shafts that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.
- 2) In Group B and R occupancies equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 of the International Building Code, smoke dampers are not required at penetrations of shafts where kitchen, clothes dryer, bathroom and toilet room exhaust openings with steel exhaust sub-ducts, having a minimum thickness of 0.0187 inch (0.4712 mm) (No. 26 gage), extend at least 22 inches (559 mm) vertically and the exhaust fan at the upper terminus is powered continuously in

accordance with the provisions of Section 909.11 of the International Building Code, and maintains airflow upward to the outdoors.

- 3) Smoke dampers are not required at penetrations of exhaust or supply shafts in parking garages that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.
- 4) Smoke dampers are not required at penetrations of shafts where ducts are used as part of an approved mechanical smoke control system designed in accordance with Section 909 of the International Building Code and where the smoke damper will interfere with the operation of the smoke control system.
- 5) Fire dampers and combination fire/smoke dampers are not required in kitchen and clothes dryer exhaust systems installed in accordance with this code.

**605.5.5.1 Enclosure at the Bottom.** Shaft enclosures that do not extend to the bottom of the building or structure shall be protected in accordance with Section 713.11 of the International Building Code.

**605.5.6 Exterior Walls.** Ducts and air transfer openings in fire-resistance-rated exterior walls required to have protected openings in accordance with Section 705.10 of the International Building Code shall be protected with listed fire dampers installed in accordance with their listing.

**605.5.7 Smoke Partitions.** A listed smoke damper designed to resist the passage of smoke shall be provided at each point where an air transfer opening penetrates a smoke partition. Smoke dampers and smoke damper actuation methods shall comply with Section 605.3.3.2.

**Exception:** Where the installation of a smoke damper will interfere with the operation of a required smoke control system in accordance with Section 522, approved alternate protection shall be used.

**605.6 Horizontal Assemblies.** Penetrations by air ducts of a floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly shall be protected by a shaft enclosure that complies with Section 713 and Sections 717.6.1 through 717.6.3 of the International Building Code or shall comply with Sections 605.6.1 through 605.6.3.

**605.6.1 Through Penetrations.** In occupancies other than Groups I-2 and I-3, a duct constructed of approved materials in accordance with Section 603 that penetrates a fire resistance-rated floor/ceiling assembly that connects not more than two stories is permitted without shaft enclosure protection provided that a listed fire damper is installed at the floor line or the duct is protected in accordance with Section 714.4 of the International Building Code. For air transfer openings, see Exception 7, Section 712.1.8 of the International Building Code.

**Exception:** A duct is permitted to penetrate three floors or less without a fire damper at each floor provided it meets all of the following requirements.

- 1) The duct shall be contained and located within the cavity of a wall and shall be constructed of steel having a minimum thickness of 0.0187 inch (0.4712 mm) (No. 26 gage).
- 2) The duct shall open into only one dwelling unit or sleeping unit and the duct system shall be continuous from the unit to the exterior of the building.
- 3) The duct shall not exceed 4-inch (102 mm) nominal diameter and the total area of such ducts shall not exceed 100 square inches for any 100 square feet (64 516 mm<sup>2</sup> per 9.3 m<sup>2</sup>) of the floor area.
- 4) The annular space around the duct is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 or UL 263 time temperature conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.
- 5) Grille openings located in a ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly shall be protected with a listed ceiling radiation damper installed in accordance with Section 605.6.2.1.

**605.6.2 Membrane Penetrations.** Ducts and air transfer openings constructed of approved materials, in accordance with Section 603, that penetrate the ceiling membrane of a fire-resistance-rated floor/ceiling or roof/ceiling assembly shall be protected with one of the following:

- 1) A shaft enclosure in accordance with Section 713 of the International Building Code.
- 2) A listed ceiling radiation damper installed at the ceiling line where a duct penetrates the ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly.
- 3) A listed ceiling radiation damper installed at the ceiling line where a diffuser with no duct attached penetrates the ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly.

**605.6.2.1 Ceiling Radiation Dampers.** Ceiling radiation dampers shall be tested in accordance with Section 605.3.1. Ceiling radiation dampers shall be installed in accordance with the details listed in the fire-resistance rated assembly and the manufacturer's installation instructions and the listing.

Ceiling radiation dampers are not required where either of the following applies:

- 1) Tests in accordance with ASTM E 119 or UL 263 have shown that ceiling radiation dampers are not necessary to maintain the fire-resistance rating of the assembly.
- 2) Where exhaust duct penetrations are protected in accordance with Section 714.4.1.2 of the International Building Code, are located within the cavity of a wall and do not pass through another dwelling unit or tenant space.
- 3) Where duct and air transfer openings are protected with a duct outlet protection system tested as part of a fire-resistance-rated assembly in accordance with ASTM E 119 or UL 263.

**605.6.3 Non Fire-Resistance-Rated Floor Assemblies.** Duct systems constructed of approved materials in accordance with Section 603 that penetrate nonfire-resistance-rated floor assemblies shall be protected by any of the following methods:

- 1) A shaft enclosure in accordance with Section 713 of the International Building Code.
- 2) The duct connects not more than two stories, and the annular space around the penetrating duct is protected with an approved noncombustible material that resists the free passage of flame and the products of combustion.
- 3) In floor assemblies composed of noncombustible materials, a shaft shall not be required where the duct connects not more than three stories, and the annular space around the penetrating duct is protected with an approved noncombustible material that resists the free passage of flame and the products of combustion and a fire damper is installed at each floor line

**Exception:** Fire dampers are not required in ducts within individual residential dwelling units.

**605.7 Flexible Ducts and Air Connectors.** Flexible ducts and air connectors shall not pass through any fire-resistance-rated assembly.

### **608.0 Automatic Shutoffs**

### **608.1 General**

#### **Exceptions:**

(6) Automatic Shutoffs for Fan Powered Terminal Units shall comply with Section 608.3.

**608.2 Common Supply and Return Air Systems.** Where multiple air-handling systems share common supply or return air ducts or plenums with a combined design capacity greater than 2,000 cfm (0.9 m<sup>3</sup>/s), the supply air system shall be provided with smoke detectors in accordance with Section 608.1.

**608.3** Individual smoke detectors shall not be required for each new or relocated fan-powered terminal unit, provided that such units do not have an individual design capacity greater than 2,000 cfm (0.9 m<sup>3</sup>/s) and will be shut down by activation of one of the following:

- 1) Smoke detectors required by Sections 608.1
- 2) Where an air-handling unit is located within a space or area and is interconnected with the FPTU's, the duct smoke detector shall be located in supply side of the main air-handler served by that system.
- 3) An area smoke detector system as prescribed in the exceptions of 608.1.

**608.3.1 Shutdown Control of Fan-Powered Terminal Units by the Fire Alarm System.** When a fire alarm is initiated by a smoke detector located in air handling equipment on a floor or in air handling equipment in an independent smoke zone, the air handling equipment on that floor or in that independent smoke zone shall be de-energized, including all fan-powered terminal units (FPTU's)

Each FPTU shall have a fire alarm relay installed within three feet (3') of each FPTU. All of these fire alarm relays shall be controlled only by the fire alarm system. For each new or relocated FPTU, the control wiring for the FPTU fan shall be wired through its associated fire alarm shut down relay such that each FPTU shall be de-energized by a signal from the fire alarm system. The FPTU fan shall remain off until the FPTU fire alarm relay is reset through the fire alarm system. It shall not be possible to override the fire alarm relay and its "off" control of the FPTU fan through the building automation system or any other control system.

When addressing existing buildings and construction that are not compliant with this code section, all FPTUs in the area of construction/remodel shall be required to be shut down. When construction/remodel exceeds 50% of the aggregate area of the building as per the International Existing Building Code, than all FPTUs that are part of the systems being modified will need to comply with this section of the code. If any modification to the HVAC systems occur within the scope of the permit, than compliance with this section of code shall be required.

**608.4 Return Air Risers.** Where return air risers serve two or more stories and serve any portion of a return air system having a design capacity greater than 15,000 cfm (7.1 m<sup>3</sup>/s), smoke detectors shall be installed at each story. Such smoke detectors shall be

located upstream of the connection between the return air riser and any air ducts or plenums.

**608.5 Installation.** The required smoke detectors shall be installed to monitor the entire airflow conveyed by the supply or return air system. Access shall be provided to smoke detectors for inspection and maintenance.

**608.6 Controls Operation.** Upon activation, the smoke detectors shall shut down all operational capabilities of the air distribution system in accordance with the listing and labeling of appliances used in the system. Air distribution systems that are part of a smoke control system shall switch to the smoke control mode upon activation of a detector.

**608.6.1 Supervision.** The duct smoke detectors shall be connected to a fire alarm system where a fire alarm system is required by Section 907.2 of the International Fire Code. The actuation of a duct smoke detector shall activate a visible and audible supervisory signal at a constantly attended location.

**Exceptions:**

- 1) The supervisory signal at a constantly attended location is not required where the duct smoke detector activates the building's alarm-indicating appliances.
- 2) In occupancies not required to be equipped with a fire alarm system, actuation of a smoke detector shall activate a visible and audible signal in an *approved* location. Duct smoke detector trouble conditions shall activate a visible or audible signal in an *approved* location and shall be identified as air duct detector.

**1014.2 Licensing Requirements for Steam and Hot-Water Boilers and Piping.** Steam and hot-water boilers and piping shall be installed and maintained according to applicable regulations of the Texas Department of Licensing and Regulations.

**1015.0 Efficiency Standards for Steam Boilers.** Steam boilers shall comply with the following.

- 1) Steam boilers shall be equipped with conductivity controllers to control blowdown, and boilers shall be equipped with a cold water make-up meter. For systems 50 Boiler Horse Power or greater, the meter shall be connected to the building Energy management System or Utility Monitoring Dashboard.
- 2) Steam condensate return systems shall be installed for all steam boilers.
- 3) Steam boilers shall be fitted with a blowdown heat exchanger to transfer heat from blowdown to the feed water. Where heat recovery can

be used to heat boiler make-up water or for other purposes, the boiler blowdown from boilers exceeding 15 psi and 100 Boiler Horse Power shall be directed to a heat recovery system that reduces the temperature of the blowdown discharge to below 140 degrees Fahrenheit without using tempering water.

**1126.0 Standards for Cooling Towers.** Cooling towers shall comply with the following.

- 1) Cooling towers utilizing a potable water source shall achieve a minimum of five cycles of concentration.
- 2) Cooling towers shall be fitted with overflow sensors and alarms, make-up water and blow down meters to manage water consumption, and conductivity controllers. For cooling towers of 100 tons or more, the make-up and overflow meters, and the over flow alarm shall be connected to the building's Central energy Management System or Utility Monitoring Dashboard.
- 3) Cooling towers, evaporative condensers, and fluid coolers shall be equipped with drift eliminators that have a drift rate of not more than 0.005 percent of the circulated water flow rate in accordance with the equipment manufacturer's instructions.
- 4) Owners of existing cooling towers shall register their cooling tower with Austin Water Utility's Water Conservation Division by May1, 2017. New cooling towers shall be registered with AWU prior to the start of operation.
- 5) The owner of a cooling tower shall submit by March 1<sup>st</sup> of each year an annual compliance inspection report prepared by an independent third party licensed through TDLR as a mechanical contractor, prepared by a Licensed Professional Engineer registered with the State of Texas as a Mechanical Engineer, or other persons approved by the Authority Having Jurisdiction for cooling tower performance testing. The report shall be on a form developed by the AHJ and certify that he cooling tower meets or exceeds all applicable requirements of this code. In addition, the owner shall maintain on site a written log containing the monthly make-up and blow down meter reads, conductivity values, and cycles of concentration. The log shall be made available to city employees upon request.
- 6) Effective January 1, 2017, cooling towers of 100 tons of capacity or greater for new commercial or multi-family development shall install a water storage tank, plumbing and treatment to utilize blowdown water for landscape or other authorized beneficial purposes, or offset a minimum of 10% of the makeup water with reclaimed or onsite water reuse.

**1403.0 Plans Required.**

**1403.1 General.** Plans, engineering calculations, diagrams, and other data shall be submitted in one or more sets with each application for a permit. The Authority Having Jurisdiction may require plans, computations, and specifications to be prepared and designed by a Professional Engineer licensed by the State of Texas. Permit fees and plan review fees shall be established under a separate ordinance by the City Council.

## **Chapter 15. Solar Systems**

**[B] 1502.0. Guards.** Guards shall be provided where appliances, *equipment*, solar systems and appurtenances require service and are located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guard shall extend not less than 30 inches (762 mm) beyond each end of such appliances, *equipment*, Solar systems and appurtenances and the top of the guard shall be located not less than 42 inches (1067 mm) above the elevated surface adjacent to the guard. The guard shall be constructed so as to prevent the passage of a 21-inch-diameter (533 mm) sphere and shall comply with the loading requirements for guards specified in the *International Building Code*. 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.

## **Chapter 18 Specific Appliances, Fireplaces and Solid Fuel-Burning Equipment**

### **1801.0 General.**

**1801.1 Scope.** This chapter shall govern the approval, design, installation, construction, maintenance, alteration and repair of the appliances and equipment specifically identified herein and factory-built fireplaces. The *Uniform Plumbing Code* shall regulate the installation of natural gas in relationship to gas-fired appliances.

**1801.2 General.** The requirements of this chapter shall apply to the mechanical equipment and appliances regulated by this chapter, in addition to the other requirements of this Code.

**1801.3 Hazardous Locations.** Fireplaces and solid fuel burning appliances shall not be installed in hazardous locations.

**1801.4 Fireplace Accessories.** Listed and labeled fireplace accessories shall be installed in accordance with the conditions of the listing and the manufacturer's instructions. Fireplace accessories shall comply with UL 907.

**1802.0 Masonry Fireplaces.** Masonry fireplaces shall be constructed in accordance with the *International Building Code*.

### **1803.0 Factory-Built Fireplaces.**

**1803.1 General.** Factory-built fireplaces shall be listed and labeled and shall be installed in accordance with the conditions of the listing. Factory-built fireplaces shall be tested in accordance with UL 127.

**1803.2 Hearth extensions.** Hearth extensions of approved factory- built fireplaces shall be installed in accordance with the listing of the fireplace. The hearth extension shall be readily distinguishable from the surrounding floor area. Listed and labeled hearth extensions shall comply with UL 1618.

**1803.3 Unvented gas log heaters.** An unvented gas log heater shall not be installed in a factory-built fireplace unless the fireplace system has been specifically tested, listed and labeled for such use in accordance with UL 127.

#### **1804.0 Pellet Fuel-Burning Appliances.**

**1804.1 General** Pellet fuel-burning appliances shall be *listed* and *labeled* in accordance with ASTM E 1509 and shall be installed in accordance with the terms of the listing.

#### **1805.0 Fireplaces Stoves and Room Heaters.**

**1805.1 General.** Fireplace stoves and solid-fuel-type room heaters shall be listed and labeled and shall be installed in accordance with the conditions of the listing. Fireplace stoves shall be tested in accordance with UL 737. Solid-fuel-type room heaters shall be tested in accordance with UL 1482. Fireplace inserts intended for installation in fireplaces shall be listed and labeled in accordance with the requirements of UL 1482 and shall be installed in accordance with the manufacturer's installation instructions.

**1805.2 Connection to fireplace.** The connection of solid fuel appliances to chimney flues serving fireplaces shall comply with Chapter 8 (*Chimneys and Vents*).

#### **1806.0 Sauna Heaters.**

**1806.1 Location and protection.** Sauna heaters shall be located so as to minimize the possibility of accidental contact by a person in the room.

**1806.2 Guards.** Sauna heaters shall be protected from accidental contact by an approved guard or barrier of material having a low coefficient of thermal conductivity. The guard shall not substantially affect the transfer of heat from the heater to the room.

**1806.3 Installation.** .Sauna heaters shall be *listed* and *labeled* in accordance with UL 875 and shall be installed in accordance with their listing and the manufacturer's installation instructions.

**1806.4 Access.** Panels, grilles and access doors that are required to be removed for normal servicing operations shall not be attached to the building.

**1806.5 Heat and time controls.** Sauna heaters shall be equipped with a thermostat that will limit room temperature to 194°F (90°C). If the thermostat is not an integral part of the sauna heater, the heat-sensing element shall be located within 6 inches (152 mm) of the ceiling. If the heat-sensing element is a capillary tube and bulb, the assembly shall be attached to the wall or other support, and shall be protected against physical damage.

**1806.6 Timers.** A timer, if provided to control main burner operation, shall have a maximum operating time of 1 hour. The control for the timer shall be located outside the sauna room.

**1806.7 Sauna room.** A ventilation opening into the sauna room shall be provided. The opening shall be not less than 4 inches by 8 inches (102 mm by 203 mm) located near the top of the door into the sauna room.

**1806.8 Warning notice.** The following permanent notice, constructed of approved material, shall be mechanically attached to the sauna room on the outside:

WARNING: DO NOT EXCEED 30 MINUTES IN SAUNA. EXCESSIVE EXPOSURE CAN BE HARMFUL TO HEALTH. ANY PERSON WITH POOR HEALTH SHOULD CONSULT A PHYSICIAN BEFORE USING SAUNA.

The words shall contrast with the background and the wording shall be in letters not less than 0.25-inch (6.4 mm) high.

**Exception:** This section shall not apply to one-and two-family dwellings.

## **1807.0 Forced Air Furnaces**

**1807.1 Forced-air furnaces.** Oil-fired furnaces shall be tested in accordance with UL 727. Electric furnaces shall be tested in accordance with UL 1995. Solid fuel furnaces shall be tested in accordance with UL 391. Forced-air furnaces shall be installed in accordance with the listings and the manufacturer's installation instructions.

**1807.2 Minimum duct sizes.** The minimum unobstructed total area of the outside and return air ducts or openings to a forced-air warm-air furnace shall be not less than 2 square inches per 1,000 Btu/h (4402 mm<sup>2</sup>/kW) output rating capacity of the furnace and not less than that specified in the furnace manufacturer's installation instructions. The minimum unobstructed total area of supply ducts from a forced-air warm-air furnace shall not be less than 2 square inches for each 1,000 Btu/h (4402 mm<sup>2</sup>/kW) output rating capacity of the furnace and not less than that specified in the furnace manufacturer's installation instructions.

**Exception:** The total area of the supply air ducts and outside and return air ducts shall not be required to be larger than the minimum size required by the furnace manufacturer's installation instructions.

**1807.3 Heat pumps.** The minimum unobstructed total area of the outdoor and return air ducts or openings to a heat pump shall be not less than 6 square inches per 1,000 Btu/h (13,208 mm<sup>2</sup>/kW) output rating or as indicated by the conditions of listing of the heat pump. Electric heat pumps shall be tested in accordance with UL 1995.

**1807.4 Dampers.** Volume dampers shall not be placed in the air inlet to a furnace in a manner that will reduce the required air to the furnace.

**1807.5 Circulating air ducts for forced-air warm-air furnaces.** Circulating air for fuel-burning, forced-air-type, warm-air furnaces shall be conducted into the blower housing from outside the furnace enclosure by continuous airtight ducts.

#### **1808.0 Kerosene and Oil-Fired Stoves.**

**1808.1 General.** Kerosene and oil-fired stoves shall be listed and labeled and shall be installed in accordance with the conditions of the listing and the manufacturer's installation instructions. Kerosene and oil-fired stoves shall comply with NFPA 31. Oil fired stoves shall be tested in accordance with UL 896.

#### **1809.0 Masonry Heaters.**

**1809.1 General.** Masonry heaters shall be constructed in accordance with the *International Building Code*.

**PART 2.** This ordinance takes effect on \_\_\_\_\_, 2016.

**PASSED AND APPROVED**

\_\_\_\_\_, 2016

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\_\_\_\_\_  
Mayor

**APPROVED:** \_\_\_\_\_

**ATTEST:** \_\_\_\_\_

City Attorney

City Clerk

DRAFT