2. The Group F occupancy has ~~have an~~ a combined occupant load of 500 or more above or below the lowest level of exit discharge.

   **Exception:** Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system and the ~~alarm~~ occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

**907.2.5 Group H.** A manual fire alarm system shall be installed in Group H-5 occupancies and in occupancies used for the manufacture of organic coatings. An automatic smoke detection system shall be installed for highly toxic gases, organic peroxides and oxidizers in accordance with Chapters 37, 39 and 40, respectively.

**907.2.6 Group I.** A manual fire alarm system shall be installed in Group I occupancies. An ~~electrically supervised,~~ automatic smoke detection system shall be provided in accordance with Sections 907.2.6.1 and 907.2.6.2.

**Exception:** Manual fire alarm boxes in resident or patient sleeping areas of Group I-1 and I-2 occupancies shall not be required at exits if located at all nurses' control stations or other constantly attended staff locations, provided such stations are visible and continuously accessible and that travel distances required in Section ~~907.4.1~~ 907.5.2 are not exceeded.

**907.2.6.1 Group I-1.** ~~Corridors,~~ An automatic smoke detection system shall be installed in corridors, waiting areas open to corridors and habitable spaces other than sleeping units and kitchens~~, and waiting areas that are open to corridors shall be equipped with an automatic smoke detection system~~. The system shall be activated in accordance with Section 907.6.

**Exceptions:**

1. Smoke detection in habitable spaces is not required where the facility is equipped throughout with an automatic sprinkler system.
2. Smoke detection is not required for exterior balconies.

**907.2.6.1.1 Smoke alarms.** Single- and multiple-station smoke alarms shall be installed in accordance with Section 907.2.10.

**907.2.6.2 Group I-2.** An automatic smoke detection system shall be installed in corridors in nursing homes (both intermediate care and skilled nursing facilities), detoxification facilities and spaces permitted to be open to the corridors by Section 407.2 of the *International Building Code* ~~shall be equipped with an automatic fire detection system~~. The system shall be activated in accordance with Section 907.6. Hospitals shall be equipped with smoke detection as required in Section 407.2 of the *International Building Code.*

**Exceptions:**

1. Corridor smoke detection is not required in smoke compartments that contain patient sleeping units where patient sleeping units are provided with smoke detectors that comply with UL 268. Such detectors shall provide a visual display on the corridor side of each patient sleeping unit and shall provide an audible and visual alarm at the nursing station attending each unit.
2. Corridor smoke detection is not required in smoke compartments that contain patient sleeping units where patient sleeping unit doors are equipped with automatic door-closing devices with integral smoke detectors on the unit sides installed in accordance with their listing, provided that the integral detectors perform the required alerting function.

**907.2.6.3 Group I-3 occupancies.** Group I-3 occupancies shall be equipped with a manual and automatic fire alarm system installed for alerting staff.

**907.2.6.3.1 System initiation.** Actuation of an automatic fire-extinguishing system, a manual fire alarm box or a fire detector shall initiate an approved fire alarm signal which automatically notifies staff. ~~Presignal systems shall not be used.~~

**907.2.6.3.2 Manual fire alarm boxes.** Manual fire alarm boxes are not required to be located in accordance with Section ~~907.4~~ 907.5.2 where the fire alarm boxes are provided at staff-attended locations having direct supervision over areas where manual fire alarm boxes have been omitted.

Manual fire alarm boxes are allowed to be locked in areas occupied by detainees, provided that staff members are present within the subject area and have keys readily available to operate the manual fire alarm boxes.

**907.2.6.3.3 Smoke detectors.** An ~~approved~~ automatic smoke detection system shall be installed throughout resident housing areas, including sleeping units and contiguous day rooms, group activity spaces and other common spaces normally accessible to residents.

**Exceptions:**

1. Other approved smoke-detection arrangements providing equivalent protection, including, but not limited to, placing detectors in exhaust ducts from cells or behind protective guards listed for the purpose, are allowed when necessary to prevent damage or tampering.
2. Sleeping units in Use Conditions 2 and 3.
3. Smoke detectors are not required in sleeping units with four or fewer occupants in smoke compartments that are equipped throughout with an ~~approved~~ automatic sprinkler system.

**907.2.7 Group M.** A manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in Group M occupancies where one of the following conditions exists:

1. The combined Group M occupant load of all floors is ~~having an occupant load of~~ 500 or more persons. ~~or~~
2. The Group M occupant load is more than 100 persons above or below the lowest level of exit discharge. ~~The initiation of a signal from a manual fire alarm box shall initiate alarm notification appliances as required by Section 907.10.~~

**Exceptions:**

1. A manual fire alarm system is required in covered mall buildings complying with Section 402 of the *International Building Code.*
2. Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system and the ~~alarm~~ occupant notification appliances will automatically activate throughout the notification zones upon sprinkler water flow.

**907.2.7.1 Occupant notification.** During times that the building is occupied, the initiation of a signal from a manual fire alarm box or from a water flow switch shall not be required to activate the alarm notification appliances when an alarm signal is activated at a constantly attended location from which evacuation instructions shall be initiated over an emergency voice/alarm communication system installed in accordance with Section ~~907.2.12.2~~ 907.6.2.2.

The emergency voice/alarm communication system shall be allowed to be used for other announcements, provided the manual fire alarm use takes precedence over any other use.

**907.2.8 Group R-1.** Fire alarm systems and smoke alarms shall be installed in Group R-1 occupancies as required in Sections 907.2.8.1 through 907.2.8.3.

**907.2.8.1 Manual fire alarm system.** A manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in Group R-1 occupancies.

**Exceptions:**

1. A manual fire alarm system is not required in buildings not more than two stories in height where all individual dwelling units or sleeping units and contiguous attic and crawl spaces to those units are separated from each other and public or common areas by at least 1-hour fire partitions and each individual dwelling unit or sleeping unit has an exit directly to a public way, exit court or yard.
2. Manual fire alarm boxes are not required throughout the building when the following conditions are met:
   2.1. The building is equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.
   2.2. The notification appliances will activate upon sprinkler water flow; and
   2.3. At least one manual fire alarm box is installed at an approved location.

**907.2.8.2 Automatic fire alarm system.** An automatic fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed throughout all interior corridors serving dwelling units or sleeping units.

**Exception:** An automatic fire detection system is not required in buildings that do not have interior corridors serving dwelling units or sleeping units and where each dwelling unit or sleeping unit has a means of egress door opening directly to an exit or to an exterior exit access that leads directly to an exit.

**907.2.8.3 Smoke alarms.** Single- and multiple-station smoke alarms shall be installed ~~as required by~~ in accordance with Section 907.2.10. ~~In buildings that are not equipped throughout with an automatic sprinkler system installed in~~

~~accordance with Section 903.3.1.1 or 903.3.1.2, the smoke alarms in sleeping units shall be connected to an emergency electrical system and shall be annunciated by sleeping unit at a constantly attended location from which the fire alarm system is capable of being manually activated.~~

**907.2.9 Group R-2.** Fire alarm systems and smoke alarms shall be installed in Group R-2 occupancies as required in Section 907.2.9.1 and 907.9.2.

**907.2.9.1 Manual fire alarm system.** A manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in Group R-2 occupancies where:

1. Any dwelling unit or sleeping unit is located three or more stories above the lowest level of exit discharge;
2. Any dwelling unit or sleeping unit is located more than one story below the highest level of exit discharge of exits serving the dwelling unit or sleeping unit; or
3. The building contains more than 16 dwelling units or sleeping units.

**Exceptions:**

~~1. A fire alarm system is not required in buildings not more than two stories in height where all dwelling units or sleeping units and contiguous attic and crawl spaces are separated from each other and public or common areas by at least 1-hour fire partitions and each dwelling unit or sleeping unit has an exit directly to a public way, exit court or yard.~~

~~2.~~ 1. Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system and the ~~building when the following conditions are met:~~
   ~~2.1. The building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2; and~~
   ~~2.2.~~ ~~The~~ occupant notification appliances will automatically activate throughout the notification zones upon a sprinkler water flow.

~~3.~~ 2. A manual fire alarm system is not required in buildings not more than two stories in height that do not have interior corridors serving dwelling units ~~and are protected by an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2,~~ provided that dwelling units either have a means of egress door opening directly to an exterior exit access that leads directly to the exits or are served by open-ended corridors designed in accordance with Section 1023.6, Exception 4.

**907.2.9.2 Smoke alarms.** Single- and multiple-station smoke alarms shall be installed in accordance with Section 907.2.10.

**907.2.10 Single- and multiple-station smoke alarms.** Listed single- and multiple-station smoke alarms complying with UL 217 shall be installed in accordance with ~~the provisions of this code~~ Sections 907.1.10.1 through 907.2.10.4 and ~~the household fire-warning equipment provisions of~~ NFPA 72.

~~**907.2.10.1 Where required.** Single- or multiple-station smoke alarms shall be installed in the locations described in Sections 907.2.10.1.1 through 907.2.10.1.3.~~

~~**907.2.10.1.1**~~ **907.2.10.1 Group R-1.** Single- or multiple-station smoke alarms shall be installed in all of the following locations in Group R-1:

1. In sleeping areas.
2. In every room in the path of the means of egress from the sleeping area to the door leading from the dwelling unit or sleeping unit.
3. In each story within the dwelling unit or sleeping unit, including basements. For dwelling units or sleeping units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.

~~**907.2.10.1.2**~~ **907.2.10.2 Groups R-2, R-3, R-4 and I-1.** Single or multiple-station smoke alarms shall be installed and maintained in Groups R-2, R-3, R-4 and I-1 regardless of occupant load at all of the following locations:

1. On the ceiling or wall outside of each separate sleeping area in the immediate vicinity of bedrooms.
2. In each room used for sleeping purposes.

   **Exception:** Single- or multiple-station smoke alarms in Group I-1 shall not be required where smoke detectors are provided in the sleeping rooms as part of an automatic smoke detection system.

3. In each story within a dwelling unit, including basements but not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.

~~**907.2.10.1.3 Group I-1.** Single- or multiple-station smoke alarms shall be installed and maintained in sleeping areas in Group I-1 occupancies.~~

~~**Exception:** Single- or multiple-station smoke alarms shall not be required where the building is equipped throughout with an automatic fire detection system in accordance with Section 907.2.6.~~

**907.2.10.3 Interconnection.** Where more than one smoke alarm is required to be installed within an individual dwelling unit or sleeping unit in Groups R-1, R-2, R-3 or R-4, ~~or within an individual sleeping unit in Group R-1,~~ the smoke alarms shall be interconnected in such a manner that the activation of one alarm will activate all of the alarms in the individual unit. The alarm shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed.

~~**907.2.10.4 Acceptance testing.**~~ (Relocated to Section 907.8.1)

~~**907.2.10.2**~~ **907.2.10.4 Power source.** In new construction, required smoke alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source and shall be equipped with a battery backup. Smoke alarms with integral strobes that are not equipped with battery back-up shall be connected to an emergency electrical system. Smoke alarms shall emit a signal when the batteries are low. Wiring shall be permanent and without a disconnecting switch other than as required for overcurrent protection.

**Exception:** Smoke alarms are not required to be equipped with battery backup ~~in Group R-1~~ where they are connected to an emergency electrical system.

**907.2.11 Special amusement buildings.** An ~~approved~~ automatic smoke detection system shall be provided in special amusement buildings in accordance with this section.

**Exception:** In areas where ambient conditions will cause a smoke detection system to alarm, an approved alternative type of automatic fire detector shall be installed.

**907.2.11.1 Alarm.** Activation of any single smoke detector, the automatic sprinkler system or any other automatic fire detection device shall immediately sound an alarm at the building at a constantly attended location from which emergency action can be initiated, including the capability of manual initiation of requirements in Section 907.2.11.2.

**907.2.11.2 System response.** The activation of two or more smoke detectors, a single smoke detector with alarm verification, the automatic sprinkler system or other approved fire detection device shall automatically:

1. Cause illumination of the means of egress with light of not less than 1 foot-candle (11 lux) at the walking surface level;
2. Stop any conflicting or confusing sounds and visual distractions; ~~and~~
3. Activate an approved directional exit marking that will become apparent in an emergency; and
4. ~~Such system response shall also include activation of~~ Activate a prerecorded message, ~~clearly~~ audible throughout the special amusement building, instructing patrons to proceed to the nearest exit. Alarm signals used in conjunction with the prerecorded message shall produce a sound which is distinctive from other sounds used during normal operation.

~~The wiring to the auxiliary devices and equipment used to accomplish the above fire safety functions shall be monitored for integrity in accordance withNFPA72.~~

**907.2.11.3 Emergency voice/alarm communication system.** An emergency voice/alarm communication system, which is also allowed to serve as a public address system, shall be installed in accordance with ~~NFPA 72~~ Section 907.6.2.2 and be audible throughout the entire special amusement building.

**907.2.12 High-rise buildings.** Buildings with a floor used for human occupancy located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access shall be provided with an automatic fire alarm system and an emergency voice/alarm communication system in accordance with Section ~~907.2.12.2~~ 907.6.2.2.

**Exceptions:**

1. Airport traffic control towers in accordance with Section 907.2.22 and Section 412 of the *International Building Code*.
2. Open parking garages in accordance with Section 406.3 of the *International Building Code*.
3. Buildings with an occupancy in Group A-5 in accordance with Section 303.1 of the *International Building Code*.
4. Low-hazard special occupancies in accordance with Section 503.1.1 of the *International Building Code*.

5. Buildings with an occupancy in Group H-1, H-2 or H-3 in accordance with Section 415 of the *International Building Code*.
6. In Group I-1 and I-2 occupancies, the alarm shall sound at a constantly attended location and general occupant notification shall be broadcast by the paging system.

**907.2.12.1 Automatic fire detection.** Smoke detectors shall be provided in accordance with this section. Smoke detectors shall be connected to an automatic fire alarm system. The activation of any detector required by this section shall operate the emergency voice/alarmcommunication system. Smoke detectors shall be located as follows:

1. In each mechanical equipment, electrical, transformer, telephone equipment or similar room which is not provided with sprinkler protection, elevator machine rooms, and in elevator lobbies.
2. In the main return air and exhaust air plenum of each air-conditioning system having a capacity greater than 2,000 cubic feet per minute (cfm) (0.94 $m^3$/s). Such detectors shall be located in a serviceable area downstream of the last duct inlet.
3. At each connection to a vertical duct or riser serving two or more stories from a return air duct or plenum of an air-conditioning system. In Group R-1 and R-2 occupancies, a ~~listed~~ smoke detector is allowed to be used in each return-air riser carrying not more than 5,000 cfm (2.4m3/s) and serving not more than 10 air-inlet openings.

~~**907.2.12.2 Emergency voice/alarm communication system.**~~ (Relocated to Section 907.6.2.2)
~~**907.2.12.2.1 Manual override.**~~ (Relocated to Section 907.6.2.2.1)
~~**907.2.12.2.2 Live voice messages.**~~ (Relocated to Section 907.6.2.2.2)
~~**907.2.12.2.3 Standard.**~~ (Relocated to Section 907.6.2.2)

~~**907.2.12.3**~~ **907.2.12.2 Fire department communication system.** An approved two-way, fire department communication system designed and installed in accordance with NFPA 72 shall be provided for fire department use. It shall operate between a fire command center complying with Section 509 and elevators, elevator lobbies, emergency and standby power rooms, fire pump rooms, areas of refuge and inside enclosed exit stairways. The fire department communication device shall be provided at each floor level within the enclosed exit stairway.

**Exception:** Fire department radio systems where approved by the fire department.

**907.2.13 Atriums connecting more than two stories.** A fire alarm system shall be installed in occupancies with an atrium that connects more than two stories. The system shall be activated in accordance with Section ~~907.7~~ 907.6. Such occupancies in Group A, E or M shall be provided with an emergency voice/alarm communication system complying with the requirements of Section ~~907.2.12.2~~ 907.6.2.2.

**907.2.14 High-piled combustible storage areas.** An automatic fire detection system shall be installed throughout high-piled combustible storage areas where required by Section 2306.5.

~~**907.2.15 Delay egress locks.**~~ (Relocated to Section 907.4.2)

~~**907.2.16**~~ **907.2.15 Aerosol storage uses.** Aerosol storage rooms and general-purpose warehouses containing aerosols shall be provided with an approved manual fire alarm system where required by this code.

~~**907.2.17**~~ **907.2.16 Lumber, wood structural panel and veneer mills.** Lumber, wood structural panel and veneer mills shall be provided with a manual fire alarm system.

~~**907.2.18**~~ **907.2.17 Underground buildings with smoke ~~exhaust~~ control systems.** Where a smoke ~~exhaust~~ control system is installed in an underground building in accordance with the *International Building Code*, automatic fire detectors shall be provided in accordance with this section.

~~**907.2.18.1**~~ **907.2.17.1 Smoke detectors.** A minimum of one smoke detector listed for the intended purpose shall be installed
in the following areas:

1. Mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar rooms.
2. Elevator lobbies.
3. The main return and exhaust air plenum of each air-conditioning system serving more than one story and located in a serviceable area downstream of the last duct inlet.
4. Each connection to a vertical duct or riser serving two or more floors from return air ducts or plenums of heating, ventilating and air-conditioning systems, except that in Group R occupancies, a listed smoke detector is allowed to be used in each return-air riser carrying not more than 5,000 cfm (2.4 $m^3$/s) and serving not more than 10 air inlet openings.

~~907.2.18.2~~ **907.2.17.2 Alarm required.** Activation of the smoke ~~exhaust~~ control system shall activate an audible alarm at a constantly attended location.

~~907.2.19~~ **907.2.17.3 Deep underground buildings.** Where the lowest level of a structure is more than 60 feet (18 288 mm) below the lowest level of exit discharge, the structure shall be equipped throughout with a manual fire alarm system, including an emergency voice/alarm communication system installed in accordance with Section ~~907.2.12.2~~ 907.6.2.2.

~~907.2.19.1~~ **907.2.17.3.1 Public address system.** Where a fire alarm system is not required by Section 907.2, a public address system shall be provided which shall be capable of transmitting voice communications to the highest level of exit discharge serving the underground portions of the structure and all levels below.

~~907.2.20~~ **907.2.18 Covered mall buildings.** Covered mall buildings exceeding 50,000 square feet (4645 $m^2$) in total floor area shall be provided with an emergency voice/alarm communication system. An emergency voice/alarm communication system serving a mall, required or otherwise, shall be accessible to the fire department. The system shall be provided in accordance with Section ~~907.2.12.2~~ 907.6.2.2.

~~907.2.21~~ **907.2.19 Residential aircraft hangars.** A minimum of one ~~listed~~ single-station smoke alarm shall be installed within a residential aircraft hangar as defined in the *International Building Code* and shall be interconnected into the residential smoke alarm or other sounding device to provide an alarm which will be audible in all sleeping areas of the dwelling.

~~907.2.22~~ **907.2.20 Airport traffic control towers.** An automatic fire detection system that activates the occupant notification system in accordance with Section 907.6 shall be provided in airport traffic control towers in all occupiable spaces.

~~907.2.23~~ **907.2.21 Battery rooms.** An ~~approved~~ automatic smoke detection system shall be installed in areas containing stationary storage battery systems ~~having~~ with a liquid capacity of more than 50 gallons (189 L). The detection system shall activate a local alarm signal at a constantly attended location or shall be supervised by an approved central, proprietary, or remote station service ~~or a local alarm which will sound an audible signal at a constantly attended location~~.

**907.3 Where required—retroactive in existing buildings and structures.** An approved manual, automatic or manual and automatic fire alarm system shall be installed in existing buildings and structures in accordance with Sections 907.3.1 through 907.3.1.8 and provide occupant notification in accordance with Section 907.6 unless other requirements are provided by other sections of this code. ~~Where automatic sprinkler protection is provided in accordance with Section 903.3.1.1 or 903.3.1.2 and connected to the building fire alarm system, automatic heat detection required by this section shall not be required.~~

~~An approved automatic fire detection system shall be installed in accordance with the provisions of this code and NFPA 72. Devices, combinations of devices, appliances and equipment shall be approved. The automatic fire detectors shall be smoke detectors, except an approved alternative type of detector shall be installed in spaces such as boiler rooms where, during normal operation, products of combustion are present in sufficient quantity to actuate a smoke detector.~~

~~**907.3.1 Occupancy requirements.** A fire alarm system shall be installed in accordance with Sections 907.3.1.1 through 907.3.1.8.~~

~~**Exception:** Occupancies with an existing, previously approved fire alarm system.~~

~~907.3.1.1~~ **907.3.1 Group E.** A fire alarm system shall be installed in existing Group E occupancies in accordance with Section 907.2.3.

**Exceptions:**

1. A manual fire alarm system is not required in a building with a maximum area of 1,000 square feet (93 $m^2$) that contains a single classroom and is located no closer than 50 feet (15 240 mm) from another building.
2. A manual fire alarm system is not required in Group E with an occupant load less than 50.

**907.3.2 Group I.** A fire alarm system shall be installed in existing Group I occupancies in accordance with Sections 907.3.2.1 through 907.3.2.3.

**Exception:** Manual fire alarm boxes in resident or patient sleeping areas of Group I-1 and I-2 occupancies shall not be required at exits if located at all nurses' control stations or other constantly attended staff locations, provided

such stations are visible and continuously accessible and that travel distances required in Section 907.5.2 are not exceeded.

~~**907.3.1.2**~~ **907.3.2.1 Group I-1.** An automatic or manual fire alarm system shall be installed in existing Group I-1 residential care/assisted living facilities in accordance with Section 907.2.6.1.

**Exception:** Where each sleeping room has a means of egress door opening directly to an exterior egress balcony that leads directly to the exits in accordance with Section 1014.5, and the building is not more than three stories in height.

~~**907.3.1.3**~~ **907.3.2.2 Group I-2.** An automatic or manual fire alarm system shall be installed in existing Group I-2 occupancies in accordance with Section 907.2.6.2.

~~**907.3.1.4**~~ **907.3.2.3 Group I-3.** An automatic or manual fire alarm system shall be installed in existing Group I-3 occupancies in accordance with Section 907.2.6.3.

**907.3.3 Group R.** A fire alarm system and smoke alarms shall be installed in existing Group R occupancies in accordance with Sections 907.3.3.1 through 907.3.3.4.

~~**907.3.1.5**~~ **907.3.3.1 Group R-1 hotels and motels.** An automatic or manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in existing Group R-1 hotels and motels more than three stories or with more than 20 dwelling units or sleeping units.

**Exception:** Buildings less than two stories in height where all dwelling units or sleeping units, attics and crawl spaces are separated by 1-hour fire-resistance-rated construction and each dwelling unit or sleeping unit has direct access to a public way, exit court or yard.

~~**907.3.1.6**~~ **907.3.3.2 Group R-1 boarding and rooming houses.** An automatic or manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in existing Group R-1 boarding and rooming houses.

**Exception:** Buildings that have single-station smoke alarms meeting or exceeding the requirements of Section 907.2.10.1 and where the fire alarm system includes at least one manual fire alarm box per floor arranged to initiate the alarm.

~~**907.3.1.7**~~ **907.3.3.3 Group R-2.** An automatic or manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in existing Group R-2 occupancies more than three stories in height or with more than 16 dwelling units or sleeping units.

**Exceptions:**

1. Where each living unit is separated from other contiguous living units by fire barriers having a fire-resistance rating of not less than 0.75 hour, and where each living unit has either its own independent exit or its own independent stairway or ramp discharging at grade.
2. A separate fire alarm system is not required in buildings that are equipped throughout with an approved supervised automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 and having a local alarm to notify all occupants.
3. A fire alarm system is not required in buildings that do not have interior corridors serving dwelling units and are protected by an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, provided that dwelling units either have a means of egress door opening directly to an exterior exit access that leads directly to the exits or are served by open-ended corridors designed in accordance with Section 1023.6, Exception 4.

~~**907.3.1.8**~~ **907.3.3.4 Group R-4.** An automatic or manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in existing Group R-4 residential care/assisted living facilities.

**Exceptions:**

1. Where there are interconnected smoke alarms meeting the requirements of Section 907.2.10 and there is at least one manual fire alarm box per floor arranged to sound continuously the smoke alarms.
2. Other manually activated, continuously sounding alarms approved by the fire code official.

~~907.3.2~~ 9097.3.4 **Single- and multiple-station smoke alarms.** Single- and multiple-station smoke alarms shall be installed in existing Group R occupancies in accordance with Sections ~~907.3.2.1~~ 907.3.4.1 through ~~907.3.2.3~~ 907.3.4.3.

~~907.3.2.1~~ **907.3.4.1** ~~**General**~~ **Where required.** Existing Group R occupancies not already provided with single-station smoke alarms shall be provided with ~~approved~~ single-station smoke alarms. Installation shall be in accordance with Section 907.2.10, except as provided in Sections ~~907.3.2.2~~ 907.3.4.2 and ~~907.3.2.3~~ 907.3.4.3.

~~907.3.2.2~~ **907.3.4.2 Interconnection.** Where more than one smoke alarm is required to be installed within an individual dwelling unit or sleeping unit in Group R-1, R-2, R-3 or R-4, ~~or within an individual sleeping unit in Group R-1,~~ the smoke alarms shall be interconnected in such a manner that the activation of one alarm will activate all of the alarms in the individual unit. The alarm shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed.

**Exceptions:**

1. Interconnection is not required in buildings that are not undergoing alterations, repairs or construction of any kind.
2. Smoke alarms in existing areas are not required to be interconnected where alterations or repairs do not result in the removal of interior wall or ceiling finishes exposing the structure, unless there is an attic, crawl space or basement available which could provide access for interconnection without the removal of interior finishes.

~~907.3.2.3~~ **907.3.4.3 Power source.** In Group R occupancies, single-station smoke alarms shall receive their primary power from the building wiring provided that such wiring is served from a commercial source and shall be equipped with a battery backup. Smoke alarms with integral strobes that are not equipped with battery back-up shall be connected to an emergency electrical system. Smoke alarms shall emit a signal when the batteries are low. Wiring shall be permanent and without a disconnecting switch other than as required for overcurrent protection.

**Exception:** Smoke alarms are permitted to be solely battery operated: in existing buildings where no construction is taking place; in buildings that are not served from a commercial power source; and in existing areas of buildings undergoing alterations or repairs that do not result in the removal of interior walls or ceiling finishes exposing the structure, unless there is an attic, crawl space or basement available which could provide access for building wiring without the removal of interior finishes.

~~**907.4 Manual fire alarm boxes.**~~ (Relocated to Section 907.5.2)
~~**907.4.1 Location.**~~ (Relocated to Section 907.5.2.1)
~~**907.4.2 Height.**~~ (Relocated to Section 907.5.2.2)
~~**907.4.3 Color.**~~ (Relocated to Section 907.5.2.3)
~~**907.4.4 Signs.**~~ (Relocated to Section 907.5.2.4)
~~**907.4.5 Protective covers.**~~ (Relocated to Section 907.5.2.5)
~~**907.5 Power supply.**~~ (Relocated to Section 907.7.2)
~~**907.6 Wiring.**~~ (Relocated to Section 907.7.1)
~~**907.7 Activation.**~~ (Relocated to Section 907.6)
~~**907.8 Presignal system.**~~ (Relocated to Section 907.6.1)
~~**907.9 Zones.**~~ (Relocated to Section 907.7.3)
~~**907.9.1 Zoning indicator panel.**~~ (Relocated to Section 907.7.3.1)
~~**907.9.2 High-rise buildings.**~~ (Relocated to Section 907.7.3.2)
~~**907.10 Alarm notification appliances.**~~ (Relocated to Section 907.6.2)
~~**907.10.1 Visible alarms.**~~ (Relocated to Section 907.6.2.3)
~~**907.10.1.1 Public and common areas.**~~ (Relocated to Section 907.6.2.3.1)
~~**907.10.1.2 Employee work areas.**~~ (Relocated to Section 907.6.2.3.2)
~~**907.10.1.3 Groups I-1 and R-1.**~~ (Relocated to Section 907.6.2.3.3)
~~**Table 907.10.1.3 Visible and Audible Alarms**~~ (Relocated to Table 907.6.2.3.3)
~~**907.10.1.4 Group R-2.**~~ (Relocated to Section 907.6.2.3.4)
~~**907.10.2 Audible alarms.**~~ (Relocated to Section 907.6.2.1)

~~907.11~~ **907.4 Fire safety functions.** Automatic fire detectors utilized for the purpose of performing fire safety functions shall be connected to the building's fire alarm control ~~panel~~ unit where a fire alarm system is ~~required by Section 907.2~~ provided. Detectors shall, upon actuation, perform the intended function and activate the alarm notification appliances or activate a visible and audible supervisory signal at a constantly attended location. In buildings not ~~required to be~~ equipped with a fire alarm system, the automatic fire detector shall be powered by normal electrical service and, upon actuation, perform the intended function. The detectors shall be located in accordance with NFPA 72.

~~907.12~~ **907.4.1 Duct smoke detectors.** Duct smoke detectors shall be connected to the building's fire alarm control ~~panel~~ unit when a fire alarm system is provided. Activation of a duct smoke detector shall initiate a visible and audible supervisory signal at a constantly attended location. Duct smoke detectors shall not be used as a substitute for required open area detection.

**Exceptions:**

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

~~**907.13 Access.**~~ (Relocated to Section 907.7.4)
~~**907.14 Fire extinguishing systems.**~~ (Relocated to Section 907.6(4)
~~**907.15 Monitoring.**~~ (Relocated to Section 907.7.5)
~~**907.16 Automatic telephone dialing devices.**~~ (Relocated to Section 907.7.5.1)
~~**907.17 Acceptance tests.**~~ (Relocated to Section 907.8)
~~**907.18 Record of completion.**~~ (Relocated to Section 907.8.2)
~~**907.19 Instructions.**~~ (Relocated to Section 907.8.3)
~~**907.20 Inspection, testing and maintenance.**~~ (Relocated to Section 907.9)
~~**907.20.1 Maintenance required.**~~ (Relocated to Section 907.9.1)
~~**907.20.2 Testing.**~~ (Relocated to Section 907.9.2)
~~**907.20.3 Detection sensitivity.**~~ (Relocated to Section 907.9.3)
~~**907.20.4 Method.**~~ (Relocated to Section 907.9.4)
~~**907.20.4.1 Testing device.**~~ (Relocated to Section 907.9.4.1)
~~**907.20.5 Maintenance, inspection and testing.**~~ (Relocated to Section 907.9.5)

~~**907.2.15**~~ **907.4.2 Delayed egress locks.** Where delayed egress locks are installed on means of egress doors in accordance with Section 1008.1.8.6, an automatic smoke or heat detection system shall be installed as required by that section.

**907.4.3 Elevator emergency operation.** Automatic fire detectors installed for elevator emergency operation shall be installed in accordance with the provisions of ASME A17.1 and NFPA 72.

**907.4.4 Wiring.** The wiring to the auxiliary devices and equipment used to accomplish the above fire safety functions shall be monitored for integrity in accordance with NFPA 72.

**907.5 Initiating devices.** Where manual or automatic alarm initiation is required as part of a fire alarm system, the initiating devices shall installed in accordance with Sections 907.5.1 through 907.5.4.

**907.5.1 Protection of fire alarm control unit.** In areas that are not continuously occupied, a single smoke detector shall be provided at the location of each fire alarm control unit.

**Exception**: Where ambient conditions prohibit installation of smoke detector, a heat detector shall be permitted.

~~**907.4**~~ **907.5.2 Manual fire alarm boxes.** Where a manual fire alarm system is required by another section of this code, it shall be activated by fire alarm boxes ~~shall be~~ installed in accordance with Sections ~~907.4.1~~ 907.5.2.1 through ~~907.4.5~~ 907.5.2.5.

~~**907.4.1**~~ **907.5.2.1 Location.** Manual fire alarm boxes shall be located not more than 5 feet (1524 mm) from the entrance to each exit. Additional manual fire alarm boxes shall be located so that travel distance to the nearest box does not exceed 200 feet (60 960 mm).

~~**907.4.2**~~ **907.5.2.2 Height.** The height of the manual fire alarm boxes shall be a minimum of 42 inches (1067 mm) and a maximum of 48 inches (1372 mm) measured vertically, from the floor level to the activating handle or lever of the box.

~~**907.4.3**~~ **907.5.2.3 Color.** Manual fire alarm boxes shall be red in color.

~~**907.4.4**~~ **907.5.2.4 Signs.** Where fire alarm systems are not monitored by a supervising station, an approved permanent sign shall be installed adjacent to each manual fire alarm box that reads: WHEN ALARM SOUNDS—CALL FIRE DEPARTMENT.

**Exception:** Where the manufacturer has permanently provided this information on the manual fire alarm box.

~~907.4.5~~ **907.5.2.5 Protective covers.** The fire code official is authorized to require the installation of listed manual fire alarm box protective covers to prevent malicious false alarms or to provide the manual fire alarm box with protection from physical damage. The protective cover shall be transparent or red in color with a transparent face to permit visibility of the manual fire alarm box. Each cover shall include proper operating instructions. A protective cover that emits a local alarm signal shall not be installed unless approved. Protective covers shall not project more than that permitted by Section 1003.3.3 of the *International Building Code*.

**907.5.3 Automatic detection.** The automatic fire detectors shall be smoke detectors. Where ambient conditions prohibit installation of smoke detectors, other approved automatic fire detection shall be permitted. Where automatic sprinkler protection installed in accordance with Section 903.3.1.1 or 903.3.1.2 is provided and connected to the building fire alarm system, automatic heat detection required by this section shall not be required.

~~907.7 Activation~~ **907.6 Alarm notification systems.** A fire alarm system shall annunciate at the panel and shall initiate occupant notification upon activation, in accordance with this section. Where ~~an~~ a fire alarm ~~notification~~ system is ~~required by another section of this code~~ provided, it shall be activated by:

1. ~~Required~~ Automatic fire ~~alarm system~~ detectors.
2. Sprinkler water-flow devices.
3. ~~Required~~ Manual fire alarm boxes.
4. Automatic fire-extinguishing systems.

**Exceptions:**

1. Occupant notification is not required for fire detectors used to control fire safety functions in accordance with Section 907.4.
2. Where notification systems are permitted elsewhere in this section to annunciate at a constantly attended location.
3. Where a dedicated function fire alarm system is installed exclusively to transmit waterflow signals to a remote monitoring location, a single audible alarm notification device, in accordance with Section 903.4.2, shall be installed in the vicinity of the manual fire alarm box to activate upon detection of waterflow or upon activation of the manual fire alarm box.

~~907.8~~ **907.6.1 Presignal ~~system~~ feature.** Presignal ~~systems~~ feature shall not be installed unless approved by the fire code official and the fire department. Where a presignal ~~system~~ feature is ~~installed~~ provided, ~~24-hour personnel supervision shall be provided at~~ a signal shall be annunciated at a constantly attended location approved by the fire department, in order that ~~the alarm signal~~ occupant notification can be ~~actuated~~ activated in the event of fire or other emergency.

~~907.10~~ **907.6.2 Alarm notification appliances.** Alarm notification appliances shall be provided and shall be listed for their purpose.

~~907.10.2~~ **907.6.2.1 Audible alarms.** Audible alarm notification appliances shall be provided and sound a distinctive sound that is not to be used for any purpose other than that of a fire alarm.

**Exception:** Visible alarm notification appliances shall be allowed in lieu of audible alarm notification appliances in critical care areas of Group I-2 occupancies.

~~907.10.2~~ **907.6.2.1.1 Average sound pressure.** The audible alarm notification appliances shall provide a sound pressure level of 15 decibels (dBA) above the average ambient sound level or 5 dBA above the maximum sound level having a duration of at least 60 seconds, whichever is greater, in every occupied space within the building. The minimum sound pressure levels shall be: ~~70~~ 75 dBA in occupancies in Groups R and I-1; 90 dBA in mechanical equipment rooms; and 60 dBA in other occupancies.

~~907.10.2~~ **907.6.2.1.2 Maximum soundpressure.** The maximum sound pressure level for audible alarm notification appliances shall be ~~120~~ 110 dBA at the minimum hearing distance from the audible appliance. Where the average ambient noise is greater than 105 dBA, visible alarm notification appliances shall be provided in accordance with NFPA 72 and audible alarm notification appliances shall not be required.

~~907.2.12.2.3 Standard.~~ **907.6.2.2 Emergency voice/alarm communication system.** The emergency voice/alarm communication system shall be designed and installed in accordance with NFPA 72. ~~**907.2.12.2 Emergency voice/alarm communication system.** The operation of any automatic fire detector, sprinkler water-flow device or manual fire alarm box shall automatically sound an alert tone followed by voice instructions giving approved information and directions for a general or staged evacuation on a minimum of the alarming floor, the floor above and the floor below in accordance with the building's fire safety and evacuation plans required by Section 404. Speakers shall be provided throughout the building by paging zones. As a minimum, paging zones shall be provided as follows:

1. Elevator groups.
2. Exit stairways.
3. Each floor.
4. Areas of refuge as defined in Section 1002.1.

~~907.2.12.2.1~~ **907.6.2.2.1 Manual override.** A manual override for emergency voice communication shall be provided on a selective and all-call basis for all paging zones.

~~907.2.12.2.2~~ **907.6.2.2.2 Live voice messages.** The emergency voice/alarm communication system shall also have the capability to broadcast live voice messages ~~through~~ by paging zones on a selective and all-call basis.

~~907.2.1.2~~ **907.6.2.2.3 Emergency power.** Emergency voice/alarm communications systems shall be provided with an approved emergency power source.

~~907.10.1~~ **907.6.2.3 Visible alarms.** Visible alarm notification appliances shall be provided in accordance with Sections ~~907.10.1.1~~ 907.6.2.3.1 through ~~907.10.1.4~~ 907.6.2.3.4.

**Exceptions:**

1. Visible alarm notification appliances are not required in alterations, except where an existing fire alarm system is upgraded or replaced, or a new fire alarm system is installed.
2. Visible alarm notification appliances shall not be required in exits as defined in Section 1002.1.

~~907.10.1.1~~ **907.6.2.3.1 Public and common areas.** Visible alarm notification appliances shall be provided in public areas and common areas.

~~907.10.1.2~~ **907.6.2.3.2 Employee work areas.** Where employee work areas have audible alarm coverage, the notification appliance circuits serving the employee work areas shall be initially designed with a minimum of 20 percent spare capacity to account for the potential of adding visible notification appliances in the future to accommodate hearing impaired employee(s).

~~907.10.1.3~~ **907.6.2.3.3 Groups I-1 and R-1.** Group I-1 and R-1 dwelling units or sleeping units in accordance with Table ~~907.10.1.3~~ 907.6.2.3.3 shall be provided with a visible alarm notification appliance, activated by both the in-room smoke alarm and the building fire alarm system.

**TABLE ~~907.10.1.3~~ 907.6.2.3.3**
**VISIBLE ~~AND AUDIBLE~~ ALARMS**

| NUMBER OF SLEEPING UNITS | SLEEPING ACCOMMODATIONS WITH VISIBLE ~~AND AUDIBLE~~ ALARMS |
|---|---|
| 6 to 25 | 2 |
| 26 to 50 | 4 |
| 51 to 75 | 7 |
| 76 to 100 | 9 |
| 101 to 150 | 12 |
| 151 to 200 | 14 |
| 201 to 300 | 17 |
| 301 to 400 | 20 |
| 401 to 500 | 22 |
| 501 to 1,000 | 5% of total |
| 1,001 and over | 50 plus 3 for each 100 over 1,000 |

~~907.10.1.4~~ **907.6.2.3.4 Group R-2.** In Group R-2 occupancies required by Section 907 to have a fire alarm system, the notification appliance circuits serving all dwelling units and sleeping units shall be initially designed with a minimum of 20% spare ~~provided with the~~ capability to support visible alarm notification appliances in accordance with ICC A117.1.

**907.7 Installation.** A fire alarm system shall be installed in accordance with this section and NFPA 72.

~~907.6~~ **907.7.1 Wiring.** Wiring shall comply with the requirements of the ICC *Electrical Code* and NFPA 72. Wireless protection systems utilizing radio-frequency transmitting devices shall comply with the special requirements for supervision of low-power wireless systems in NFPA 72.

~~907.5~~ **907.7.2 Power supply.** The primary and secondary power supply for the fire alarm system shall be provided in accordance with NFPA 72.

**Exception:** Back-up power for single-station and multiple-station smoke alarms as required in Sections 907.2.10.4 and 907.3.4.3.

~~**907.9**~~ **907.7.3 Zones.** Each floor shall be zoned separately and a zone shall not exceed 22,500 square feet (2090 $m^2$). The length of any zone shall not exceed 300 feet (91 440 mm) in any direction.

**Exception:** Automatic sprinkler system zones shall not exceed the area permitted by NFPA 13.

~~**907.9.1**~~ **907.7.3.1 Zoning indicator panel.** A zoning indicator panel and the associated controls shall be provided in an approved location. The visual zone indication shall lock in until the system is reset and shall not be canceled by the operation of an audible-alarm silencing switch.

~~**907.9.2**~~ **907.7.3.2 High-rise buildings.** In buildings with a floor used for human occupancy that is located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access, a separate zone by floor shall be provided for all of the following types of alarm-initiating devices where provided:

1. Smoke detectors.
2. Sprinkler water-flow devices.
3. Manual fire alarm boxes.
4. Other approved types of automatic fire detection devices or suppression systems.

~~**907.13**~~ **907.7.4 Access.** Access shall be provided to each detector for periodic inspection, maintenance and testing.

~~**907.15**~~ **907.7.5 Monitoring.** Fire alarm systems required by this chapter or by the *International Building Code* shall be monitored by an approved supervising station in accordance withNFPA72.

**Exception:** ~~Supervisory service~~ Monitoring by a supervising station is not required for:

1. Single- and multiple-station smoke alarms required by Section 907.2.10.
2. Smoke detectors in Group I-3 occupancies.
3. Automatic sprinkler systems in one- and two-family dwellings.

~~**907.16**~~ **907.7.5.1 Automatic telephone-dialing devices.** Automatic telephone-dialing devices used to transmit an emergency alarm shall not be connected to any fire department telephone number unless approved by the fire chief.

~~**907.17**~~ **907.8 Acceptance tests and completion.** Upon completion of the installation, ~~of~~ the fire alarm system~~, alarm notification appliances and circuits, alarm initiating devices and circuits, supervisory signal initiating devices and circuits, signaling line circuits, and primary and secondary power supplies~~ and all fire alarm components shall be tested in accordance with NFPA 72.

~~**907.2.10.4 Acceptance testing**~~ **907.8.1 Single- and multiple-station alarm devices.** When the installation of the alarm devices is complete, each ~~detector~~ device and interconnecting wiring for multiple-station alarm devices shall be tested in accordance with the ~~household fire warning equipment~~ smoke alarm provisions of NFPA 72.

~~**907.18**~~ **907.8.2 Record of completion.** A record of completion in accordance with NFPA 72 verifying that the system has been installed and tested in accordance with the approved plans and specifications shall be provided.

~~**907.19**~~ **907.8.3 Instructions.** Operating, testing and maintenance instructions and record drawings ("as builts") and equipment specifications shall be provided at an approved location.

~~**907.20**~~ **907.9 Inspection, testing and maintenance.** The maintenance and testing schedules and procedures for fire alarm and fire detection systems shall be in accordance with this section and ~~Chapter 10 of~~ NFPA 72.

~~**907.20.1**~~ **907.9.1 Maintenance required.** Whenever ~~or wherever any device, equipment, system, condition, arrangement, level of protection or any other feature is~~ required for compliance with the provisions of this code, ~~such~~ devices, equipment, systems, conditions, arrangements, levels of protection or other feature shall thereafter be continuously maintained in accordance with applicable NFPA requirements or as directed by the fire code official.

~~**907.20.2**~~ **907.9.2 Testing.** Testing shall be performed in accordance with the schedules in ~~Chapter 10 of~~ NFPA 72 or more frequently where required by the fire code official. ~~Where automatic testing is performed at least weekly by a remotely monitored fire alarm control unit specifically listed for the application, the manual testing frequency shall be permitted to be extended to annual.~~

**Exception: D**evices or equipment that are inaccessible for safety considerations shall be tested during scheduled shutdowns where approved by the fire code official, but not less than every 18 months.

~~907.20.3~~ **907.9.3 Smoke detector sensitivity.** Smoke detector sensitivity shall be checked within one year after installation and every alternate year thereafter. After the second calibration test, where sensitivity tests indicate that the detector has remained within its listed and marked sensitivity range (or 4-percent obscuration light grey smoke, if not marked), the length of time between calibration tests shall be permitted to be extended to a maximum of five years. Where the frequency is extended, records of detector-caused nuisance alarms and subsequent trends of these alarms shall be maintained. In zones or areas where nuisance alarms show any increase over the previous year, calibration tests shall be performed.

~~907.20.4~~ **907.9.4 Method.** To ensure that each smoke detector is within its listed and marked sensitivity range, it shall be tested using either a calibrated test method, the manufacturer's calibrated sensitivity test instrument, listed control equipment arranged for the purpose, a smoke detector/control unit arrangement whereby the detector causes a signal at the control unit where its sensitivity is outside its acceptable sensitivity range or other calibrated sensitivity test method acceptable to the fire code official. Detectors found to have a sensitivity outside the listed and marked sensitivity range shall be cleaned and recalibrated or replaced.

**Exceptions:**

1. Detectors listed as field adjustable shall be permitted to be either adjusted within the listed and marked sensitivity range and cleaned and recalibrated or they shall be replaced.
2. This requirement shall not apply to single-station and multiple-station smoke alarms.

~~907.20.4.1~~ **907.9.4.1 Testing device.** Smoke detector sensitivity shall not be tested or measured using a device that administers an unmeasured concentration of smoke or other aerosol into the detector.

~~907.20.5~~ **907.9.5 Maintenance, inspection and testing.** The building owner shall be responsible ~~for ensuring that the fire and life safety systems are maintained~~ to maintain the fire and life safety systems in an operable condition at all times. Service personnel shall meet the qualification requirements of NFPA 72 for maintaining, inspecting and testing such systems. A written record shall be maintained and shall be made available to the fire code official.

**PART II – IBC**

**Add new text as follows:**

**(IBC) 907.3 Existing buildings.** Fire alarm systems to be installed in existing buildings shall be in accordance with this code and the *International Existing Building Code* and the *International Fire Code*.

(No other subsections are intended to be added under 907.3 in the IBC)

**Reason:** To clarify the fire alarm provisions and add limited technical revisions that will aid in providing clarity to the code. The general organization of the reformatted 907 section is as follows:

907.1 General
907.2 Requirements for new buildings
907.3 Requirements for existing buildings
907.4 Requirements for special functions
907.5 Initiating devices
907.6 Notification Devices
907.7 Installation requirements
907.8 Acceptance testing
907.9 Inspection, testing and maintenance

Section 907 evolved as an amalgamation of the three legacy codes. In the process, it absorbed formatting issues from each in a different manner. The charging statement for each Occupancy Group is inconsistent. The text that indicates what is required is inconsistent. And, the general arrangement of text, although in a logical format, is not consistent with the way many people approach the code. It is certainly not consistent with the way that Section 903 is organized. The proposal is an effort made by a group of people from various segments of the industry and code application to correlate, reformat and generally improve usability of the code. Before addressing the technical and formatting changes involved in the proposal, it is worth noting appreciation to the people who helped work on this effort. In alphabetical order:

Bill Aaron (Code Consultants, Inc.),
Diane Arend (Office of the State Fire Marshal; California),
Gene Boecker (Code Consultants, Inc),
Shane Clary (Bay Alarm)
John Guhl (Office of the State Fire Marshal; California),
Tom Hammerberg (Automatic Fire Alarm Association, Inc),
Bill Hopple (SimplexGrinnel),
Dave Lowrey (Fire Rescue; City of Boulder),
Dan Nichols (Building Codes Division; State of New York),
Jon Nisja (State Fire Marshal Division; Minnesota),
Brit Rockafellow (Building Project Review, San Diego),
Jimbo Schiffiliti (Fire Safety Consultants, Inc),
Dave Stringfield (University of Minnesota)

This is one in a series of code changes. This one incorporates all the formatting changes and all the technical changes. It is hoped that this would be heard first; and, if acceptable recommended for approval by the committee. Otherwise, there are alternative code change proposals being submitted that divide the overall proposal into reformatting and various technical proposals.

**PART I – IFC**

The following is a section by section description of what was changed in each, followed by a comparison matrix indicating what the old section numbers are and what the new, proposed sections numbers would be. Due to the reformatting, reference is made to the proposed, new section number. Because the text is mostly the same in both the IBC and the IFC, only a single statement is offered and the differences identified as necessary.

907.1 – The paragraph was divided and itemized for quicker visual reference to requirements for new and existing buildings.

907.1.1 The term "construction drawings" is too generic. The type of information noted in the list is what is submitted with "shop drawings." Whether the jurisdiction requires shop drawings to be submitted at the time of permit application is irrelevant. There is confusion over whether or not the information is required on the contract documents prepared by the architects and engineers or whether it is prepared by the designer of the fire alarm system. The term Shop drawing is the proper term. #3 The terminology was changed to be more consistent with that used in NFPA 72. #4 Annunciation is the action that occurs and is simply called "occupant notification." The intent is to identify where the Annunciator panels may be located so that coordination with the fire service needs can occur. #9 The name of the manufacturer is what the code literally requires as written. What is actually requested and provided are data sheets from the manufacturers about their products. The data sheets contain the manufacturer's information as well as detailed descriptions of the products. #12 This is a new item to the list. One question that seems to be asked regularly but is not previously identified as being required is the supervising station information. Now it will be required to submit what firm will be performing the supervising and what type of supervision will be done.

907.1.2 It is possible to have fire alarm equipment that is not part of a "system" as defined by the code. Therefore the word "their" can be deleted.

907.2 Section renumbering is intended to relate to what is done elsewhere in this proposal. The first sentence is deleted because there is no place in 907 that requires heat detection. Therefore the sentence is extraneous. The second deleted sentence is moved to the new section 907.5.3 because it has more to do with the initiating devices than to "new construction."

This manual fire alarm box is needed to provide a means of manually activating a fire alarm system that only contains automatic devices like waterflow switches or smoke detectors. It serves two purposes. One is for the sprinkler technician to be able to manually activate the fire alarm system in the event of a fire during the time the sprinkler system is down for maintenance. The second purpose is to allow building occupants a means to manually active the fire alarm system prior to sprinkler water discharge in the event a fire is discovered. The NFPA 72 Protected Premises Technical Committee feels this requirement belongs in building and fire codes rather than in NFPA 72. NFPA 72 provides the "how to" for fire alarm devices required by building and fire codes. Building and fire codes provide the "when required". This requirement will be removed from NFPA 72 once it is in the building and fire codes.

907.2.1 The code now clearly indicates that occupant notification is required. It had been assumed and is noted in the commentaries as being the understood response but it never clearly stated that in the code. It is also intimated in the definition but is not clear since there are systems in the code that do not require full occupant notification. The added text removes the ambiguity. This additional text is added in several locations throughout the code

In the exception, the term "alarm notification" technically only indicates that the alarm condition is recognized at the panel. It does not mean that horns and strobes will be activated. "Occupant notification" is the term used to describe that function. The added words "within the notification zones" are provided so that it is clear to what extent the notification should occur. While there is a general understanding about what devices should activate, the revised language clarifies the intent.

907.2.1.1 The reference to NFPA is removed from this section. It is included in the new Section 907.6.2.2. The existing section 907.2.1.2 is deleted because the requirement is included in the new Section 907.6.2.2.3. Because the voice alarm system is part of the fire alarm system, it is subject to 907.2 which requires emergency and standby power to be in accordance with NFPA 72.

907.2.2 The paragraph is divided into various conditions. This is similar to the manner in which Section 903 is organized and makes for easier identification of the various conditions; both in reading and citation. This approach is used throughout the reorganization as a general reformatting concept for clarity. In so doing, the language in item one needed to be changed to make sense and additional language in item two added for clarity

The text change in the exception is the same as that noted for Section 907.2.1. The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1.

907.2.3, Exception #1 To clarify a potential misunderstanding, the wording is added so that it is clear that the exception applies to the manual fire alarm system and not the connection referred to in the charging sentence. Exception #2.1 Alarm Verification is a term that is no longer used. Exception #2.2 The wording "the like" is vague. While "similar areas" does not give specific information, it is consistent with code language and better than the alternative – keeping "the like." Exception #2.4 The phrase "off-premises" is not consistent with NFPA 72 terminology. The code requires that all fire alarm systems must be supervised. Therefore, the intent is provided without any need for this requirement. The text is consequently extraneous and can be deleted.

907.2.4 The section is divided and language changed for clarity. See rationale statement for Section 907.2.2. The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1.

907.2.5 (No change)

907.2.6 There is no reason for the wording "electrically supervised" since all smoke detection systems must be supervised by a method using electricity.

907.2.6.1 The charging statement is reworded to be in the positive and ordered in a similar manner to the other sections in 907.2. The reorganization also eliminates a confusion over whether or not the term "habitable" was intended to be applied to the other spaces in the list.

907.2.6.1.1 A new section is added as a pointer to the smoke alarm requirement for Group I-1 occupancies. As it is currently written, the reader does not find out about smoke alarms for I occupancies until reading the section for residential occupancies. This will point out the requirement.

907.2.6.2 – Similar to Section 907.6.1, the text is reworded to be in the positive and consistent with language used elsewhere in Section 907.2.

907.2.6.3 (No change)

907.2.6.3.1 The sentence regarding presignal systems is removed because the sentence preceding it is describing a presignal feature. The existing second sentence contradicts the first sentence. Because the staff notification feature is both desirable and consistent with the Life Safety Code, the second sentence is not necessary.

907.2.6.3.2 The only change is intended to revise the section number reference to be the proper one since the latter section numbers are revised.

907.2.6.3.3 The word "approved" is extraneous in this sense because al fire alarm systems require an approval through the permit process. The word adds nothing of value to the code in this use. This deletion occurs twice – once in the charging paragraph and once again in exception #3.

907.2.7 –The charging paragraph is divided in similar fashion to that noted above (see 907.2.2). The phrase stating what the manual system should activate is relocated to be still in the charging portion of the text. Language changes in the exceptions are the same as those in Section 907.2.2 and for the same reasons. The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1.

907.2.7.1 The referenced section is changed because the voice alarm section is proposed to be relocated. Otherwise, there is no change.

907.2.8 Smoke alarms are added to the charging language. While the requirement for smoke alarms is found in the following sections there is currently nothing in the charging text acknowledging it.

907.2.8.1 The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1. Two changes are proposed to exception one – both for clarity. The phrase “to those units” is proposed so that it is clear that the crawl spaces of interest are those associated with the units where the exception would be applied and not elsewhere in the building. The second change is to include dwelling units in the description for R-1 occupancies. While the typical assumption for an R-1 occupancy is the hotel room, many transient housing units now include cooking facilities and would therefore be called dwelling units. These types of units include extended stay units and weekly time-share rental properties. Hence, it is necessary to include the term dwelling unit and apply it as necessary for R-1 units as well as R-2 units.

907.2.8.2 The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1. There are also two changes to this section. Similar to 907.2.8.1, wording is added for dwelling units. Additionally, it is necessary to indicate that the egress door could lead directly into an exit as well as to an exterior exit access. In compressed site designs, it is not uncommon for the alternative route to be an exit enclosure rather than an exterior balcony. And, if the path leads directly into an exit, that should be counted as at least equal to an exterior balcony.

907.2.8.3 In the first sentence “single- and multiple-station” is added in association with smoke alarms so that it is clear that the requirements in 907.2.10 apply to both conditions. The other change to this sentence is to make it read consistent with other sections of the code. The second sentence is no longer necessary since all new construction for residential occupancies is required to be sprinklered.

907.2.9 In order that the requirements the manual fire alarm system and for smoke alarms can be divided, a new charging sentence is proposed. This is consistent with the format for Section 903 and helps the reader distinguish between code provisions.

907.2.9.1 A new title is added for the split off section. The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1.

Existing Exception #1 The essence of this exception has to do with buildings that do not have interior corridors. The criterion for 1-hour separation is a requirement regardless, so it can be deleted. What is left is the limitation that the exception applies to buildings not more than two-stories in height. That criterion is inserted in to exception #3. When the old exception #1 is deleted, the old exception #2 becomes the new exception #1.

New Exception #1 Since the building must be sprinklered reference to sprinklers can be deleted as extraneous. The word “water” is added so that the phrase “water flow” is consistent with that used elsewhere in the code.

New Exception #2 because sprinklers are required in all residential occupancies, the reference to sprinklers can be deleted. The rest of the exception is so similar to the old exception #1 that the two-story limitation was relocated to this exception. The two-story provision with an exterior exit access is the only thing that makes this exception different from the new Exception #1. For practical purposes it could also be deleted since the sprinkler exception in #1 covers the issue completely. The exception was retained in case there was a situation where sprinkler protection may be waived.

907.2.9.2 A new pointer section is added that directs the reader to the requirement for smoke alarms in Group R-2 occupancies.

907.2.10 Charging language from the old 907.10.1 was relocated into this section to make it the charging section. The reference to household fire warning devices is deleted since the term used in NFPA is “smoke alarm.” If the same term is used, it is already clear what the intent is when applying NFPA 72.

907.2.10.1 The old 907.10.1.1 is now the first section relating to smoke alarms. The addition of the terms dwelling units is explained in the substantiation for Section 907.2.8.1 above.

907.2.10.2 The exception added to item #2 is taken from the existing 907.2.10.1.3. The existing 907.2.10.1.3 relates to only item #2 in this list. This way all the provisions are located in the same place instead of two sections. Therefore, the existing 907.2.10.1.3 can be deleted.

907.2.10.3 Consistent with the application in 907.2.8.1 and elsewhere, if dwelling units can also apply to Group R-1 occupancies then there is no reason to segregate the occupancy in the text.

907.2.10.4 The section is renumbered due to the change in the charging section. A sentence is added in recognition of a concern raised by NFPA 72. Reference to Group R-1 is proposed to be deleted since the concept is applicable to all cases where a smoke alarm is required.

At the present time, there are on the market smoke alarms that have an integral strobe that do not have a built in battery for the strobe. Thus, if the power for the building goes down, while the smoke detection and horn of the device may still operate, the strobe will not. It is critical for rooms that are equipment with these smoke alarms that may house the hearing impaired that depend on the strobe to alert them to the alarm. The proposed change to 907.2.10.4 would require that a smoke alarm with an integral strobe that does not have a battery backup would be required to be connected to an emergency electrical system for the required backup power. The section has been changed to 907.2.10.4 to be in alignment with the proposed changes to Section 907 that are part of this submittal.

907.2.11 The word “approved” can be deleted since all alarm systems must be reviewed and approved. In the exception the word “fire” is added to differentiate between what type of alternate detector is allowed should smoke detectors not be appropriate for the ambient conditions. It is not clear in the present text whether or not a pressure sensitive detonation detector could be used as an alternative. The intent is that a fire detector be used.

907.2.11.1 (No change)

907.2.11.2 The paragraph after the list is also a part of the required functions. It is proposed to insert the text as a fourth function in the list and rephrase the text to be consistent with the way that the list is worded. The sentence relative to wiring is generic to all types of fire alarm systems. It is not necessary to repeat it here. The same provision is already located in NFPA 72.

907.2.11.3 The reference to NFPA 72 is deleted since it is more appropriate to refer to the code sections that specifically address the system function. NFPA 72 gives information as to how the voice alarm system should be installed but leaves options since it is primarily and installation document. Without the reference to 907.6.2.2 it is unclear what functions should be provided for a voice alarm in a special amusement building.

907.2.12 –The referenced section is changed from 907.2.12.2 to 907.6.2.2 because the provisions are moved to that new location. This is discussed further in Section 907.6.2.2. Exception #6 is moved from Section 907.2.12.2. It was unclear in its current location whether the exception applies to the last item in the list of to the entire section. This clarifies the issue. Additionally, providing the exception in this section means that the question of voice alarm for high-rise I-1 and I-2 occupancies can be settled before the need to read through the voice alarm requirement sections. The exception should be associated with the charging section.

907.2.12.1 The word “listed can be deleted since it is already a requirement by definition that smoke detectors must be listed.

907.2.12.2 The existing 907.2.12.2 (and subordinate) sections are proposed to be relocated to a new 907.6.2.2 section with subordinate sections. See Section 906.2.2 for additional rationale. Therefore, the existing 907.2.12.3 becomes the proposed 907.2.12.2 – without any changes.

907.2.12.3 The section is renumbered.

907.2.13 The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1. Code section references are changed due to the relocation of text. It is the intent that the references point to the same text as in the existing code arrangement.

907.2.14 – (No change)

907.2.15 The delayed egress lock section relates to a specific safety function and is proposed to be located in a place with similar requirements. Therefore the existing 907.2.16 becomes the new 907.2.15.

907.2.16 Due to section renumbering, the existing 907.2.17 becomes the new 907.2.16.

907.2.17 –With section renumbering, existing 907.2.18 becomes proposed 907.2.17. The nomenclature is changed from smoke “exhaust” to smoke “control” to be consistent with Section 909 and language used elsewhere in the code. The section becomes the changing section for all underground buildings. (See 907.2.17.3)

907.2.17.1 Other than the section renumbering, nothing is changed.

907.2.17.2 The wording is changed to read smoke “control” system rather than smoke “exhaust” system to be consistent with terminology in Section 909.

907.2.17.3 The existing 907.2.19 addresses requirements for an underground building. The only difference between it and that in the previous section is the depth below grade. Therefore, this section is made to be a subsection of the one addressing underground buildings. The reference section change is due to the relocation of the voice alarm provision.

907.2.17.3.1 No change other than section renumbering.

907.2.18 The section is renumbered due to relocation of requirements and the reference for voice alarms also changes because that provision is relocated.

907.2.19 – The word “listed” is deleted because all smoke detectors and smoke alarms must be listed (see also proposed section 907.2.10). The wording “single-station” is added to provide clarity to the term smoke alarm.

907.2.20 The section is renumbered. The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1. A sentence is added to indicate where smoke detection is required. In airport control towers smoke detectors are provided as part of a package of provisions to supplement the lack of egress because only one exit is required. However, without some direction, smoke detectors could be construed to be required in every closet and underfloor space. The basic intent is to provide notification and early warning but with such a small area limited placement is all that is necessary. Therefore, the proposed text would direct the installation to be in those areas where people work; which are also the areas with the greatest potential fuel source for a fire. This application is consistent with what is being done in most parts of the country and with what the original intent was for the smoke detection requirement.

907.2.21 The section is renumbered due to text relocation. The word “approved' is deleted since all fire alarm systems must be approved. The word “having” is changed to “with” to be consistent with language used elsewhere in the code. The provision for activation of an alarm at a constantly attended location is moved forward in the sentence. Generally, the preferred solution is listed first. The constantly attended location is the option typically used because it will let people in the vicinity know immediately that there has been an incident so action can be taken immediately. Most of the facilities with this type of battery storage area also one that have on site fire brigades who can respond faster to the scene that the fire department of the local jurisdiction. The preference and generally accepted method should be listed first in the code.

907.3 – Text is added that discusses occupant notification similar to the charging text for 907.2. Also similar to what is proposed for section 907.2, specific text is relocated or deleted because it is not necessary in a charging section. See also the discussion for Section 907.2.

907.3.1 The existing section is deleted since this information is already included in 907.3. It also makes the format consistent with that of 907.2. The exception to the existing 907.3.1 becomes the exception to 907.3 because it addresses the charging provisions of 907.3. The proposed 907.3.1 has no changes other than the renumbering.

907.3.2 A new scoping statement is added to be similar to that in 907.2.6 for new construction. The same exception for new construction is included in 907.3.2.

907.3.2.1 The existing text states fire alarm system which includes both manual and automatic. The proposed text inserts that language as a starting point from which more descriptive and precise code changes can be proposed in the future. Requirements for an existing Group I-1 occupancy is being reference back to 907.2.6.1 so that the exceptions of that section can also be applied as necessary. Otherwise the requirements for existing building would be more restrictive that those for new construction. The existing exception is retained.

907.3.2.2 The existing text states fire alarm system which includes both manual and automatic. The proposed text inserts that language as a starting point from which more descriptive and precise code changes can be proposed in the future. Requirements for an existing Group I-2 occupancy is being reference back to 907.2.6.2 so that the exceptions of that section can also be applied as necessary. Otherwise the requirements for existing building would be more restrictive that those for new construction.

907.3.2.3 The existing text states fire alarm system which includes both manual and automatic. The proposed text inserts that language as a starting point from which more descriptive and precise code changes can be proposed in the future. Requirements for an existing Group I-3 occupancy is being reference back to 907.2.6.3 so that the exceptions of that section can also be applied as necessary. Otherwise the requirements for existing building would be more restrictive that those for new construction.

907.3.3 A new scoping section is added because there are two sets of requirements for Group R occupancies. This places the section in the same hierarchy as other requirements for existing buildings.

907.3.3.1 The section is renumbered due to relocated text. The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1. The words “manual or automatic” are added because these are both types of fire alarm systems. The change to this framework will allow future revisions to be made to further clarify the intent as necessary. As was done for the provisions for new buildings, the words “dwelling unit” is added because R-1 units can be either sleeping units or dwelling units. (see substantiation for Section 907.2.8.1.)

907.3.3.2 The section is renumbered due to relocated text. The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1. The words “manual or automatic” are added because these are both types of fire alarm systems. The change to this framework will allow future revisions to be made to further clarify the intent as necessary.

907.3.3.3 The section is renumbered due to relocated text. The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1. The words “manual or automatic” are added because these are both types of fire alarm systems. The change to this framework will allow future revisions to be made to further clarify the intent as necessary.

907.3.3.4 The section is renumbered due to relocated text. The code now clearly indicates that occupant notification is required. See rationale statement for Section 907.2.1. The words “manual or automatic” are added because these are both types of fire alarm systems. The change to this framework will allow future revisions to be made to further clarify the intent as necessary.

907.3.4 In addition to the section being renumbered, the references are renumbered so that they point to the same requirements as before. Otherwise, there is no change to this section.

907.3.4.1 The section and referenced sections are renumbered as necessary to point to the same provision. The word “approved” is deleted because all fire alarm systems are required to be approved.

907.3.4.2 Consistent with the application in 907.2.8.1 and elsewhere, if dwelling units can also apply to Group R-1 occupancies then there is no reason to segregate the occupancy in the text.

907.3.4.3 Text is added to address battery back-up as it relates top visual devices, integral to the smoke alarm. See substantiation for 907.2.10.4.

907.4 Formerly Section 907.11. The wording is changed twice to read fire control “unit” rather than panel to be consistent with terminology in NFPA 72. Additionally the wording is proposed to be changed in two places from where “required” to where “provided.” It should not matter whether the fire alarm safety function is required by the code. If it is provided, it should meet certain levels of performance so that it can be expected to function in a manner consistent with its intent. For example, if duct smoke detection is “provided” although the size of the unit is less than what is “required,” it should still perform in a manner expected for that function. Therefore the term used should be provided rather than required.

The following four sections are proposed to be lumped in the same area of Section 907. They all relate to special fire safety functions that are not a part of a general fire alarm system. These include duct detectors, delayed egress locks and elevator recall.

907.4.1 The word “panel” is changed to “unit” to be consistent with the term used in NFA 72.

907.4.2 No change to the section other than the renumbering from 907.2.15 to 907.4.2.

907.4.3 This is a new section written to provide clearer reference to both the Elevator Code and the Fire Alarm Code as the standards for installation. Both of these are standards are currently referenced in the codes so there is no reason to address the question of referenced standards in the substantiation.

907.4.4 The proposed text was a part of the last sentence in current Section 907.2.11.2. However, the intent is applicable to all types of special fire safety functions and should not be limited to only special amusement buildings. If wiring is provided as a part of the installation, it should be monitored for integrity so that it has reasonable reliability.

907.5 This is a new scoping statement. In the current code it is unclear as to whether or not the manual fire alarm requirements are to be applied when a manual fire alarm is required or whether the placement in the code indicates that manual devices are required regardless. This is also part of an attempt to differentiate the code requirements between initiating devices and notification devices.

907.5.1 This is a new section that is added to address the smoke detector that is required in NFPA 72. The NFPA 72 Fundamental Technical Committee feels this requirement is more appropriate in the building and fire codes rather than NFPA 72. NFPA 72 provides the “how to” for fire alarm devices required by building and fire codes. Building and fire codes provide the “when required”. This smoke detector is required to ensure the fire alarm system is capable of performing its function in the event of a fire in the vicinity of the fire alarm control unit. This smoke detector will

activate the fire alarm control and allow it to either notify occupants or transmit a signal to a remote monitoring location before the fire impairs the fire alarm control unit. This requirement will be removed from NFPA 72 once it is in the building and fire codes.

907.5.2 The section is reworded so that it is clear that the intent is to install fire alarm boxes where a manual fire alarm system is required. This clears up the question as to when manual devices are required.

907.5.2.1 Other than the section number, nothing is changed

907.5.2.2 Other than the section number, nothing is changed

907.5.2.3 Other than the section number, nothing is changed

907.5.2.4 Other than the section number, nothing is changed

907.5.2.5 – A reference is added to the allowed projections in the IBC. Without this reference, it would be possible for a review by the fire code official to allow a protective cover that would project in a manner not allowed by the IBC.

907.5.3 The basic language is located currently in Section 907.2. However, it is referring to detection devices and should be located in this part of Section 907. The first sentence is rephrased. Smoke detectors are the limiting installation device. A smoke detection system also includes wiring, power supply, etc. It is not these things but rather the smoke detectors that are of concern. Additionally "shall be permitted" is proper code language – not "shall be allowed." The word "approved" is inserted here because it is appropriate that there be coordination between the code official and the designer in the selection of the device that will substitute for the smoke detector.

907.6 The existing section 907.7 is given a new title to more clearly indicate the function of the activation. The first sentence is added so that it is clear that activation begins by notifying the panel and then notifying the occupants of an alarm condition.

The existing sentence (now the second sentence) has terminology changed to "fire alarm system" which is defined and used elsewhere in the code. The existing term "alarm notification system" is undefined and therefore not well enforceable. It is assumed that the 'alarm notification" was intended to indicate that an alarm condition would be sent to the fire alarm control unit but it is not clear that occupant notification would be included in the assumption. The revised text clarifies the issue.

In three locations "required" is deleted and in one place "provided" inserted. As stated previously, it is assumed that when there is a manual fire alarm box, that it performs the function of every other manual fire alarm box – whether the device is "required" or optionally "provided." If there are special circumstances wherein the anticipated response to a provided system is other than expected by this section, it will be necessary to address that with coordination between the designer and the code official.

The fourth item in the list is a proposal based on moving the provisions in the existing section 907.14 to this location. It is not intended to increase or decrease any provisions of the code – only combine similar requirements into one location for better ease of use.

There are three new exceptions proposed. A few of these are not all "new" insomuch as they are identified rather than simply "understood" to be the case.

Exception #1 According to the general understanding and the concepts addressed in NFPA 72, it is not necessary to initiate occupant notification if the device is to close a damper or affect the function of a door. The reference to Section 907.4 is to the proposed 907.4 dealing with specific fire safety functions.

Exception #2 This exception is a recognition that there are places in the code where one alternative to occupant notification is an alarm notification at a constantly attended location. The exception is intended to clarify the code so that there is no question as to whether this general provision for alarm activation is superseded by the other sections addressing the alarm notification at a constantly attended location. There is no new exception offered here, only recognition of and coordination with those already in the code.

Exception #3 This is a new exception that attempts to address a confusing section in Section 903.4.2. The addition of the one audible alarm notification appliance is intended to provide feedback to the individual operating the manual fire alarm box so they know that something is happening. It is not intended to provide full occupant notification. There are numerous differences in interpretation of what must occur if this manual fire alarm box is actuated. A similar exception has been submitted for Section 903.4.2. Many interpret 903.4.2 to require alarm notification appliances to be installed throughout a facility due to the wording in this section that states "Where a fire alarm system is installed, actuation of the automatic sprinkler system shall actuate the building fire alarm system." NFPA has added a new definition in the 2007 edition to describe this system as a "Dedicated Function Fire Alarm System", with the intent to show that it is not the building fire alarm system, and was only installed to provide monitoring of the required sprinkler system. Since Section 903 does not require occupant notification inside the building, full occupant notification should not be required. Visible alarm notification appliance were intentionally omitted to avoid any conflict with ADAAG requirements.

907.6.1 The ability to "presignal" is a feature of a fire alarm system and not a separate system as described within NFPA 72. Thus the title and language with the section are changed to recognize that fact. And use language common to the industry. The phrase "24-hour personnel supervision" is deleted since that is language that describes a proprietary supervisory service. Instead, the phrase "at a constantly attended location" is used, consistent with its usage in other sections of the code where a presignal feature is allowed. The text noting that occupant notification can be activated in the event of a fire is consistent with description of a presignal feature in NFPA 72.

907.6.2 The text is relocated from 907.10. There are no changes to the text.

907.6.2.1 The requirements of Section 907.10.2 are moved up. There sections address the audible devices. Because the code addresses audible and visual devices in that order, the sections are changed to reflect the order. There are no changes to the first sentence. The remainder of the large existing paragraph is divided for ease of reference and to make it clear what the exception applies to.

907.6.2.1.1 The second sentence in the existing 907.10.2 is given its own title and section. These represent the general sound pressure requirements for audibility. A technical change is made to the minimum sound pressure level for sleeping rooms. Based on the current text in NFPA 72, the pressure level is proposed to be increased from 70 dBA to 75 dBA. Otherwise the sentence is unchanged. The higher level is deemed necessary in order to wake people from a deep sleep.

907.6.2.1.2 The third sentence in the existing paragraph addresses special conditions relative to the maximum recommended sound pressure levels. Also based on recommendations from NFPA 72, the maximum sound pressure level is proposed to be lowed from 120 dBA to 110 dBA. The reduction is based on the fact that 120 dBA is just under the threshold of pain. If a person where close to such a device when it activated the result could be permanent hearing loss. The lower threshold is considered to still be loud enough for people to hear consistent with device spacing requirements in NFPA 72 for such spaces.

907.6.2.2 The voice alarm system is a type of notification device. It is a audible one but one which can produce intelligible words and provide direction to occupants in case of an emergency. Although it is most often associated with high-rise buildings, it is also used in large assembly spaces. Therefore, it is more appropriate that it be located in a part of section 907 that is not specifically associated with one type of building. The existing location is considered "buried" in the text and not easily found. The proposed relocation to a section with other notification devices makes the requirement more user-friendly. It should be located close to the requirements for other devices using sound. There are no proposed changes to the text.

907.6.2.2.1 This is text moved from the subordinate section to 907.2.12. There is no proposed change to the text – only renumbering to be consistent with the relocation of 907.2.12.

907.6.2.2.2 This is text moved from the subordinate section to 907.2.12. There is no proposed change to the text – only renumbering to be consistent with the relocation of 907.2.12.

907.6.2.2.3 In the subsection for large assembly voice alarms, is the requirement for emergency power for the voice alarm system. This is assumed to be true also for high-rise but is noted in the high-rise section of the IBC (403.11.1, item 3). Thus it makes sense that the provision be inserted here so that it is clear that emergency power is required.

907.6.2.3 The provision in Section 907.10.1 are relocated without change to the text or to the exceptions other than to refer to new section numbers, revised as a result of text relocation.

907.6.2.3.1 Text is relocated. There is no change to the text except for renumbering.

907.6.2.3.2 The word "initially" is added to make it clear that the intent is to initially provide for the expansion in circuitry when the system is designed. This is so that at some time in the future additional devices may be added. It is not the intent that the 20% spare capacity be increased each time that the system is modified. The reason for the additional capacity is so that visual devices can be added should hearing disabled employees be hired and renovations be required to add strobes. The 20% spare capacity is intended to be used – not continued at that time.

907.6.2.3.3 The word “dwelling unit” is added. As discussed in prior sections, if there are provisions for cooking in the I-1 or R-1 unit, it then is defined as a dwelling unit. Consequently the term must be added in order to address those conditions. The reference to the table will change as a result of the change in location and renumbering of the base code section. There are no other changes to the code section.

Table 907.6.2.3.3 The table is changed both in the title and in the second column heading. Because the table only deals with visual devices, the reference to audible devices is extraneous. Therefore, it is deleted from the table. Quantities in the table and threshold numbers are unchanged.

907.6.2.3.4 The text is proposed to be modified to be consistent with that in new section 907.3.2.3.2. The existing text only makes reference to spare capacity but does not address what the spare capacity must be. Because the reason for the spare capacity in Group R-2 is the same as that for employee areas, the language was made to be the same.

907.7 A new scoping section is added that identifies the following provisions those associated with installation and not as being somehow another requirement for additional devices. The statement is made that installation shall comply with NFPA 72. This allows similar statements all other the section to be removed as redundant.

907.7.1 The text was moved from 907.6, unchanged. Wiring is placed in the section before power supply because wiring must be installed before the power supply. Thus it is a simple order shift to a logical format.

907.7.2 The text was relocated from 907.5. Although the basic section is unchanged, a new exception is proposed to recognize the fact that battery back-up is provided for smoke alarms as the secondary power supply.

907.7.3 A portion of the installation is to establish alarm notification zones. The text is taken from the existing section 907.9 without changes.

907.7.3.1 The provisions for the zoning indicator panel are relocated here without changes; again as a subsection to zoning.

907.7.3.2 Because special notification zoning is included in the code for high-rise buildings, the provisions are inserted here, after zoning. There are no changes to the text.

907.7.4 Access to devices is an installation consideration and so it is relocated here. Otherwise the text is unchanged.

907.7.5 –The requirement for monitoring the fire alarm is relocated here from 907.15. The terminology is changed from “supervisory service” to monitoring by a “supervising station” to reflect the current usage in NFPA 72 and within the industry.

907.7.5.1 Telephone dialing devices are located in a section subordinate to that for monitoring and so are moved her, without changes.

907.8 Section 907.17 is proposed to be renumbered and function as the scoping section for acceptance testing of fire alarm systems. The total is changed to reflect the fact that testing is a portion of what it means to complete the installation. The “grocery list” of components is deleted and the sentence revised to include the fire alarm system “and all fire alarm components.” Because the acceptance testing is to be in accordance with NFPA 72, those components that have testing procedures will be included as part of the fire alarm system

907.8.1 Specific acceptance testing is noted in the existing code for smoke alarms in new buildings. There is no similar provision in the code for existing buildings although it would make sense that the same testing be applied to those devices as well. By taking those provisions and relocating them here, it is clear that all smoke alarms are to be tested as applicable to smoke alarms.

907.8.2 The record of completion should mean that the system has not only been installed but that it is tested. It is important to note testing here rather than allow the reference to NFPA 72 alone. If the system requires a special testing procedure due to special circumstances, then those testing procedures will be a part of the approved plans and/or specifications. Until it is tested, the installation is not complete. Otherwise the text from existing section 907.18 is unchanged.

907.8.3 The section about instructions is unchanged except for the renumbering.

907.9 –The section is renumbered as part of the reformatting. The reference to Chapter 10 in NFPA 72 is deleted. The code makes it clear enough that the requirements for inspection, testing and maintenance must be in accordance with NFPA 72. The provisions for that are no longer in Chapter 10. By deleting the chapter reference the code will always be consistent with the proper reference.

907.9.1 The grocery list is proposed for deletion. It adds nothing and could possibly be construed as all inclusive. The resultant text simply states that “whenever required. . .” That should address the concern.

907.9.2 As noted for section 907.9, there is no reason to make reference to a specific chapter in NFPA 72 since the document already identifies what needs to be done for testing. And, because testing intervals are also addressed in NFPA 72, there is no reason for the second sentence which could conflict with the reference standard if NFPA 72 changes. The exception is maintained because it specifically involves an action required by the fire code official.

907.9.3 The word “smoke” is added too clarify that the sensitivity testing is only applicable to smoke detectors and should not be applied to other types of detectors. It can be understood by reading the text but it is much clearer to simply state smoke detector rather than leave it ambiguous.

907.9.4 The section is renumbered. In Exception #2 the words “and multiple-station” are added so that it is clear that the exception applies whether there is a single smoke alarm or whether there are more that are interconnected.

907.9.4.1 Again, the word “smoke” is added to make it clear that the testing is for smoke detectors and not other devices.

907.9.5 The language is changed to be clearer that the building owner bears the responsibility for maintaining the fire and life safety systems. Use of the word “ensure’ does nothing to assist in the enforcement of the code. It only provides a mechanism by which the owner can argue that someone else is responsible for a particular action. While various responsibilities may be a reality, the code should not make the distinction. It is the owner’s responsibility; plain and simple.

**PART II – IBC**

In the Part II - IBC portion of this code change, the insertion of the new IBC Section 907.3 will give a reference to the reader for new work that is in conjunction with an existing building. It also serves to align the numbering between the IFC and the IBC. None of the other subsections of 907.3 in the fire code will be included in the building code.

Primarily, the effort in this code change is in reorganization. A little was in proper use of terminology. Still a little more was in addressing changes in the NFPA 72 standard. Basically, the effort is to produce a part of the code that is similar in organization to other sections and that provides a framework where future proposals can be made without adding section after section to the end of 907.

**SECTION 907 ADDITIONAL INFORMATION**

Summary of differences: There are two rather large code change proposals that are submitted together along with several smaller ones. One of the large ones is based on a comprehensive change to Section 907 in formatting and clarifications as well as several technical changes. The other proposal is intended only to address the reformatting and several clarification items. Several additional code change proposals have been submitted separately to address those technical items. If the comprehensive proposal is preferred there is no need to separately address those other technical proposals. This is the comprehensive proposal that <u>includes</u> those technical changes. The list below is a brief description of the differences between the two:

907.1.1 – Added item #12; classification of supervising station;

907.2 – Added requirement for manual alarm box at fire alarm control unit, consistent with NFPA 72 requirements;

907.2.10.4 – Added back-up power for strobes in smoke alarms (new construction)

907.3.4.3 – Added back-up power for strobes in smoke alarms (existing construction)

907.5.1 – Added smoke detector at fire alarm control unit consistent with NFPA 72

907.6.2.1.1 & 907.6.2.1.2 – Changed sound pressure levels based on recommendations for the upcoming NFPA 72

Section matrix and general listing of renumbered sections. This matrix is provided as an assist in reviewing the renumbering of individual sections and to understand where certain segments of text may have been moved.

| New Section | Was |
|---|---|
| 907.1 | 907.1 |
| 907.1.1 | 907.1.1 |
| 907.1.2 | 907.1.2 |
| 907.2. | 907.2 |
| 907.2.1 | 907.2.1 |
| 907.2.1.1 | 907.2.1.1 |
| 907.2.2 | 907.2.2 |
| 907.2.3 | 907.2.3 |
| 907.2.4 | 907.2.4 |
| 907.2.5 | 907.2.5 |
| 907.2.6 | 907.2.6 |
| 907.2.6.1 | 907.2.6.1 |
| 907.2.6.1.1 | New |
| 907.2.6.2 | 907.2.6.2 |
| 907.2.6.3 | 907.2.6.3 |
| 907.2.6.3.1 | 907.2.6.3.1 |
| 907.2.6.3.2 | 907.2.6.3.2 |
| 907.2.6.3.3 | 907.2.6.3.3 |
| 907.2.7 | 907.2.7 |
| 907.2.7.1 | 907.2.7.1 |
| 907.2.8 | 907.2.8 |
| 907.2.8.1 | 907.2.8.1 |
| 907.2.8.2 | 907.2.8.2 |
| 907.2.8.3 | 907.2.8.3 |
| 907.2.9 | 907.2.9 |
| 907.2.9.1 | New |
| 907.9.2 | New |
| 907.2.10 | 907.2.10 |
| 907.2.10.1 | 907.2.10.1.1 |
| 907.2.10.2 | 907.2.10.1.2<br>907.2.10.1.3 |
| 907.2.10.3 | 907.2.10.3 |
| 907.2.10.4 | 907.2.10.2 |
| 907.2.11 | 907.2.11 |
| 907.2.11.1 | 907.2.11.1 |
| 907.2.11.2 | 907.2.11.2 |
| 907.2.11.3 | 907.2.11.3 |
| 907.2.12 | 907.2.12 |
| 907.2.12.1 | 907.2.12.1 |
| 907.2.12.2 | 907.2.12.3 |
| 907.2.13 | 907.2.13 |
| 907.2.14 | 907.2.14 |
| 907.2.15 | 907.2.16 |
| 907.2.16 | 907.2.17 |
| 907.2.17 | 907.2.18 |
| 907.2.17.1 | 907.2.18.1 |
| 907.2.17.2 | 907.2.18.2 |
| 907.2.17.3 | 907.2.19 |
| 907.2.17.3.1 | 907.2.19.1 |
| 907.2.18 | 907.2.20 |
| 907.2.19 | 907.2.21 |
| 907.2.20 | 907.2.22 |
| 907.2.21 | 907.2.23 |
| 907.3 | 907.3 |
| 907.3.1 | 907.3.1.1 |
| 907.3.2 | New |
| 907.3.2.1 | 907.3.1.2 |
| 907.3.2.2 | 907.3.1.3 |
| 907.3.2.3 | 907.3.1.4 |
| 907.3.3 | New |
| 907.3.3.1 | 907.3.1.5 |
| 907.3.3.2 | 907.3.1.6 |
| 907.3.3.3 | 907.3.1.7 |
| 907.3.3.4 | 907.3.1.8 |
| 907.3.4 | 907.3.2 |
| 907.3.4.1 | 907.3.2.1 |
| 907.3.4.2 | 907.3.2.2 |
| 907.3.4.3 | 907.3.2.3 |
| 907.4 | 907.11 |
| 907.4.1 | 907.12 |
| 907.4.2 | 907.2.15 |
| 907.4.3 | New |
| 907.4.4 | 907.2.11.2 (part) |
| 907.5 | New |
| 907.5.1 | New |
| 907.5.2 | 907.4 |

| New Section | Was |
|---|---|
| 907.5.2.1 | 907.4.1 |
| 907.5.2.2 | 907.4.2 |
| 907.5.2.3 | 907.4.3 |
| 907.5.2.4 | 907.4.4 |
| 907.5.2.5 | 907.4.5 |
| 907.5.3 | 907.2 (part) |
| 907.6 ,<br>#4 | 907.7,<br>907.14 |
| 907.6.1 | 907.8 |
| 907.6.2 | 907.10 |
| 907.6.2.1 | 907.10.2 |
| 907.6.2.1.1 | 907.10.2 |
| 907.6.2.1.2 | 907.10.2 |
| 907.6.2.2 | 907.2.12.2<br>907.2.12.2.3 |
| 907.6.2.2.1 | 907.2.12.2.1 |
| 907.6.2.2.2 | 907.2.12.2.2 |
| 907.6.2.2.3 | 907.2.1.2 |
| 907.6.2.3 | 907.10.1 |
| 907.6.2.3.1 | 907.10.1.1 |
| 907.6.2.3.2 | 907.10.1.2 |
| 907.6.2.3.3 | 907.10.1.3 |
| 907.6.2.3.4 | 907.10.1.4 |
| 907.7 | New |
| 907.7.1 | 907.6 |
| 907.7.2 | 907.5 |
| 907.7.3 | 907.9 |
| 907.7.3.1 | 907.9.1 |
| 907.7.3.2 | 907.9.2 |
| 907.7.4 | 907.13 |
| 907.7.5 | 907.15 |
| 907.7.5.1 | 907.16 |
| 907.8 | 907.17 |
| 907.8.1 | 907.2.10.4 |
| 907.8.2 | 907.18 |
| 907.8.3 | 907.19 |
| 907.9 | 907.20 |
| 907.9.1 | 907.20.1 |
| 907.9.2 | 907.20.2 |
| 907.9.3 | 907.20.3 |
| 907.9.4 | 907.20.4 |
| 907.9.4.1 | 907.20.4.1 |
| 907.9.5 | 907.20.5 |

**Bibliography:**
NFPA 72 – National Fire Alarm Code; 2002 edition.
NFPA 72 – National Fire Alarm Code; 2007 edition – draft text
NFPA 72 – National Fire Alarm handbook; 2002 edition
NFPA 101 – Life Safety Code; 2006 edition
SFPE Handbook; 2nd edition, 1995

**Cost Impact:** There is little to no cost impact to this proposal, depending on the Occupancy Group classification and size of building. A few of the items may increase the cost of construction (i.e. battery backup for smoke alarms) but the added clarification should reduce the cost of construction.

**PART I – IFC**

| | | | | |
|---|---|---|---|---|
| Public Hearing: | Committee: | AS | AM | D |
| | Assembly: | ASF | AMF | DF |

**PART II – IBC**

| | | | | |
|---|---|---|---|---|
| Public Hearing: | Committee: | AS | AM | D |
| | Assembly: | ASF | AMF | DF |

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# F123–06/07
## 909.8.1 (IBC [F] 909.8.1)

**Proponent:** Daniel E. Nichols, New York State Department of State

**Revise as follows:**

**909.8.1 Smoke layer.** The height of the lowest horizontal surface of the ~~accumulating~~ smoke layer interface shall be maintained at least 6 feet (1829 mm) above any walking surface that forms a portion of a required egress system within the smoke zone.

**Reason:** The purpose of this code change proposal is to remove a potential conflict between the IFC (IBC, IMC) and the design standard, NFPA 92B

NFPA 92B has a definition for the term 'smoke layer interface'. Due to the dynamics of a fire event, smoke does not accumulate at a constant rate from the ceiling of a space. NFPA 92B addresses this by discussing the smoke layer as the hazard it produces rather than the current IFC language that is often interpreted as a clear space. Retaining the term 'accumulating smoke layer' could become confusing when using NFPA 92B since it could be interpreted that the code is referencing the NFPA 92B definition of 'transition zone' or 'first indication of smoke' rather than the 'smoke layer interface.'

**Bibliography**: NFPA 92B, 2005 edition- Smoke Management Systems

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F124–06/07
## 910.2, 910.2.1 (IBC [F] 910.2, [F] 910.2.1)

**Proponent:** Richard Schulte, Schulte & Associates

**Revise as follows:**

**910.2 Where required.** Smoke and heat vents shall be installed in the roofs of one-story buildings or portions thereof occupied for the uses set forth in Sections 910.2.1 ~~through 910.2.3~~ and 910.2.2.

~~**910.2.1 Group F-1 or S-1.** Buildings and portions thereof used as a Group F-1 or S-1 occupancy having more than 50,000 square feet (4645 $m^2$) of undivided area.~~

~~**Exception:** Group S-1 aircraft repair hangars.~~

~~**910.2.2**~~ **910.2.1 High-piled combustible storage.** Buildings and portions thereof containing high-piled combustible stock or rack storage in any occupancy group when required by Section 2306.7.

~~**910.2.3**~~ **901.2.2 Exit access travel distance increase.** Buildings and portions thereof used as a Group F-1 or S-1 occupancy where the maximum exit access travel distance is increased in accordance with Section 1016.2.

**Reason:** The purpose of this proposal is to eliminate the requirement for roof vents in F-1 and S-1 occupancies.

Buildings which are more than 50,000 square feet in floor area and which contain Group F-1 or S-1 occupancies will be provided with sprinkler protection. The sprinkler protection by itself will provide adequate occupant fire safety, firefighter safety and property protection to comply with the intent of the code. If the sprinkler protection successfully operates and controls the fire, there is no need to provide roof vents/draft curtains. If the sprinkler protection fails to control the fire, roof vents and draft curtains will provide little in the way of protection for the occupants or the building. Since roof vents/draft curtains provide little, if any benefit, the cost/benefit ratio is large.

In a memorandum dated September 10, 1999, the American Architectural Manufacturers Association (AAMA) announced the commencement of AAMA Smoke Vent Task Group's research project on the use of smoke/heat vents. The announcement states that the purpose of this research project is to "study the interaction between sprinklers, smoke/heat vents and draft curtains" and "to develop scientifically based engineering design criteria for the installation of draft curtains and vents."

The AAMA memorandum is essentially an admission by the AAMA Smoke Vent Task Group in 1999 that we do not presently have sufficient information on the interaction between sprinklers, smoke/heat vents and draft curtains to utilize smoke/heat and draft curtains in buildings which are protected by sprinklers. Given this admission by the AAMA, it would seem questionable that the International Building Code and International Fire Code should mandate the use of smoke/heat vents and draft curtains in buildings which are protected throughout by a sprinkler system.

To date, the AAMA Smoke Vent Task Group has yet to complete the research project announced in September, 1999.

Chapter 10 in Section 5 of the 15th Edition of the Fire Protection Handbook published by the National Fire Protection Association in 1981 states the following:

> "Even though there is no universally accepted conclusion from either fire experience or research, concern has been raised by a recent series of model studies that indicate the following trends when the present Smoke and Heat Venting Guide [NFPA 204M] is implemented:
>
> 1. Venting delays loss of visibility;
> 2. Venting results in increased fuel consumption; and
> 3. Depending on the location of the fire relative to the vents, the necessary water demand to achieve control is either increased or decreased over an unvented condition. With the fire directly under the vent, water demand is decreased. With the fire equidistant from the vents, water demand is increased."

Chapter 6 in the 1991 edition of NFPA 204M, the Guide for Smoke and Heat Venting, specifically addresses the use of smoke/heat vents in sprinklered buildings. Section 6-1 in this edition of NFPA 204M states the following:

> "A broadly accepted equivalent design basis for using both sprinklers and vents together for hazard control (e.g. property protection, life safety, water usage, obscuration, etc.) has not been universally recognized."

Section 6-2 in the 1991 edition of NFPA 204M further states the following:

> "For occupancies that present a high challenge to sprinkler systems, concern has been raised that inclusion of automatic roof venting may be detrimental to the performance of automatic sprinklers."

In addition to this statement, Chapter 6 in the 1991 edition of NFPA 204M contains the exact same statement quoted above from the 15th edition on the NFPA Fire Protection Handbook. Chapter 8 in the 1998 edition of NFPA 204 contains the same statements regarding the use of smoke/heat vents in sprinklered buildings as contained in the 1991 edition of NFPA 204M and also the 15th edition of the Fire Protection Handbook. In addition, the 1998 edition of NFPA 204 states the following regarding the use of curtain boards:

> "Large-sale fire tests [Troup 1994] indicates that the presence of curtain boards can cause increases in sprinkler operation, smoke production, and fire damage (i.e. sprinklers opened will away from the fire)."

The issue of the use of roof vents in sprinklered buildings is also addressed in Chapter 11 of the 2002 edition of NFPA 204. Section 11.1 in the 2002 edition of NFPA 204 reads as follows:

> "Where provided, the design of the venting for sprinklered buildings shall be based on a performance analysis acceptable to the authority having jurisdiction, demonstrating that the established objectives are met."(See Annex F.3.)"

The provisions for roof vents contained in both the International Building Code and the International Fire Code are specification-oriented and do not require a "performance analysis" required by NFPA 204-2002.

Annex F.3 in the 2002 edition of NFPA 204 contains similar statements regarding the use of roof vents in sprinklered buildings as those contained in previous editions of NFPA 204 (and NFPA 204M). In addition, Annex F.3 of the 2002 edition of NFPA 204 includes the following statements:

> "Vents that are open prior to sprinkler operation in a region surrounding the ignition point, within a radius of 1-1/2 sprinkler spacings, can interfere with the opening of sprinklers capable of delivering water to the fire."

> "Draft curtains can delay or prevent operation and can interfere with the discharge of sprinklers capable of delivering water to the fire."

The above is an indication that, from the early 1980's to the present day, questions still persist about whether it is appropriate to use of smoke/heat vents and draft curtains in buildings which are protected by sprinklers.

The installation of roof vents in sprinklered buildings which contain high-piled storage is also specifically addressed in NFPA 13. Section 7.4.1.3.1 in the 1999 edition of NFPA 13 reads as follows:

> "Sprinkler protection criteria is based on the assumption that roof vents and draft curtains are not being used."

Section C-7.4.1.3.1 in the 1999 edition of NFPA 13 also addresses this issue as follows:

> ". . . The design curves are based upon the absence of roof vents or draft curtains in the building."

Section 2-6.1 in the 1995 edition of NFPA 13E, the Guide for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems states the following with regard to routine ventilation in sprinklered storage buildings:

> "Occupancies with a wide variety of configurations and a wide range of storage commodities might need special procedures, particularly where storage heights are in excess of 15 feet. In some cases, routine ventilation procedures in the early stages of a fire can hinder effective sprinkler operation. It is desirable for the fire department to discuss its pre-fire plan for warehouse occupancies with the occupant, sprinkler designer, and insurance carrier to determine if a modification in procedures is appropriate."

Section 2-6.2 in NFPA 13E (1995 edition) further states the following:

> "For those cases where search and rescue operations have been completed prior to ventilation work being performed by the fire department, it might be appropriate to allow the automatic sprinklers to continue to operate without further ventilation to enable them to achieve full control of the fire. This might take 20 to 30 min[utes] or more."

The information from NFPA 13E regarding the use of ventilation in storage buildings is further supported by information contained in NFPA 231 and NFPA 231C.

Section 3-2 in the 1998 edition of NFPA 231, the Standard for General Storage, states the following with the respect to the use of smoke/heat vents and draft curtains in sprinklered storage buildings:

> "The protection outlined in the standard shall apply to buildings with or without roof vents and draft curtains."

The exception to this section in NFPA 231 states the following:

> "Where local codes require heat and smoke vents in buildings that are protected by ESFR sprinklers, the vents shall be manually operated or shall have an operating mechanism with a standard response fusible element that is rated no less that 360F. Drop out vents shall not be permitted."

Section A-3-2 in NFPA 231 provides additional information regarding the use of smoke/ heat vents in sprinklered buildings to which NFPA 231 is applicable. This section states the following:

> "Smoke removal is important to manual fire fighting and overhaul. Since most fire tests were conducted without smoke and heat venting, the protection specified in Sections 5-1, 6-1 and 7-1 was developed without the use of such venting. However, venting through eaveline windows, doors, monitors, or gravity or mechanical exhaust systems is essential to smoke removal after control of the fire is achieved. (See NFPA 204, Guide for Smoke and Heat Venting.)"

While section 3-2 in NFPA 231 states that the use of smoke/heat vents is acceptable in buildings where NFPA 231 is applicable, the explanatory material contained in Appendix A of NFPA 231 clearly indicates that the use of manually operated roof vents or some other method of ventilation is preferred. The fact that this exception regarding the use of vents with ESFR sprinklers is included in NFPA 231 is an admission that heat/roof vents can affect the operation of ESFR sprinklers. Given the exception to section 3-2 in NFPA 231, along with the information on venting in sprinklered buildings provided in NFPA 204, certainly the wisdom of providing automatic smoke/heat vents in buildings protected by standard sprinklers should be questioned.

NFPA 231C, the Standard for Rack Storage of Materials, also addresses the use of smoke/ heat vents in sprinklered buildings. Section 3-3 in the 1998 edition of NFPA 231C reads as follows:

> "Design curves are based on the assumption that roof vents and draft curtains are not being used."

Explanatory material provided in section B-3-3 in NFPA 231 provides further information on the use of smoke/heat vents in sprinklered storage buildings which contain storage racks. This section reads as follows:

> "Tests were conducted as a part of this program with eave line windows and louvers open to simulate smoke and heat venting. These tests opened 87.5 percent and 91 percent more sprinklers that did comparative tests without windows and louvers open. Venting tests that have been conducted in other programs were without the benefit of sprinkler protection and, as such, are not considered in this report, which covers only buildings protected by sprinklers. The design curves are based upon the absence of roof vents or draft curtains in the building. During mop-up operations, ventilating systems, were installed, should be capable of manual exhaust operations."

NFPA 231C also contains information on fire department operations for buildings protected by sprinkler systems designed to comply with NFPA 231C. Section A-12-6 in NFPA 231C reads as follows:

> "Sprinkler protection installed as required in this standard is expected to protect the building occupancy without supplemental fire department activity. Fires that occur in rack storage occupancies are likely to be controlled within the limits outlined in B-1.1, since no significant building damage is expected. The first fire department pumper arriving at a rack storage-type fire should connect immediately to the sprinkler siamese fire department connection and start pumping operations.
>
> In the test series for storage up to 25 ft [feet], the average time from ignition to smoke obscuration in the test building was about 13 minutes. The first sprinkler operating time in these same fires averaged about 3 minutes. Considering response time for the waterflow device to transmit a waterflow signal, approximately 9 minutes remains between the time of receipt of a waterflow alarm signal at fire department headquarters and the time of smoke obscuration with the building as an overall average.
>
> In the test series for storage over 25 ft [feet], the visibility time was extended. If the fire department or plant protection department arrives at the building in time to have sufficient visibility to locate the fire, suppression activities with small hose lines should be started. . . . . .Manual fire-fighting operations in such a warehouse should not be considered a substitute for sprinkler operation.
>
> Smoke removal capability should be provided. Examples of smoke removal equipment include:
> (a) Mechanical air-handling systems
> (b) Powered exhaust fans
> (c) Roof-mounted gravity vents
> (d) Perimeter gravity vents
>
> Whichever system is selected, it should be designed for manual actuation by the fire department, thus allowing personnel to coordinate the smoke removal (ventilation) with mop-up operations."
>
> During the testing program, the installed automatic extinguishing system was capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition. Ventilation operations and mop-up were not started until this point. The use of smoke removal equipment is important."

While it has been stated by proponents of heat/smoke vents that the use of eave line windows is different from the operation of automatic smoke/heat vents, the explanatory materials contained in NFPA 231C clearly states that automatic venting should not be provided. Given the explanatory material cited above, it can be concluded that providing automatic smoke/heat vents in a building which is required to comply with NFPA 231C is, in fact, a violation of NFPA 231C.

The purpose of providing heat/smoke vents in a storage building is to vent both heat and smoke to improve visibility within the building and prevent structural damage to the roof of the building. Venting heat and smoke from the building will more safely permit the fire department to enter the building and attack the fire. Given the information provided in both NFPA 13E and in NFPA 231C, the question is why should the fire department enter the building to attack the fire. NFPA 231C clearly indicates that a sprinkler system designed per NFPA 231C is "capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition." If the sprinkler system is capable of achieving this level of control, why should the fire department enter the building and put its personnel at risk? Providing smoke/heat vents in the building encourages fire department personnel to enter the building and puts firefighters at risk.

Recently (April 2005), the National Institute of Occupational Safety and Health (NIOSH) issued a NIOSH Alert titled “Preventing Injuries and Deaths of Firefighters Due to Truss System Failures”. Page 7 of the NIOSH Alert includes the following statement:

“Fire fighters should be discouraged from risking their lives solely for property protection activities.”

Given that sprinkler protection is “capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition” and that “fire fighters should be discouraged from risking their lives solely for property protection activities” means that the proper fire fighting strategy in large one story industrial and storage buildings is to delay manual fire fighting activity for a period of at least 30 minutes to allow the sprinkler system to extinguish the fire. In the event that the sprinkler system fails to control and extinguish the fire, no interior manual fire fighting should be attempted merely to protect property. Hence, there is no need to provide roof vents to assist fire fighting in large industrial and storage buildings.

Factory Mutual's opinion of the use of automatic smoke/heat vents is expressed by the following excerpt from FM Data Sheet 8-33 dated January, 1984:

> "Factory Mutual recommended protection is based on roof vents and draft curtains not being provided. Fire tests have not shown automatic vents to be cost effective and they may even increase sprinkler water demand. Hence, permanent heat and smoke vents, if any, should be arranged for manual operation. Smoke removal during mop-up operations can frequently be achieved through eave-line windows, doors, monitors, non-automatic exhaust systems (gravity or mechanical), or manually operated heat and smoke vents. Fire departments can cut holes in steel or wood roofs and also use their smoke exhausters."

If the premier property insurer in the United States is on record as stating that the installation of smoke/heat vents is not cost effective (as early as 1984), then the question should be asked-why should the membership of the International Code Council mandate this fire protection technology?

Prior to the development of the International Fire Code, two of the three model fire prevention codes used in the United States, the Uniform Fire Code and the Standard Fire Prevention Code, required the installation of the smoke/heat vents in large storage buildings, while the third model fire prevention code, the BOCA National Fire Prevention Code, did not include requirements for smoke/heat vents. Given this, it should be a relatively easy research task to compare the property losses from fires in storage buildings in jurisdictions using the BOCA National Fire Prevention Code and the losses from fire in storage buildings located in jurisdictions using the two other model fire prevention codes. If the fire loss statistics for storage buildings in BOCA jurisdictions is not significantly higher than the fire loss statistics in ICBO and SBCCI jurisdictions, this would be an indication that the installation of smoke/heat vents is simply not effective. Prior to commencing the AAMA study of smoke/heat vents, the AAMA should concentrate on providing statistics which demonstrate the effectiveness of vents.

Given the technical information presented above, along with the fact that the manufacturers of smoke/heat vents have presented no statistics that their products are, in fact, effective at reducing property losses, the membership of the ICC should remove the requirements for smoke/heat vents (until such time as the industry provides conclusive proof that vents actually work as represented).

The fire protection field has wrestled with this issue for more that 30 years. There is absolutely no reason why the vent industry couldn't have conducted its proposed research 25 years ago. Eliminating the requirement for vents in the code should be an incentive for the vent manufacturers to quickly complete its testing program and provide conclusive proof one way or the other on the need for vents.

It should be noted that a similar proposal to delete the requirements for roof vents was submitted to the ICC in 2000 (Birmingham, Alabama). The committee hearing this proposal voted to deny the proposal given that the vent industry was involved in a testing program announced in September 1999. Since the committee's denial of this proposal, the vent industry has not published any results from their research program. This fact is a tantamount admission by the vent industry that the proposal to eliminate the requirement for roof vents in sprinklered buildings has merit.

It is my opinion that the installation of roof vents and draft curtains in sprinklered buildings is in the realm of "junk science". In the absence of the independent research which conclusively demonstrates that the installation of roof vents and draft curtains is not only not detrimental to the operation of sprinklers, but is also effective, the requirements for the installation of roof vents and draft curtains should be removed from both the IBC and the IFC.

**Bibliography:**

Fire Protection Handbook-15th Edition (1981)
FM Data Sheet 8-33, January, 1984
NFPA 13, 1999 edition
NFPA 13E, 1995 edition
NFPA 204M, 1991 edition
NFPA 204, 1998 edition.
NFPA 204, 2002 edition.
NFPA 231, 1998 edition
NFPA 231C, 1998 edition
"Preventing Injuries and Deaths of Firefighters Due to Truss System Failures, NIOSH Alert, April 2005

**Cost Impact:** The code change proposal will not increase the cost of construction.

| Public Hearing: | | | | |
|---|---|---|---|---|
| | Committee: | AS | AM | D |
| | Assembly: | ASF | AMF | DF |

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# F125–06/07

## 910.2, 910.2.2 (IBC [F] 910.2, [F] 910.2.2)

**Proponent:** Richard Schulte, Schulte & Associates

**Revise as follows:**

**910.2 Where required.** Smoke and heat vents shall be installed in the roofs of one-story buildings or portions thereof occupied for the uses set forth in Sections 910.2.1 ~~through 910.2.3~~ and 910.2.2.

**910.2.1 Group F-1 or S-1.** Buildings and portions thereof used as a Group F-1 or S-1 occupancy having more than 50,000 square feet (4645 $m^2$) of undivided area.

**Exception:** Group S-1 aircraft repair hangars.

~~**910.2.2 High-piled combustible storage.** Buildings and portions thereof containing high-piled combustible stock or rack storage in any occupancy group when required by Section 2306.7.~~

~~**910.2.3**~~ **910.2.2 Exit access travel distance increase.** Buildings and portions thereof used as a Group F-1 or S-1 occupancy where the maximum exit access travel distance is increased in accordance with Section 1016.2.

**Reason:** The purpose of this proposal is to eliminate the requirement for roof vents in buildings which contain high piled combustible storage.

Buildings which contain high-piled storage and which are required to be provided with roof vents will be provided with sprinkler protection. The sprinkler protection by itself will provide adequate occupant fire safety, firefighter safety and property protection to comply with the intent of the code. If the sprinkler protection successfully operates and controls the fire, there is no need to provide roof vents/draft curtains. If the sprinkler protection fails to control the fire, roof vents and draft curtains will provide little in the way of protection for the occupants or for the building. Since roof vents/draft curtains provide little, if any benefit, the cost/benefit ratio is large.

In a memorandum dated September 10, 1999, the American Architectural Manufacturers Association (AAMA) announced the commencement of AAMA Smoke Vent Task Group's research project on the use of smoke/heat vents. The announcement states that the purpose of this research project is to "study the interaction between sprinklers, smoke/heat vents and draft curtains" and "to develop scientifically based engineering design criteria for the installation of draft curtains and vents."

The AAMA memorandum is essentially an admission by the AAMA Smoke Vent Task Group in 1999 that we do not presently have sufficient information on the interaction between sprinklers, smoke/heat vents and draft curtains to utilize smoke/heat and draft curtains in buildings which are protected by sprinklers. Given this admission by the AAMA, it would seem questionable that the International Building Code and International Fire Code should mandate the use of smoke/heat vents and draft curtains in buildings which are protected throughout by a sprinkler system.

To date, the AAMA Smoke Vent Task Group has yet to complete the research project announced in September, 1999.

Chapter 10 in Section 5 of the 15th Edition of the Fire Protection Handbook published by the National Fire Protection Association in 1981 states the following:

"Even though there is no universally accepted conclusion from either fire experience or research, concern has been raised by a recent series of model studies that indicate the following trends when the present Smoke and Heat Venting Guide [NFPA 204M] is implemented:

1. Venting delays loss of visibility;
2. Venting results in increased fuel consumption; and
3. Depending on the location of the fire relative to the vents, the necessary water demand to achieve control is either increased or decreased over an unvented condition. With the fire directly under the vent, water demand is decreased. With the fire equidistant from the vents, water demand is increased."

Chapter 6 in the 1991 edition of NFPA 204M, the Guide for Smoke and Heat Venting, specifically addresses the use of smoke/heat vents in sprinklered buildings. Section 6-1 in this edition of NFPA 204M states the following:

"A broadly accepted equivalent design basis for using both sprinklers and vents together for hazard control (e.g. property protection, life safety, water usage, obscuration, etc.) has not been universally recognized."

Section 6-2 in the 1991 edition of NFPA 204M further states the following:

"For occupancies that present a high challenge to sprinkler systems, concern has been raised that inclusion of automatic roof venting may be detrimental to the performance of automatic sprinklers."

In addition to this statement, Chapter 6 in the 1991 edition of NFPA 204M contains the exact same statement quoted above from the 15th edition of the NFPA Fire Protection Handbook. Chapter 8 in the 1998 edition of NFPA 204 contains the same statements regarding the use of smoke/heat vents in sprinklered buildings as contained in the 1991 edition of NFPA 204M and also the 15th edition of the Fire Protection Handbook. In addition, the 1998 edition of NFPA 204 states the following regarding the use of curtain boards:

"Large-sale fire tests [Troup 1994] indicates that the presence of curtain boards can cause increases in sprinkler operation, smoke production, and fire damage (i.e. sprinklers opened will away from the fire)."

The issue of the use of roof vents in sprinklered buildings is also addressed in Chapter 11 of the 2002 edition of NFPA 204. Section 11.1 in the 2002 edition of NFPA 204 reads as follows:

"Where provided, the design of the venting for sprinklered buildings shall be based on a performance analysis acceptable to the authority having jurisdiction, demonstrating that the established objectives are met."(See Annex F.3.)"

The provisions for roof vents contained in both the International Building Code and the International Fire Code are specification-oriented and do not require a "performance analysis" required by NFPA 204-2002.

Annex F.3 in the 2002 edition of NFPA 204 contains similar statements regarding the use of roof vents in sprinklered buildings as those contained in previous editions of NFPA 204 (and NFPA 204M). In addition, Annex F.3 of the 2002 edition of NFPA 204 includes the following statements:

"Vents that are open prior to sprinkler operation in a region surrounding the ignition point, within a radius of 1-1/2 sprinkler spacings, can interfere with the opening of sprinklers capable of delivering water to the fire."

"Draft curtains can delay or prevent operation and can interfere with the discharge of sprinklers capable of delivering water to the fire."

The above is an indication that, from the early 1980's to the present day, questions still persist about whether it is appropriate to use of smoke/heat vents and draft curtains in buildings which are protected by sprinklers.

The installation of roof vents in sprinklered buildings which contain high-piled storage is also specifically addressed in NFPA 13. Section 7.4.1.3.1 in the 1999 edition of NFPA 13 reads as follows:

"Sprinkler protection criteria is based on the assumption that roof vents and draft curtains are not being used."

Section C-7.4.1.3.1 in the 1999 edition of NFPA 13 also addresses this issue as follows:

". . . The design curves are based upon the absence of roof vents or draft curtains in the building."

Section 2-6.1 in the 1995 edition of NFPA 13E, the Guide for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems states the following with regard to routine ventilation in sprinklered storage buildings:

"Occupancies with a wide variety of configurations and a wide range of storage commodities might need special procedures, particularly where storage heights are in excess of 15 feet. In some cases, routine ventilation procedures in the early stages of a fire can hinder effective sprinkler operation. It is desirable for the fire department to discuss its pre-fire plan for warehouse occupancies with the occupant, sprinkler designer, and insurance carrier to determine if a modification in procedures is appropriate."

Section 2-6.2 in NFPA 13E (1995 edition) further states the following:

"For those cases where search and rescue operations have been completed prior to ventilation work being performed by the fire department, it might be appropriate to allow the automatic sprinklers to continue to operate without further ventilation to enable them to achieve full control of the fire. This might take 20 to 30 min[utes] or more."

The information from NFPA 13E regarding the use of ventilation in storage buildings is further supported by information contained in NFPA 231 and NFPA 231C.

Section 3-2 in the 1998 edition of NFPA 231, the Standard for General Storage, states the following with the respect to the use of smoke/heat vents and draft curtains in sprinklered storage buildings:

"The protection outlined in the standard shall apply to buildings with or without roof vents and draft curtains."

The exception to this section in NFPA 231 states the following:

"Where local codes require heat and smoke vents in buildings that are protected by ESFR sprinklers, the vents shall be manually operated or shall have an operating mechanism with a standard response fusible element that is rated no less that 360F. Drop out vents shall not be permitted."

Section A-3-2 in NFPA 231 provides additional information regarding the use of smoke/ heat vents in sprinklered buildings to which NFPA 231 is applicable. This section states the following:

"Smoke removal is important to manual fire fighting and overhaul. Since most fire tests were conducted without smoke and heat venting, the protection specified in Sections 5-1, 6-1 and 7-1 was developed without the use of such venting. However, venting through eaveline windows, doors, monitors, or gravity or mechanical exhaust systems is essential to smoke removal after control of the fire is achieved. (See NFPA 204, Guide for Smoke and Heat Venting.)"

While section 3-2 in NFPA 231 states that the use of smoke/heat vents is acceptable in buildings where NFPA 231 is applicable, the explanatory material contained in Appendix A of NFPA 231 clearly indicates that the use of manually operated roof vents or some other method of ventilation is preferred. The fact that this exception regarding the use of vents with ESFR sprinklers is included in NFPA 231 is an admission that heat/roof vents can affect the operation of ESFR sprinklers. Given the exception to section 3-2 in NFPA 231, along with the information on venting in sprinklered buildings provided in NFPA 204, certainly the wisdom of providing automatic smoke/heat vents in buildings protected by standard sprinklers should be questioned.

NFPA 231C, the Standard for Rack Storage of Materials, also addresses the use of smoke/ heat vents in sprinklered buildings. Section 3-3 in the 1998 edition of NFPA 231C reads as follows:

"Design curves are based on the assumption that roof vents and draft curtains are not being used."

Explanatory material provided in section B-3-3 in NFPA 231 provides further information on the use of smoke/heat vents in sprinklered storage buildings which contain storage racks. This section reads as follows:

"Tests were conducted as a part of this program with eave line windows and louvers open to simulate smoke and heat venting. These tests opened 87.5 percent and 91 percent more sprinklers that did comparative tests without windows and louvers open. Venting tests that have been conducted in other programs were without the benefit of sprinkler protection and, as such, are not considered in this report, which covers only buildings protected by sprinklers. The design curves are based upon the absence of roof vents or draft curtains in the building. During mop-up operations, ventilating systems, were installed, should be capable of manual exhaust operations."

NFPA 231C also contains information on fire department operations for buildings protected by sprinkler systems designed to comply with NFPA 231C. Section A-12-6 in NFPA 231C reads as follows:

"Sprinkler protection installed as required in this standard is expected to protect the building occupancy without supplemental fire department activity. Fires that occur in rack storage occupancies are likely to be controlled within the limits outlined in B-1.1, since no significant building damage is expected. The first fire department pumper arriving at a rack storage-type fire should connect immediately to the sprinkler siamese fire department connection and start pumping operations.

In the test series for storage up to 25 ft [feet], the average time from ignition to smoke obscuration in the test building was about 13 minutes. The first sprinkler operating time in these same fires averaged about 3 minutes. Considering response time for the waterflow device to transmit a waterflow signal, approximately 9 minutes remains between the time of receipt of a waterflow alarm signal at fire department headquarters and the time of smoke obscuration with the building as an overall average.

In the test series for storage over 25 ft [feet], the visibility time was extended. If the fire department or plant protection department arrives at the building in time to have sufficient visibility to locate the fire, suppression activities with small hose lines should be started. . . . . .Manual fire-fighting operations in such a warehouse should not be considered a substitute for sprinkler operation.

Smoke removal capability should be provided. Examples of smoke removal equipment include:

(a) Mechanical air-handling systems
(b) Powered exhaust fans
(c) Roof-mounted gravity vents
(d) Perimeter gravity vents

Whichever system is selected, it should be designed for manual actuation by the fire department, thus allowing personnel to coordinate the smoke removal (ventilation) with mop-up operations."

During the testing program, the installed automatic extinguishing system was capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition. Ventilation operations and mop-up were not started until this point. The use of smoke removal equipment is important."

While it has been stated by proponents of heat/smoke vents that the use of eave line windows is different from the operation of automatic smoke/heat vents, the explanatory materials contained in NFPA 231C clearly states that automatic venting should not be provided. Given the explanatory material cited above, it can be concluded that providing automatic smoke/heat vents in a building which is required to comply with NFPA 231C is, in fact, a violation of NFPA 231C.

The purpose of providing heat/smoke vents in a storage building is to vent both heat and smoke to improve visibility within the building and prevent structural damage to the roof of the building. Venting heat and smoke from the building will more safely permit the fire department to enter the building and attack the fire. Given the information provided in both NFPA 13E and in NFPA 231C, the question is why should the fire department enter the building to attack the fire. NFPA 231C clearly indicates that a sprinkler system designed per NFPA 231C is "capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition." If the sprinkler system is capable of achieving this level of control, why should the fire department enter the building and put its personnel at risk? Providing smoke/heat vents in the building encourages fire department personnel to enter the building and puts firefighters at risk.

Recently (April 2005), the National Institute of Occupational Safety and Health (NIOSH) issued a NIOSH Alert titled “Preventing Injuries and Deaths of Firefighters Due to Truss System Failures”. Page 7 of the NIOSH Alert includes the following statement:

“Fire fighters should be discouraged from risking their lives solely for property protection activities.”

Given that sprinkler protection is “capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition” and that “fire fighters should be discouraged from risking their lives solely for property protection activities” means that the proper fire fighting strategy in

large one story industrial and storage buildings is to delay manual fire fighting activity for a period of at least 30 minutes to allow the sprinkler system to extinguish the fire. In the event that the sprinkler system fails to control and extinguish the fire, no interior manual fire fighting should be attempted merely to protect property. Hence, there is no need to provide roof vents to assist fire fighting in large industrial and storage buildings.

Factory Mutual's opinion of the use of automatic smoke/heat vents is expressed by the following excerpt from FM Data Sheet 8-33 dated January, 1984:

"Factory Mutual recommended protection is based on roof vents and draft curtains not being provided. Fire tests have not shown automatic vents to be cost effective and they may even increase sprinkler water demand. Hence, permanent heat and smoke vents, if any, should be arranged for manual operation. Smoke removal during mop-up operations can frequently be achieved through eave-line windows, doors, monitors, non-automatic exhaust systems (gravity or mechanical), or manually operated heat and smoke vents. Fire departments can cut holes in steel or wood roofs and also use their smoke exhausters."

If the premier property insurer in the United States is on record as stating that the installation of smoke/heat vents is not cost effective (as early as 1984), then the question should be asked-why should the membership of the International Code Council mandate this fire protection technology?

Prior to the development of the International Fire Code, two of the three model fire prevention codes used in the United States, the Uniform Fire Code and the Standard Fire Prevention Code, required the installation of the smoke/heat vents in large storage buildings, while the third model fire prevention code, the BOCA National Fire Prevention Code, did not include requirements for smoke/heat vents. Given this, it should be a relatively easy research task to compare the property losses from fires in storage buildings in jurisdictions using the BOCA National Fire Prevention Code and the losses from fire in storage buildings located in jurisdictions using the two other model fire prevention codes. If the fire loss statistics for storage buildings in BOCA jurisdictions is not significantly higher than the fire loss statistics in ICBO and SBCCI jurisdictions, this would be an indication that the installation of smoke/heat vents is simply not effective. Prior to commencing the AAMA study of smoke/heat vents, the AAMA should concentrate on providing statistics which demonstrate the effectiveness of vents.

Given the technical information presented above, along with the fact that the manufacturers of smoke/heat vents have presented no statistics that their products are, in fact, effective at reducing property losses, the membership of the ICC should remove the requirements for smoke/heat vents (until such time as the industry provides conclusive proof that vents actually work as represented).

The fire protection field has wrestled with this issue for more that 30 years. There is absolutely no reason why the vent industry couldn't have conducted its proposed research 25 years ago. Eliminating the requirement for vents in the code should be an incentive for the vent manufacturers to quickly complete its testing program and provide conclusive proof one way or the other on the need for vents.

It should be noted that a similar proposal to delete the requirements for roof vents was submitted to the ICC in 2000 (Birmingham, Alabama). The committee hearing this proposal voted to deny the proposal given that the vent industry was involved in a testing program announced in September 1999. Since the committee's denial of this proposal, the vent industry has not published any results from their research program. This fact is a tantamount admission by the vent industry that the proposal to eliminate the requirement for roof vents in sprinklered buildings has merit.

It is my opinion that the installation of roof vents and draft curtains in sprinklered buildings is in the realm of "junk science". In the absence of the independent research which conclusively demonstrates that the installation of roof vents and draft curtains is not only not detrimental to the operation of sprinklers, but is also effective, the requirements for the installation of roof vents and draft curtains should be removed from both the IBC and the IFC.

**Bibliography:**

Fire Protection Handbook-15th Edition (1981)
FM Data Sheet 8-33, January, 1984
NFPA 13, 1999 edition
NFPA 13E, 1995 edition
NFPA 204M, 1991 edition
NFPA 204, 1998 edition.
NFPA 204, 2002 edition.
NFPA 231, 1998 edition
NFPA 231C, 1998 edition
"Preventing Injuries and Deaths of Firefighters Due to Truss System Failures, NIOSH Alert, April 2005

**Cost Impact:** The code change proposal will not increase the cost of construction.

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| Public Hearing: | Committee: | AS | AM | D |
| | Assembly: | ASF | AMF | DF |

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# F126–06/07

## 910.2, 910.2.3 (IBC [F] 910.2, [F] 910.2.3)

**Proponent:** Richard Schulte, Schulte & Associates

**Revise as follows:**

**910.2 Where required.** Smoke and heat vents shall be installed in the roofs of one-story buildings or portions thereof occupied for the uses set forth in Sections 910.2.1 ~~through 910.2.3~~ and 910.2.2.

**910.2.1 Group F-1 or S-1.** Buildings and portions thereof used as a Group F-1 or S-1 occupancy having more than 50,000 square feet (4645 $m^2$) of undivided area.

**Exception:** Group S-1 aircraft repair hangars.

**910.2.2 High-piled combustible storage.** Buildings and portions thereof containing high-piled combustible stock or rack storage in any occupancy group when required by Section 2306.7.

~~**910.2.3 Exit access travel distance increase.** Buildings and portions thereof used as a Group F-1 or S-1 occupancy where the maximum exit access travel distance is increased in accordance with Section 1016.2.~~

**Reason:** The purpose of this proposal is to eliminate the code provision which permits an increase in travel distance to 400 feet in Group F-1 or S-1 occupancies when sprinkler protection and roof vents/draft curtains are provided. Another code change proposal will permit an increase in travel distance in one-story buildings containing Group F-1 and S-1 occupancies when only sprinkler protection is provided.

If the sprinkler system operates prior to the operation of roof vents and successfully controls the fire, it is highly unlikely that any roof vents will open. Given this, the present code provisions permit an increase in travel distance for a fire protection feature that will likely not function and, hence, will not likely have any impact on the building environment through which egress must be made.

The rationale for permitting an increase in the travel distance when roof vents are provided in a building is questionable. Heat and smoke vents are heat-activated devices. The response time of a roof vent depends upon the fire size, the height of the ceiling and the horizontal distance between the fire and the vent. The higher the ceiling, the longer it will take for a heat-activated device located at the ceiling to operate (all other variables being equal). Of course, the operation of sprinklers will also impact the response time of roof vents and, more than likely, roof vents will never operate if sprinklers operate prior to the operation of the roof vents.

It should be noted that Table 910.3 in the *International Building Code* requires that the maximum spacing of roof vents to be between 90 feet and 120 feet depending upon the upon the occupancy of the building and the storage height. NFPA 13 limits the maximum spacing of standard upright and pendent sprinklers to 15 feet on centers. Based upon the spacing of standard sprinklers with respect to the spacing of roof vents, it is highly probable that sprinklers will activate prior to the roof vents (unless the fire is located in close proximity to a roof vent). If sprinklers operate prior to the roof vents and successfully control the fire, then it is highly improbable that the roof vents will ever operate. Given this, it can be concluded that, in the most highly probable scenario, providing roof vents will have no impact upon the heat or smoke confined within the building. Based upon this, it can be concluded that, in most cases, providing roof vents in sprinklered buildings will have no beneficial impact on egress system serving F-1 and S-1 occupancies. Hence, the heat and smoke conditions under which egress will be made will usually be the same in sprinklered buildings with or without roof vents.

At a walking speed of 150 feet per minute (1.70 miles per hour), the time to walk 400 feet is 160 seconds. Depending upon the fire size and ceiling height, roof vents may <u>not</u> even operate prior to the evacuation of the building being completed. Given this, it makes little sense to allow an increase in the travel distance for the installation of roof vents.

It should be noted that if the proposed change to Table 1015.1 (which will permit an exit access travel distance of 400 feet in sprinklered F-1 and S-1 occupancies) is approved, there will be no need for this code section.

**Cost Impact:** The code change proposal will not increase the cost of construction.

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| Public Hearing: | Committee: | AS | AM | D |
| | Assembly: | ASF | AMF | DF |

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# F127–06/07
## 910.3.1 (IBC [F] 910.3.1)

**Proponent:** Rick Thornberry, P.E., The Code Consortium, Inc., representing AAMA Smoke Vent Task Group

**Revise as follows:**

**910.3.1 Design.** Smoke and heat vents shall be listed and labeled ~~to indicate compliance with UL 793~~ <u>for their intended purpose</u>.

**Reason:** This is a follow up code change proposal to Code Change Proposal F167-04/05 which was approved as modified during the last code development cycle. That code change proposal was also submitted by the AAMA Smoke Vent Task Group to further clarify what an approved smoke and heat vent consisted of by referencing appropriate standards. In the 2004 Supplement to the International Codes, Section 910.3.1 stated: "Smoke and heat vents shall be listed and labeled." Previous to that the only requirement for determining if a smoke and heat vent was appropriate for its application was the statement in Section 910.2 that they were required to be "approved" with no specific guidance given. The AAMA Smoke Vent Task Group, which represents the majority of manufacturers of smoke and heat vents, believed that it would be appropriate to provide specific references to standards that are used to list and label smoke and heat vents so that the code enforcer would know what was acceptable. That was the purpose for submitting Code Change F167-04/05. The original code change submittal specified that smoke and heat vents would be listed "to indicate compliance with FM4430, UL793, or an approved equivalent nationally recognized standard."

FM4430 is entitled *Heat and Smoke Vents* and UL793 is entitled *Standard for Automatically Operated Roof Vents for Smoke and Heat.* It was also the intent of that code change proposal by referencing "an approved equivalent nationally recognized standard" to allow smoke and heat vents to be evaluated by the ICC Evaluation Service, Inc. based on UBC Standard 15-7 *Automatic Smoke and Heat Vents* which did not meet the criteria for a consensus standard under the rules of procedure of the ICC but which was being utilized by the legacy evaluation services to evaluate and label smoke and heat vents for compliance with the legacy codes. Unfortunately, FM4430 does not meet the criteria for consensus standards as established by the ICC so the International Fire Code Committee modified the code change proposal to simply reference UL793 which did meet the requirements for a consensus developed standard. The Committee indicated that alternate test methods and standards, such as FM4430 and UBC Standard 15-7, could always be accepted by the code enforcement official based on Section 104.9 Alternate Materials and Methods as meeting the intent of the requirement that they be listed and labeled in accordance with UL793.

However, industry members have since considered this approach and have found it to be unacceptable. It is the industry's belief that code enforcement officials will simply require all smoke and heat vents to be listed and labeled to UL793 without consideration for an alternate test procedure or method as indicated above. This will then require them to approach a jurisdiction on a case by case basis to negotiate an approval, if possible, based on the alternate methods approach. This will make it very impractical to have recognition for smoke and heat vents that are listed and labeled in accordance with FM4430 or UBC Standard 15-7 or are otherwise recognized in an evaluation report issued by the ICC Evaluation Service, Inc.

The major concern the industry has with mandating compliance with UL793 only is that UL793 contains other requirements that are not necessarily applicable to the ultimate performance of a smoke and heat vent for the purpose intended by the International Fire Code (IFC). These can add significant costs to the manufacture of such skylights. This is especially of concern to the industry since they have been manufacturing and selling skylights throughout the country based on both FM4430 and UBC Standard 15-7.

This proposed code change will, in essence, return the code back to what it was in the 2004 Supplement which is still an improvement over what it was in the 2003 edition of the IFC. It will still specify that smoke and heat vents be listed and labeled but, in this case, it will be for their intended

purpose rather than specifically to UL793. Certainly, by providing this approach it will allow smoke and heat vents to be listed and labeled in accordance with UL793 but also with FM4430 or UBC Standard 15-7 based on its incorporation as part of the acceptance criteria for ICC Evaluation Service, Inc. Evaluation Reports. In the interim, the AAMA Smoke Vent Task Group will be developing a consensus based standard through the AAMA ANSI approved standards development process. This standard will incorporate the current practices used by the ICC Evaluation Service, Inc. for evaluating smoke and heat vents for compliance with the IFC. Of course, this process will take some time but it is anticipated that it will be completed in time for the standard to be referenced during the next 18 month code development cycle. Then a new code change proposal can be submitted to incorporate the new standard into the 2009 edition of the IFC. Therefore, we respectfully request that the Committee approve this code change proposal as an interim solution to the industry's problems regarding the manufacture, sales, and use of listed and labeled smoke and heat vents.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F128–06/07
## 910.3.1 (IBC [F] 910.3.1), Chapter 45 (IBC Chapter 35)

**Proponent:** John C. Harrington, FM Global

**1. Revise as follows:**

**910.3.1 Design.** Smoke and heat vents shall be listed and labeled to indicate compliance with UL 793 and FM 4430.

**2. Add standard to Chapter 45 (IBC Chapter 35) as follows:**

Factory Mutual
Standards Laboratories Department
1151 Boston-Providence Turnpike
Norwood, MA 02062

**FM**
4430-1980 – Approval Standard for Heat and Smoke Vents

**Reason:** FM 4430 is an industry accepted listing standard for heat and smoke vents that should be included as an equivalent testing standard to UL 793.

**Cost Impact:** The code change proposal will not increase the cost of construction.

**Analysis:** Results of review of the proposed standard(s) will be posted on the ICC Website by August 20, 2006.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F129–06/07
## 910.3.2.2 (IBC [F]910.3.2.2)

**Proponent:** Kevin Kelly, National Fire Sprinkler Association

**Revise as follows:**

**910.3.2.2 Sprinklered buildings.** Where installed in buildings equipped with an approved automatic sprinkler system, smoke and heat vents shall be designed to operate automatically by actuation of a heat-responsive device rated at least 100˚F (38˚C) above the operating temperature of the sprinkler.

**Exception:** Gravity-operated drop-out vents complying with Section 910.3.2.1.

**Reason:** This criteria will ensure that the sprinkler system has time to open enough sprinklers near the area of the fire origin to control the fire. This information is based on FM criteria.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F130–06/07
## 910 (IBC [F] 910)

**Proponent:** Richard Schulte, Schulte & Associates

**Delete entire section without substitution:**

**~~SECTION 910~~**
**~~SMOKE AND HEAT VENTS~~**

**~~910.1 General.~~** ~~Where required by this code or otherwise installed, smoke and heat vents or mechanical smoke exhaust systems and draft curtains shall conform to the requirements of this section.~~

**~~Exceptions:~~**

1. ~~Frozen food warehouses used solely for storage of Class I and II commodities where protected by an approved automatic sprinkler system.~~
2. ~~Where areas of buildings are equipped with early suppression fast-response (ESFR) sprinklers, automatic smoke and heat vents shall not be required within these areas.~~

**~~910.2 Where required.~~** ~~Smoke and heat vents shall be installed in the roofs of one-story buildings or portions thereof occupied for the uses set forth in Sections 910.2.1 through 910.2.3.~~

**~~910.2.1 Group F-1 or S-1.~~** ~~Buildings and portions thereof used as a Group F-1 or S-1 occupancy having more than 50,000 square feet (4645 $m^2$) of undivided area.~~

**~~Exception:~~** ~~Group S-1 aircraft repair hangars.~~

**~~910.2.2 High-piled combustible storage.~~** ~~Buildings and portions thereof containing high-piled combustible stock or rack storage in any occupancy group when required by Section 2306.7.~~

**~~910.2.3 Exit access travel distance increase.~~** ~~Buildings and portions thereof used as a Group F-1 or S-1 occupancy where the maximum exit access travel distance is increased in accordance with Section 1016.2.~~

**~~910.3 Design and installation.~~** ~~The design and installation of smoke and heat vents and draft curtains shall be as specified in Sections 910.3.1 through 910.3.5.2 and Table 910.3.~~

**~~910.3.1 Design.~~** ~~Smoke and heat vents shall be listed and labeled to indicate compliance with UL 793.~~

**~~910.3.2 Vent operation.~~** ~~Smoke and heat vents shall be capable of being operated by approved automatic and manual means. Automatic operation of smoke and heat vents shall conform to the provisions of Sections 910.3.2.1 through 910.3.2.3.~~

**~~910.3.2.1 Gravity-operated drop out vents.~~** ~~Automatic smoke and heat vents containing heat-sensitive glazing designed to shrink and drop out of the vent opening when exposed to fire shall fully open within 5 minutes after the vent cavity is exposed to a simulated fire represented by a time-temperature gradient that reaches an air temperature of 500°F (260°C) within 5 minutes.~~

**~~910.3.2.2 Sprinklered buildings.~~** ~~Where installed in buildings equipped with an approved automatic sprinkler system, smoke and heat vents shall be designed to operate automatically.~~

**~~910.3.2.3 Nonsprinklered buildings.~~** ~~Where installed in buildings not equipped with an approved automatic sprinkler system, smoke and heat vents shall operate automatically by actuation of a heat-responsive device rated at between 100°F (56°C) and 220°F (122°C) above ambient.~~

**~~Exception:~~** ~~Gravity-operated drop out vents complying with Section 910.3.2.1.~~

**~~910.3.3 Vent dimensions.~~** ~~The effective venting area shall not be less than 16 square feet (1.5 m2) with no dimension less than 4 feet (1219 mm), excluding ribs or gutters having a total width not exceeding 6 inches (152 mm).~~

**~~910.3.4 Vent locations.~~** ~~Smoke and heat vents shall be located 20 feet (6096 mm) or more from adjacent lot lines and fire walls and 10 feet (3048 mm) or more from fire barrier walls. Vents shall be uniformly located within the roof area above high-piled storage areas, with consideration given to roof pitch, draft curtain location, sprinkler location and structural members.~~

~~**TABLE 910.3**~~
~~**REQUIREMENTS FOR DRAFT CURTAINS AND SMOKE AND HEAT VENTS[a]**~~

**(Delete entire table contents)**

~~For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929m2.~~
~~a. Requirements for rack storage heights in excess of those indicated shall be in accordance with Chapter 23. For solid-piled storage heights in excess of those indicated, an approved engineered design shall be used.~~
~~b. The distance specified is the maximum distance from any vent in a particular draft curtained area to walls or draft curtains which form the perimeter of the draft curtained area.~~
~~c. Where draft curtains are not required, the vent area to floor area ratio shall be calculated based on a minimum draft curtain depth of 6 feet (Option 1).~~
~~d. "H" is the height of the vent, in feet, above the floor.~~

~~**910.3.5 Draft curtains.** Where required, draft curtains shall be provided in accordance with this section.~~

~~**Exception:** Where areas of buildings are equipped with ESFR sprinklers, draft curtains shall not be provided within these areas. Draft curtains shall only be provided at the separation between the ESFR sprinklers and the conventional sprinklers.~~

~~**910.3.5.1 Construction.** Draft curtains shall be constructed of sheet metal, lath and plaster, gypsum board or other approved materials that provide equivalent performance to resist the passage of smoke. Joints and connections shall be smoke tight.~~

~~**910.3.5.2 Location and depth.** The location and minimum depth of draft curtains shall be in accordance with Table 910.3.~~

~~**910.4 Mechanical smoke exhaust.** Where approved by the fire code official, engineered mechanical smoke exhaust shall be an acceptable alternative to smoke and heat vents.~~

~~**910.4.1 Location.** Exhaust fans shall be uniformly spaced within each draft-curtained area and the maximum distance between fans shall not be greater than 100 feet (30 480 mm).~~

~~**910.4.2 Size.** Fans shall have a maximum individual capacity of 30,000 cfm (14.2 m³/s). The aggregate capacity of smoke exhaust fans shall be determined by the equation:~~

~~$C = A \times 300$ **(Equation 9-10)**~~
~~where:~~
~~$C$ = Capacity of mechanical ventilation required, in cubic feet per minute (m3/s).~~
~~$A$ = Area of roof vents provided in square feet ($m^2$) in accordance with Table 910.3.~~

~~**910.4.3 Operation.** Mechanical smoke exhaust fans shall be automatically activated by the automatic sprinkler system or by heat detectors having operating characteristics equivalent to those described in Section 910.3.2. Individual manual controls for each fan unit shall also be provided.~~

~~**910.4.4Wiring and control.**Wiring for operation and control of smoke exhaust fans shall be connected ahead of the main disconnect and protected against exposure to temperatures in excess of 1,000°F (538°C) for a period of not less than 15 minutes. Controls shall be located so as to be immediately accessible to the fire service from the exterior of the building and protected against interior fire exposure by fire barriers having a fire resistance rating not less than 1 hour.~~

~~**910.4.5 Supply air.** Supply air for exhaust fans shall be provided at or near the floor level and shall be sized to provide a minimum of 50 percent of required exhaust. Openings for supply air shall be uniformly distributed around the periphery of the area served.~~

~~**910.4.6 Interlocks.** On combination comfort air-handling/smoke removal systems or independent comfort air-handling systems, fans shall be controlled to shut down in accordance with the approved smoke control sequence.~~

**Reason:** The purpose of this proposal is threefold: (1) to eliminate the requirement for roof vents in F-1 and S-1 occupancies, (2) to eliminate the requirement for roof vents in buildings which contain high piled combustible storage and (3) to eliminate the code provisions which permit an increase in travel distance to 400 feet in Group F-1 or S-1 occupancies when sprinkler protection and roof vents/draft curtains are provided.

Buildings which require roof vents will be provided with sprinkler protection. The sprinkler protection by itself will provide adequate occupant fire safety, firefighter safety and property protection to comply with the intent of the code. If the sprinkler protection successfully operates and controls the fire, there is no need to provide roof vents/draft curtains. If the sprinkler protection fails to control the fire, roof vents and draft curtains will provide little in the way of protection for the occupants or the building. Since roof vents/ draft curtains provide little, if any benefit, the cost/benefit ratio is large.

Substantiation: In a memorandum dated September 10, 1999, the American Architectural Manufacturers Association (AAMA) announced the commencement of AAMA Smoke Vent Task Group's research project on the use of smoke/heat vents. The announcement states that the purpose of this research project is to "study the interaction between sprinklers, smoke/heat vents and draft curtains" and "to develop scientifically based engineering design criteria for the installation of draft curtains and vents."

The AAMA memorandum is essentially an admission by the AAMA Smoke Vent Task Group in 1999 that we do not presently have sufficient information on the interaction between sprinklers, smoke/heat vents and draft curtains to utilize smoke/heat and draft curtains in buildings which are protected by sprinklers. Given this admission by the AAMA, it would seem questionable that the International Building Code and International Fire Code should mandate the use of smoke/heat vents and draft curtains in buildings which are protected throughout by a sprinkler system.

To date, the AAMA Smoke Vent Task Group has yet to complete the research project announced in September, 1999.

Chapter 10 in Section 5 of the 15th Edition of the Fire Protection Handbook published by the National Fire Protection Association in 1981 states the following:

"Even though there is no universally accepted conclusion from either fire experience or research, concern has been raised by a recent series of model studies that indicate the following trends when the present Smoke and Heat Venting Guide [NFPA 204M] is implemented:

1. Venting delays loss of visibility;
2. Venting results in increased fuel consumption; and
3. Depending on the location of the fire relative to the vents, the necessary water demand to achieve control is either increased or decreased over an unvented condition. With the fire directly under the vent, water demand is decreased. With the fire equidistant from the vents, water demand is increased."

Chapter 6 in the 1991 edition of NFPA 204M, the Guide for Smoke and Heat Venting, specifically addresses the use of smoke/heat vents in sprinklered buildings. Section 6-1 in this edition of NFPA 204M states the following:

"A broadly accepted equivalent design basis for using both sprinklers and vents together for hazard control (e.g. property protection, l ife safety, water usage, obscuration, etc.) has not been universally recognized."

Section 6-2 in the 1991 edition of NFPA 204M further states the following:

"For occupancies that present a high challenge to sprinkler systems, concern has been raised that inclusion of automatic roof venting may be detrimental to the performance of automatic sprinklers."

In addition to this statement, Chapter 6 in the 1991 edition of NFPA 204M contains the exact same statement quoted above from the 15th edition on the NFPA Fire Protection Handbook.

Chapter 8 in the 1998 edition of NFPA 204 contains the same statements regarding the use of smoke/heat vents in sprinklered buildings as contained in the 1991 edition of NFPA 204M and also the 15th edition of the Fire Protection Handbook. In addition, the 1998 edition of NFPA 204 states the following regarding the use of curtain boards:

"Large-sale fire tests [Troup 1994] indicates that the presence of curtain boards can cause increases in sprinkler operation, smoke production, and fire damage (i.e. sprinklers opened will away from the fire)."

The issue of the use of roof vents in sprinklered buildings is also addressed in Chapter 11 of the 2002 edition of NFPA 204. Section 11.1 in the 2002 edition of NFPA 204 reads as follows:

"Where provided, the design of the venting for sprinklered buildings shall be based on a performance analysis acceptable to the authority having jurisdiction, demonstrating that the established objectives are met."(See Annex F.3.)"

The provisions for roof vents contained in both the International Building Code and the International Fire Code are specification-oriented and do not require a "performance analysis" required by NFPA 204-2002.

Annex F.3 in the 2002 edition of NFPA 204 contains similar statements regarding the use of roof vents in sprinklered buildings as those contained in previous editions of NFPA 204 (and NFPA 204M). In addition, Annex F.3 of the 2002 edition of NFPA 204 includes the following statements:

"Vents that are open prior to sprinkler operation in a region surrounding the ignition point, within a radius of 1-1/2 sprinkler spacings, can interfere with the opening of sprinklers capable of delivering water to the fire."

"Draft curtains can delay or prevent operation and can interfere with the discharge of sprinklers capable of delivering water to the fire."

The above is an indication that, from the early 1980's to the present day, questions still persist about whether it is appropriate to use of smoke/heat vents and draft curtains in buildings which are protected by sprinklers.

The installation of roof vents in sprinklered buildings which contain high-piled storage is also specifically addressed in NFPA 13. Section 7.4.1.3.1 in the 1999 edition of NFPA 13 reads as follows:

"Sprinkler protection criteria is based on the assumption that roof vents and draft curtains are not being used."

Section C-7.4.1.3.1 in the 1999 edition of NFPA 13 also addresses this issue as follows:

". . . The design curves are based upon the absence of roof vents or draft curtains in the building."

Section 2-6.1 in the 1995 edition of NFPA 13E, the Guide for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems states the following with regard to routine ventilation in sprinklered storage buildings:

"Occupancies with a wide variety of configurations and a wide range of storage commodities might need special procedures, particularly where storage heights are in excess of 15 feet. In some cases, routine ventilation procedures in the early stages of a fire can hinder effective sprinkler operation. It is desirable for the fire department to discuss its pre-fire plan for warehouse occupancies with the occupant, sprinkler designer, and insurance carrier to determine if a modification in procedures is appropriate."

Section 2-6.2 in NFPA 13E (1995 edition) further states the following:

"For those cases where search and rescue operations have been completed prior to ventilation work being performed by the fire department, it might be appropriate to allow the automatic sprinklers to continue to operate without further ventilation to enable them to achieve full control of the fire. This might take 20 to 30 min[utes] or more."

The information from NFPA 13E regarding the use of ventilation in storage buildings is further supported by information contained in NFPA 231 and NFPA 231C.

Section 3-2 in the 1998 edition of NFPA 231, the Standard for General Storage, states the following with the respect to the use of smoke/heat vents and draft curtains in sprinklered storage buildings:

"The protection outlined in the standard shall apply to buildings with or without roof vents and draft curtains."

The exception to this section in NFPA 231 states the following:

"Where local codes require heat and smoke vents in buildings that are protected by ESFR sprinklers, the vents shall be manually operated or shall have an operating mechanism with a standard response fusible element that is rated no less that 360F. Drop out vents shall not be permitted."

Section A-3-2 in NFPA 231 provides additional information regarding the use of smoke/ heat vents in sprinklered buildings to which NFPA 231 is applicable. This section states the following:

"Smoke removal is important to manual fire fighting and overhaul. Since most fire tests were conducted without smoke and heat venting, the protection specified in Sections 5-1, 6-1 and 7-1 was developed without the use of such venting. However, venting through eaveline windows, doors, monitors, or gravity or mechanical exhaust systems is essential to smoke removal after control of the fire is achieved. (See NFPA 204, Guide for Smoke and Heat Venting.)"

While section 3-2 in NFPA 231 states that the use of smoke/heat vents is acceptable in buildings where NFPA 231 is applicable, the explanatory material contained in Appendix A of NFPA 231 clearly indicates that the use of manually operated roof vents or some other method of ventilation is preferred. The fact that this exception regarding the use of vents with ESFR sprinklers is included in NFPA 231 is an admission that heat/roof vents can affect the operation of ESFR sprinklers. Given the exception to section 3-2 in NFPA 231, along with the information on venting in sprinklered buildings provided in NFPA 204, certainly the wisdom of providing automatic smoke/heat vents in buildings protected by standard sprinklers should be questioned.

NFPA 231C, the Standard for Rack Storage of Materials, also addresses the use of smoke/ heat vents in sprinklered buildings. Section 3-3 in the 1998 edition of NFPA 231C reads as follows:

"Design curves are based on the assumption that roof vents and draft curtains are not being used."

Explanatory material provided in section B-3-3 in NFPA 231 provides further information on the use of smoke/heat vents in sprinklered storage buildings which contain storage racks. This section reads as follows:

"Tests were conducted as a part of this program with eave line windows and louvers open to simulate smoke and heat venting. These tests opened 87.5 percent and 91 percent more sprinklers that did comparative tests without windows and louvers open. Venting tests that have been conducted in other programs were without the benefit of sprinkler protection and, as such, are not considered in this report, which covers only buildings protected by sprinklers. The design curves are based upon the absence of roof vents or draft curtains in the building. During mop-up operations, ventilating systems, were installed, should be capable of manual exhaust operations."

NFPA 231C also contains information on fire department operations for buildings protected by sprinkler systems designed to comply with NFPA 231C. Section A-12-6 in NFPA 231C reads as follows:

"Sprinkler protection installed as required in this standard is expected to protect the building occupancy without supplemental fire department activity. Fires that occur in rack storage occupancies are likely to be controlled within the limits outlined in B-1.1, since no significant building damage is expected. The first fire department pumper arriving at a rack storage-type fire should connect immediately to the sprinkler siamese fire department connection and start pumping operations.

In the test series for storage up to 25 ft [feet], the average time from ignition to smoke obscuration in the test building was about 13 minutes. The first sprinkler operating time in these same fires averaged about 3 minutes. Considering response time for the waterflow device to transmit a waterflow signal, approximately 9 minutes remains between the time of receipt of a waterflow alarm signal at fire department headquarters and the time of smoke obscuration with the building as an overall average.

In the test series for storage over 25 ft [feet], the visibility time was extended. If the fire department or plant protection department arrives at the building in time to have sufficient visibility to locate the fire, suppression activities with small hose lines should be started. . . . . .Manual fire-fighting operations in such a warehouse should not be considered a substitute for sprinkler operation.

Smoke removal capability should be provided. Examples of smoke removal equipment include:

(a) Mechanical air-handling systems
(b) Powered exhaust fans
(c) Roof-mounted gravity vents
(d) Perimeter gravity vents

Whichever system is selected, it should be designed for manual actuation by the fire department, thus allowing personnel to coordinate the smoke removal (ventilation) with mop-up operations."

During the testing program, the installed automatic extinguishing system was capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition. Ventilation operations and mop-up were not started until this point. The use of smoke removal equipment is important."

While it has been stated by proponents of heat/smoke vents that the use of eave line windows is different from the operation of automatic smoke/heat vents, the explanatory materials contained in NFPA 231C clearly states that automatic venting should not be provided. Given the explanatory material cited above, it can be concluded that providing automatic smoke/heat vents in a building which is required to comply with NFPA 231C is, in fact, a violation of NFPA 231C.

The purpose of providing heat/smoke vents in a storage building is to vent both heat and smoke to improve visibility within the building and prevent structural damage to the roof of the building. Venting heat and smoke from the building will more safely permit the fire department to enter the building and attack the fire. Given the information provided in both NFPA 13E and in NFPA 231C, the question is why should the fire department enter the building to attack the fire. NFPA 231C clearly indicates that a sprinkler system designed per NFPA 231C is "capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition." If the sprinkler system is capable of achieving this level of control, why should the fire department enter the building and put its personnel at risk? Providing smoke/heat vents in the building encourages fire department personnel to enter the building and puts firefighters at risk.

Recently (April 2005), the National Institute of Occupational Safety and Health (NIOSH) issued a NIOSH Alert titled "Preventing Injuries and Deaths of Firefighters Due to Truss System Failures". Page 7 of the NIOSH Alert includes the following statement:

"Fire fighters should be discouraged from risking their lives solely for property protection activities."

Given that sprinkler protection is "capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition" and that "fire fighters should be discouraged from risking their lives solely for property protection activities" means that the proper fire fighting strategy in large one story industrial and storage buildings is to delay manual fire fighting activity for a period of at least 30 minutes to allow the sprinkler system to extinguish the fire. In the event that the sprinkler system fails to control and extinguish the fire, no interior manual fire fighting should be attempted merely to protect property. Hence, there is no need to provide roof vents to assist fire fighting in large industrial and storage buildings.

Factory Mutual's opinion of the use of automatic smoke/heat vents is expressed by the following excerpt from FM Data Sheet 8-33 dated January, 1984:

"Factory Mutual recommended protection is based on roof vents and draft curtains not being provided. Fire tests have not shown automatic vents to be cost effective and they may even increase sprinkler water demand. Hence, permanent heat and smoke vents, if any, should be arranged for manual operation. Smoke removal during mop-up operations can frequently be achieved through eave-line windows, doors, monitors, non-automatic exhaust systems (gravity or mechanical), or manually operated heat and smoke vents. Fire departments can cut holes in steel or wood roofs and also use their smoke exhausters."

If the premier property insurer in the United States is on record as stating that the installation of smoke/heat vents is not cost effective (as early as 1984), then the question should be asked-why should the membership of the International Code Council mandate this fire protection technology?

Prior to the development of the International Fire Code, two of the three model fire prevention codes used in the United States, the Uniform Fire Code and the Standard Fire Prevention Code, required the installation of the smoke/heat vents in large storage buildings, while the third model fire prevention code, the BOCA National Fire Prevention Code, did not include requirements for smoke/heat vents. Given this, it should be a relatively easy research task to compare the property losses from fires in storage buildings in jurisdictions using the BOCA National Fire Prevention Code and the losses from fire in storage buildings located in jurisdictions using the two other model fire prevention codes. If the fire loss statistics for storage buildings in BOCA jurisdictions is not significantly higher than the fire loss statistics in ICBO and SBCCI jurisdictions, this would be an indication that the installation of smoke/heat vents is simply not effective. Prior to commencing the AAMA study of smoke/heat vents, the AAMA should concentrate on providing statistics which demonstrate the effectiveness of vents.

Given the technical information presented above, along with the fact that the manufacturers of smoke/heat vents have presented no statistics that their products are, in fact, effective at reducing property losses, the membership of the ICC should remove the requirements for smoke/heat vents (until such time as the industry provides conclusive proof that vents actually work as represented).

The fire protection field has wrestled with this issue for more that 30 years. There is absolutely no reason why the vent industry couldn't have conducted its proposed research 25 years ago. Eliminating the requirement for vents in the code should be an incentive for the vent manufacturers to quickly complete its testing program and provide conclusive proof one way or the other on the need for vents.

It should be noted that a similar proposal to delete the requirements for roof vents was submitted to the ICC in 2000 (Birmingham, Alabama). The committee hearing this proposal voted to deny the proposal given that the vent industry was involved in a testing program announced in September 1999. Since the committee's denial of this proposal, the vent industry has not published any results from their research program. This fact is a tantamount admission by the vent industry that the proposal to eliminate the requirement for roof vents in sprinklered buildings has merit.

It is my opinion that the installation of roof vents and draft curtains in sprinklered buildings is in the realm of "junk science". In the absence of the independent research which conclusively demonstrates that the installation of roof vents and draft curtains is not only not detrimental to the operation of sprinklers, but is also effective, the requirements for the installation of roof vents and draft curtains should be removed from both the IBC and the IFC.

**Bibliography:**

Fire Protection Handbook-15th Edition (1981)
FM Data Sheet 8-33, January, 1984
NFPA 13, 1999 edition
NFPA 13E, 1995 edition
NFPA 204M, 1991 edition
NFPA 204, 1998 edition.
NFPA 204, 2002 edition.
NFPA 231, 1998 edition
NFPA 231C, 1998 edition
"Preventing Injuries and Deaths of Firefighters Due to Truss System Failures, NIOSH Alert, April 2005

**Cost Impact:** The code change proposal will not increase the cost of construction.

| Public Hearing: | Committee: | AS | AM | D |
|---|---|---|---|---|
| | Assembly: | ASF | AMF | DF |

# F131–06/07
## Table 911.1 (IBC [F] Table [F] 414.5.1)

**Proponent:** Patrick A. McLaughlin, McLaughlin & Associates, representing The Sherwin Williams Company

**Revise table as follows:**

**TABLE 911.1 (IBC [F] Table 414.5.1)**
**EXPLOSION CONTROL REQUIREMENTS**

| MATERIAL | CLASS | EXPLOSION CONTROL METHODS | |
|---|---|---|---|
| | | Barricade construction | Explosion (deflagration) venting or explosion (deflagration) prevention systems |
| | **Hazard Category** | | |
| Flammable liquids | IA [b] | Not required | Required |
| | IB [c, f] | Not required | Required |

a. through e. (No change to current text)

f. Explosion control is allowed to be deflagration prevention, including reduction of combustible or oxidant concentration, any method complying with NFPA 69 or an approved engineering method.

(The new footnote will be footnote h. in the *International Building Code*)

(Portions of table and footnotes not shown do not change)

**Reason:** The proposal will coordinate the IFC, IBC and NFPA 30 requirements for explosion control by specifying the methods by which explosion control for flammable liquid can be provided.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F132–06/07
## 912.2 (IBC [F] 912.2)

**Proponent:** Greg Rogers, South Kitsap Fire & Rescue, representing ICC Joint Fire Service Review Committee

**Revise as follows:**

**912.2 Location.** With respect to hydrants, driveways, buildings and landscaping, fire department connections shall be so located that fire apparatus and hose connected to supply the system will not obstruct access to the buildings for other fire apparatus. The location of fire department connections shall be approved by the fire code official.

**Reason:** The proposal will correlate this section with the approval language in Sections 912.2.1 and 912.2.2.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F133–06/07
## 912.3, 912.3.2 (New), 912.3.3 (New) [IBC [F] 912.3, [F] 912.3.2 (New), [F] 912.3.3 (New)], IFC 508.5.4

**Proponent:** Greg Rogers, South Kitsap Fire & Rescue, representing ICC Joint Fire Service Review Committee

**1. Revise as follows:**

**912.3 Access.** Immediate access to fire department connections shall be maintained at all times and without obstruction by fences, bushes, trees, walls or any other fixed or moveable object ~~for a minimum of 3 feet (914 mm)~~. Access to fire department connections shall be approved by the fire code official.

**Exception:** Fences, where provided with an access gate equipped with a sign complying with the legend requirements of Section 912.4 and a means of emergency operation. The gate and the means of emergency operation shall be approved by the fire code official and maintained operational at all times.

**2. Add new text as follows:**

**912.3.2 Clear space around connections.** A working space of not less than 36 inches (762 mm) in width, 36 inches (914 mm) in depth and 78 inches (1981 mm) in height shall be provided and maintained in front of and to the sides of wall-mounted fire department connections and around the circumference of free-standing fire department connections, except as otherwise required or approved by the fire code official.

**912.3.3 Physical protection.** Where fire department connections are subject to impact by a motor vehicle, vehicle impact protection shall be provided in accordance with Section 312.

**3. Revise as follows:**

**508.5.4 Obstruction.** Unobstructed access to fire hydrants shall be maintained at all times. ~~Posts, fences, vehicles, growth, trash, storage and other materials or objects shall not be placed or kept near fire hydrants, fire department inlet connections or fire protection system control valves in a manner that would prevent such equipment or fire hydrants from being immediately discernible.~~ The fire department shall not be deterred or hindered from gaining immediate access to fire protection equipment or fire hydrants.

**Reason:** The phrase "...for a minimum of 3 feet..." was added by code changes F830-98 and F831-98 as a means of correlating with IFC Section 508.5.5 - Clear space around hydrants. The added phrase, however, can be and has been literally interpreted as allowing obstructions to fire department connection (FDC) access to exist as long as they are kept 3 feet away from the FDC.

The suggested solution clarifies the intent of the section by deleting the conflicting text from Section 912.3 and adding recognition that the obstructing objects regulated here can be either fixed or moveable (such as outdoor furnishings, shopping cart queue areas, etc.). A new sentence is also suggested that reinforces the approval process by the fire code official.

The suggested solution also includes an exception that recognizes the practical fact that sometimes, security or other considerations make installation of a fence around a building necessary as long as the fence meets the stated criteria. The sign requirement intends to provide a visual location cue to approaching fire apparatus where the height of the fence may obscure the visibility of the FDC. The text of the exception is based on IFC Section 503.6.

The suggested solution, in new Sections 912.3.2 and 912.3.3, includes text that is more reflective of the intent of the deleted phrase from Section 912.3 (and the intent of Section 508.5.5) and provides added protection consistent with Sections 508.5.6 and 312.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F134–06/07
## Table 1027.17.2

**Proponent:** William E. Koffel, P.E., Koffel Associates, Inc.

**Revise table as follows:**

**TABLE 1027.17.2**
**COMMON PATH, DEAD-END AND TRAVEL DISTANCE LIMITS (by occupancy)**

| OCCUPANCY | DEAD-END LIMIT | |
|---|---|---|
| | Unsprinklered (feet) | Sprinklered (feet) |
| Group E | 20 | ~~20~~ 50 |
| Group I-1 | 20 | ~~20~~ 50 |
| Group U | 20 | ~~20~~ 50 |

(Portions of table and footnotes not shown do not change)

**Reason:** The allowance of 50 foot dead-end corridors in fully sprinkler protected Group E, Group I-1, and Group buildings is consistent with other national codes, including the 2006 Edition of NFPA 101 Table A.7.6, the 2006 Edition of NFPA 5000, and the 2006 Edition of the International Existing Building Code (2006 IEBC). In other than Group A and H occupancies, the 2006 IEBC permits newly created dead-end corridors of 50 feet on floors protected with an automatic sprinkler system in accordance with the 2006 International Building Code (IBC) for Alterations – Level 2 (605.6 exc. 4) and Alterations – Level 3 (705.1). In addition, Section 812.4.1.1 (Means of egress for change in occupancy to higher hazard) of the 2006 IEBC references Section 605.6 for existing dead-end corridors. Further, when the change of occupancy complies with Section 812.3 of the 2006 IEBC, Section 812.4.1.2 (Means of egress for change of use to equal or lower hazard category) of the 2006 IEBC allows existing dead-end corridors no matter what length to remain regardless of the presence of an automatic sprinkler system. Section 1027.17.2 of the 2006 IFC permits dead-end corridors of 50 feet in buildings with an automatic sprinkler system in accordance with the 2006 IFC.

Once a new building is given its Use & Occupancy approval, any future work in the building can reference the 2006 IEBC and 2006 IFC requirements. The lack of conformity between the dead-end corridor requirements of the 2006 IFC and the 2006 IEBC creates a conflict when future Alteration level work occurs. Amending Table 1027.17.2 of the 2006 IFC to allow 50 foot dead-end corridors in Group E, Group I-1 and Group U buildings, where the building is protected throughout with an automatic sprinkler system in accordance with NFPA 13 requirements allows for consensus between the 2006 IFC and the 2006 IEBC.

Group U buildings historically do not have significant occupant loads. Occupant load factors and travel distance limitations are consistent with Group F and S occupancies as indicated in Table 1004.1.1 and Table 1016.1 of the 2006 IFC. Further, Table 1027.17.2 of the 2006 IFC permits 50 foot dead-end corridors for Group F and S occupancies regardless of the presence of an automatic sprinkler system. Group U buildings also tend to be smaller than Group F and S buildings.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F135–06/07
## 1027.22 (New), 1027.22.1 (New)

**Proponent:** William M. Connolly, State of New Jersey, representing International Code Council Ad Hoc Committee on Terrorism Resistant Buildings

**Revise as follows:**

**1027.22 Exit path markings.** Exit path markings shall comply with 1027.22.1.

**1027.22.1 Obstacles.** Obstacles at or below 6 feet 6 inches (1981 mm) in height and projecting more than 4 inches (102 mm) into the egress path shall be outlined with stripes not less than 1 inch (25 mm) in width comprised of a pattern of alternating equal bands of material and black with the alternating bands not more than 2 inches (51 mm) thick and angled at 45 degrees.

**Reason:** This code change proposal is one of fourteen proposals being submitted by the International Code Council Ad Hoc Committee on Terrorism Resistant Buildings.

This code change is a companion change to the IFC for exit path markings (see proposal for IBC, Section 403.15 (new); Section 1011.6 (new); Section Chapter 35 (new)). This proposed change incorporates limitations on overhead obstructions and is included in the IFC only because there will be no overhead obstructions in a new building.

In the City of New York, after the first bombing of the WTC, requirements were instituted to require exit path markings in vertical exit enclosures. This proposal is taken directly from those requirements.

**Bibliography**:

1. National Institute of Standards and Technology. Final Report of the National Construction Safety Team on the Collapses of the World Trade Center Towers. United States Government Printing Office: Washington, D.C. September 2005.
2. Reference Standard 6-1, Photoluminescent exit path markings as required by Local Law 26 of 2004, New York City Building Code, § 27-383(b)
3. UL 1994-05 Luminous Egress Path Marking Systems


**Cost Impact:** This proposal establishes a requirement for markings in vertical exit enclosures, which may increase costs, but only very modestly. The proponents believe that the decrease in egress and full building evacuation time outweighs the moderate cost of the markings.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F136–06/07
## 1028.2

**Proponent:** Ralph Vasami, The Kellen Company, representing the Door Safety Council

**Revise as follows:**

**1028.2 Reliability.** Required exit accesses, exits or exit discharges shall be continuously maintained free from obstructions or impediments to full instant use in the case of fire or other emergency when the areas served by such exits are occupied.

**Exception:** Security devices affecting means of egress shall be allowed only when approved by ~~subject to approval of~~ the fire code official.

**Reason:** This proposal will clarify the requirement for means of egress maintenance. The IFC text has been the subject of several recent proposals and public comments due to the apparent contradiction in the existing language. By moving the security device requirement to an exception, the intent of the code is more clearly realized; exits shall be kept free unless the fire code official specifically approves such security device. The proposed language will place proper emphasis on the role of the fire code official and the need for careful consideration of any impediment to safe egress.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F137–06/07
## 1028.4

**Proponent:** Lawrence Brown, CBO, National Association of Home Builders

**Revise as follows:**

**1028.4 Exit signs.** Exit signs shall be installed and maintained in accordance with Section 1011. Decorations, furnishings, equipment or adjacent signage that impairs the visibility of exit signs, ~~creates confusion~~ or prevents identification of the exit shall not be allowed.

**Reason:** The word "confusion" is shown to be deleted because, without a direct provision in the IFC citing what constitutes "confusion", this provision is arbitrary and may ultimately be enforceable. The remaining provision of requiring the exit sign to be "visible" and "identifiable", directly relates with the provisions of Section 1011.1 for the exit sign to be "readily visible from any direction of egress travel."

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F138–06/07
## 1028.5 (New)

**Proponent:** A. Hal Key, P.E., Mesa, AZ, representing himself

**Add new text as follows:**

**1028.5 Non-exit identification.** When in the opinion of the fire code official, a door is arranged, constructed similar to, or can be confused with an exit door, that door shall be identified with an approved sign reading "No Exit."

(Renumber subsequent sections)

**Reason:** Many times doors look like exit doors and those doors do not lead to an egress path. In may cases, these doors only open into rooms with no other way out. This added section will permit the fire code official to require the non-exit door signage. This added section is not intended to be included in the new construction requirements for a building due to the difficulty in determining the confusion between exit doors and non-exit door during the plan review process. This added section is intended for the Fire Code Official during maintenance inspections when the confusion becomes apparent.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F139–06/07
## 1028.8 (New)

**Proponent:** Wayne R. Jewell, CBO, Chairman, ICC Hazard Abatement in Existing Buildings Committee

**Revise as follows:**

**1028.8 Unsafe conditions.** The following conditions shall be deemed unsafe and shall be replaced or repaired to comply with Section 1003 through 1026, except as amended in Section 1027:

1. The width of a means of egress is reduced such that it inhibits safe passage;
2. Ceiling surfaced have evidence of wear, improper height or deterioration such that they inhibit safe passage;
3. Protruding objects of improper height or deterioration such that they inhibit safe passage;
4. Floor surfaces that have evidence of wear or deterioration such that they inhibit safe passage;
5. Exit signs and markings that are not functioning or have become dislodged or blocked;
6. Means of egress illumination that is not functioning or has become dislodged or blocked;
7. Guards or handrails that have evidence of wear or deterioration such that they inhibit safe passage;
8. Means of egress components, including but not limited to, doors, gates, stairs, ramps and exterior balconies that are not capable of providing safe passage.

**Reason:** The ICC Board approved the development of a new code with the scope including a compilation of current provisions in the I-Codes which address hazards such as those from fire as well as the development of new requirements relative to issues such as hazardous conditions due to structural issues. This would provide a single source code book for all disciplines to be used by building owners to bring their existing building stock up to minimum standards and enforcing agencies when performing inspections of existing buildings. The Hazard Abatement of Existing Buildings Committee (HAEB) was formed to develop this code.

During this 06/07 cycle, the committee is proposing multiple unsafe conditions requirements for inclusion within the text of the existing International Codes, predominately the *International Property Maintenance Code* and the *International Fire Code*. These requirements will later be extracted from these International Codes and placed into a new International Code dealing primarily with unsafe conditions and the abatement thereof. It is intended that the maintenance of these provisions remain with the committee of origin. The draft of this new International Code is currently scheduled to be put through the 07/08 code change process for both public proposals and public comments. The first edition of this new code is currently scheduled for 2009.

The purpose of this proposal is to add a new section that is intended to clarify to code officials, designers, contractors and property owners the minimum maintenance requirements for all components of the means of egress and if they are not maintained they should be considered unsafe and replaced or repaired. Presence of violations in this area represent such significant hazard that their presence makes occupancy of the building or portion there of unsafe.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F140–06/07
## 1106.5.1

**Proponent:** Anthony W. Richter, The Boeing Company

**Revise as follows:**

**1106.5.1 Positioning of aircraft fuel servicing vehicles.** Aircraft fuel~~ing~~ servicing vehicles shall not be located, parked or permitted to stand in a position where such unit would obstruct egress from an aircraft should a fire occur during fuel-transfer operations. ~~Tank vehicles shall not be located, parked or permitted to stand under any portion of an aircraft.~~

**Reason:** The general requirement for tank vehicles to not be located, parked or permitted to stand under any portion of an aircraft is overly restrictive and unenforceable. Depending on any one of a number of factors to include, the size of the aircraft, the location of fuel inlets and the length of hose on the tank truck, will dictate where aircraft fuel servicing vehicles are necessarily located. Approval of this proposed code change would reflect standard industry practices and eliminate a burdensome, unenforceable provision.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F141–06/07
## 1413.1 (IBC [F] 3311.1)

**Proponent:** John Berry, Cole + Russell Architects, Inc.

**Revise as follows:**

**1413.1 (IBC [F] 3311.1) Where required.** In buildings ~~four or more stories in height shall be provided with~~ required to have standpipes by Section 905.3.1, not less than one standpipe shall be provided for use during construction. Such standpipes shall be installed when the progress of construction is not more than 40 feet (12 192 mm) in height above the lowest level of fire department vehicle access. Such standpipe shall be provided with fire department hose connections at accessible locations adjacent to usable stairs. Such standpipes shall be extended as construction progresses to within one floor of the highest point of construction having secured decking or flooring.

**Reason:** The proposed text ties Sections 1413.1 and 905.3.1 together to clarify that the building first must need a standpipe based on Section 905.3.1. If the building is required to have standpipes, then one of those standpipes must be provided during construction per Section 1413.1. The proposed text does not alter the intent of the code, but rather clarifies it. The addition of the word “vehicle” merely coordinates the language used elsewhere in the code.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F142–06/07
## 1417.1

**Proponent:** Greg Rogers, South Kitsap Fire & Rescue, representing ICC Joint Fire Service Review Committee

**Revise as follows:**

**1417.1 General.** Roofing operations utilizing heat-producing systems or other ignition sources shall be conducted in accordance with Chapter 26. ~~performed by a contractor licensed and bonded for the type of roofing process to be performed~~.

**Reason:** Fire Code is not and should not be responsible for ensuring the proper licensing of contractors. IFC Chapter 26 is also an appropriate reference for roofing operations.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F143–06/07
## 1504.3.2.6

**Proponent:** Robert J. Davidson, Davidson Code Concepts, LLC, representing himself

**Revise as follows:**

**1504.3.2.6 Size.** The aggregate area of spray booths in a building shall not exceed the lesser of 10 percent of the area of any floor of a building or the basic area allowed for a Group H-2 occupancy without area increases, as set forth in the *International Building Code*. ~~The area of an individual spray booth in a building shall not exceed the lesser of the aggregate size limit or 1,500 square feet (139 m2)~~.

**Exception:** One individual booth not exceeding 500 square feet (46 $m^{2)}$.

**Reason:** The existing language in Section 1504.1.2.6 for spray booths limits the size of the largest individual spray booth to 1,500 square feet (139 $m^2$). Since there is no requirement for spray booths to be enclosed with fire barriers what effect does limiting the size of an individual booth have should a fire occur? In researching this issue I could not identify a technical basis for this limitation.

In comparison, a review of Section 1504.3.3 identifies that there is no limit to the size of a spraying space. Since spraying spaces are not required to be enclosed and spray booths are enclosed there appears to be no technical basis for limiting the size of an individual spray booth. In actuality, the use of a spray booth will do a better job of defining and containing the area used for the application of the flammable finishes and would be a preferred method of protection.

In practical application, by leaving in the language limiting the aggregate area to not exceed the lesser of 10 percent of the area of any floor of a building or the basic area allowed for a Group H-2 occupancy without area increases the largest booth would not exceed 2,100 square feet if in a Type IA constructed building or 1,650 square feet for a Type IB constructed building and continues to reduce in size as the type of construction is reduced. This further indicates that there is no technical need for the 1,500 square foot individual booth limitation and the proposal will delete that sentence without substitution.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F144–06/07
## 1506.2, 1506.3

**Proponents:** Gregory G. Victor, Fire Department, Glendale, AZ; Elley Klausbruckner, Klausbruckner & Associates

**Revise as follows:**

**1506.2 Location.** Powder coating operations shall be conducted in enclosed <u>powder coating</u> rooms<u>, enclosed powder coating facilities which are ventilated, or ventilated spray booths</u> ~~constructed and protected in accordance with Section 1506~~.

**1506.3 Construction of powder coating rooms and booths.** Powder coating rooms ~~and booths~~ shall be constructed of noncombustible materials~~,~~<u>.</u> ~~enclosed powder coating facilities which are ventilated, or ventilated~~ ~~s~~ <u>S</u>pray booths <u>shall be constructed in accordance</u> ~~complying~~ with Section 1504.3.2.

**Exception:** Listed spray-booth assemblies that are constructed of other materials shall be allowed.

**Reason:** The new format of Chapter 15 as approved by the membership is as follows:

1. General
2. Location
3. Construction & Equipment
4. Fire Protection
5. Housekeeping, maintenance and storage of hazardous materials
6. Sources of Ignition
7. Ventilation
8. Interlocks
9. Additional Specific

It came to our attention that the current text as published in the 2006 first edition appears to be incorrect since it does not seem to make sense. A review to the text as well as the original submittals and other communications that the current text appears to be the result of a word processing snafu. This proposal will revise the text of 1506.2 and 1506.3 to reflect the original intent, which was to incorporate the requirements found in old Section 1507.2 and split the location & construction requirements to meet the new format of Chapter 15 without changing the content of the original section.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F145–06/07
## 1507.2, 1507.3, 1507.3.1, 1507.5.1

**Proponent:** Anthony W. Richter, The Boeing Company

**Revise as follows:**

**1507.2 Location and clear space.** A space of at least twice the sparking distance shall be maintained between goods being painted or deteared and electrodes, electrostatic atomizing heads or conductors. A sign stating the sparking distance shall be conspicuously posted near the assembly.

**Exception**: Portable electrostatic paint-spraying apparatus approved for use in Class I, Division 1 locations.

**1507.3 Construction of equipment.** Electrodes and electro-static atomizing heads shall be of approved construction, rigidly supported in permanent locations and effectively insulated from ground. Insulators shall be nonporous and non-combustible.

**Exception**: Portable electrostatic paint-spraying apparatus approved for use in Class I, Division 1 locations.

**1507.3.1 Barriers.** Booths, fencing, railings or guards shall be placed about the equipment such that either by their location or character, or both, isolation of the process is maintained from plant storage and personnel. Railings, fencing and guards shall be of conductive material, adequately grounded, and shall be at least 5 feet (1524 mm) from processing equipment.

**Exception**: Portable electrostatic paint-spraying apparatus approved for use in Class I, Division 1 locations.

**1507.5.1 Maintenance.** Insulators shall be kept clean and dry. Drip plates and screens subject to paint deposits shall be removable and taken to a safe place for cleaning. Grounds and bonding means for the paint-spraying apparatus and all associated equipment shall be periodically cleaned and maintained free of overspray.

**Reason:** Portable electrostatic spray guns have been listed and approved by recognized testing laboratories for many years and are in use in commercial/industrial applications throughout the United States. These units are approved for use in Class I, Division I, Group D environments and they do not create an ignition source from potential sparking. Such units are designed to preclude sparking when the spray gun is moved directly against the object being sprayed. The requirements to install barriers, provide signs, and require general isolation of equipment does not improve the safety of this category of equipment and hampers its use by industry.

On the other hand, it is felt that a general safety requirement for all paint spraying operations is currently lacking in the IFC. And that deals with the fact that all electrostatic spray equipment requires that grounding and bonding means be properly maintained free of overspray so as to preclude the potential injury to employees or the creation of potential fire hazards caused by the electric charge of objects through the Leyden jar effect.

The purpose of this proposal is to update IFC provisions by recognizing standard industry practice and increase safety of spray painting operations through increased maintenance requirements.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F146–06/07
## 1802.1

**Proponent:** Pat McLaughlin, McLaughlin & Associates, representing Semiconductor Industry Association

**Delete definition without substitution:**

**1802.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

~~**HPM FLAMMABLE LIQUID.** An HPM liquid that is defined as either a Class I flammable liquid or a Class II or IIIA combustible liquid.~~

**Reason:** The definition of HPM [materials having a degree-of-hazard rating in health, flammability or reactivity of Class 3 or 4] conflicts with the definition of HPM Flammable Liquid that includes not only Class 3 flammability ranked liquids but also Class 1 & 2 flammability liquids. Table 1805.2.2 is the only place in the code where materials having hazard level ranking of 1 and 2 are or can be considered HPM. There does not appear to be any data showing that flammability hazard level ranking 1 and 2 liquids are a safety issue and many local jurisdictions agree that the definition of HPM Flammable Liquid is inconsistent and conflicts with the definition of HPM.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F147–06/07
## 1803.13.2 (IBC [F] 415.8.7.2), 3704.2.2.10

**Proponent:** Pat McLaughlin, McLaughlin & Associates, representing Semiconductor Industry Association

**Revise as follows:**

**1803.13.2 Gas detection system operation.** The continuous gas detection system shall be capable of monitoring the room, area or equipment in which the gas is located at or below the ~~permissible exposure limit (PEL) or ceiling limit of the gas for which detection is provided~~ following gas concentrations:

1. Immediately dangerous to life and health (IDLH) values when the monitoring point is with an exhausted enclosure, ventilated enclosure or gas cabinet.
2. Permissible exposure limit (PEL) levels when the monitoring point is an area outside an exhausted enclosure, ventilated enclosure or gas cabinet.
3. For flammable gases, the monitoring detection threshold level shall be vapor concentrations in excess of ~~20~~ 25 percent of the lower flammable limit (LFL) when the monitoring is within or outside an exhausted enclosure, ventilated enclosure or gas cabinet.
4. Monitoring for highly toxic and toxic gases shall also comply with Chapter 37.

**3704.2.2.10 Gas detection system**. A gas detection system shall be provided to detect the presence of gas in the room, area or equipment in which the gas is located at or below the ~~permissible exposure limit (PEL) or ceiling limit of the gas for which detection is provided~~. following gas concentrations:

1. Immediately dangerous to life and health (IDLH) values when the monitoring point is with an exhausted enclosure, ventilated enclosure or gas cabinet.
2. Permissible exposure limit (PEL) levels when the monitoring point is an area outside an exhausted enclosure, ventilated enclosure or gas cabinet.
3. The system shall be capable of monitoring the discharge from the treatment system at or below one-half the IDLH limit.

   **Exception:** A gas detection system is not required for toxic gases when the physiological warning threshold level for the gas is at a level below the accepted PEL for the gas.

**Reason:** The ACGIH has announced that it is considering lowering the arsine TLV from its current value of 50 ppb to 5 ppb. IFC section 3704.2.2.9 requires gas detection to detect a leak at or below the Permissible Exposure Limit (PEL). This exposure limit regulated by OSHA to prevent adverse health effects and is the breathing zone exposure limit for employees over an 8-hr time weighted average. A great percentage of existing gas detection technology would not be capable of detecting at arsine TLV of 5 ppb. SIA is concerned that if these TLV's are promulgated by OSHA as revised PEL's (TLV's have been the past origin of PEL's), that new detection equipment would have to be retrofitted in existing fabs at significant cost and with little real improvement to personnel safety since all HPM gases are located inside exhausted enclosures, ventilated enclosures or gas cabinets which are designed to contain a worst case release. In most cases, gas detection in the semiconductor industry is conducted in an exhausted enclosure, ventilated enclosure or gas cabinet and not in the breathing zone of the employee, and is designed to detect and alert employees of leaks inside exhausted enclosures, ventilated enclosures or gas cabinets and is not intended to estimate potential employee breathing zone exposures. The semiconductor industry addressed this by codifying NFPA 318, Section 10.9 to differentiate gas detection set points in exhausted enclosures (set at the IDLH) with gas detection when the monitoring point is in an area outside an exhausted enclosure, ventilated enclosure or gas cabinet. The purpose of the change will be to harmonize the IFC with NFPA 318, Section 10.9 (see below) guidelines that are much more relevant to the type of monitoring performed in the semiconductor manufacturing (inside exhausted enclosures, ventilated enclosures or gas cabinets). Monitoring in the semiconductor industry is designed to detect and alert employees of leaks inside exhausted enclosures, ventilated enclosures and gas cabinets and is not intended to estimate potential employee breathing zone exposures. Therefore, set points are not required or recommended to be set at occupational exposure limits (e.g. TLVs or PELs).
Additionally, the change from 20% LFL to 25% LFL will create consistency with both IMC, Section 510.2 and NFPA 318, Section 10.9.

**NFPA 318 Extracts for Gas-Detection**

**10.9 Gas-Detection Systems.**

**10.9.1 General.** A gas-detection system shall be provided for hazardous chemical gases when the physiological warning properties of the gas are at a higher level than the accepted permissible exposure limit (PEL) for the gas, for flammable gases, and for pyrophoric gases.

**10.9.2 Where Required.**
10.9.2.1 Fabrication Areas. A gas-detection system shall be provided in fabrication areas at locations in the fabrication area where gas is used or stored.
10.9.2.2 Hazardous Chemical Rooms. A gas-detection system shall be provided in hazardous chemical storage and dispensing rooms when hazardous gas is in use in the room.
10.9.2.3 Gas Cabinets, Exhausted Enclosures, and Gas Rooms.
10.9.2.3.1 A gas-detection system shall be provided in gas cabinets and exhausted enclosures.
10.9.2.3.2 A gas-detection system shall be provided in gas rooms when gases are not located in gas cabinets or exhausted enclosures.

**10.9.3 Gas-Detection System Operation.**
**10.9.3.1 Monitoring.** Gas-monitoring equipment, when required by this standard to warn of the presence of leaked gas, shall be capable of detection and alarm initiation at or below the following gas concentrations:
(1) Immediately dangerous to life or health (IDLH) values when the monitoring point is within an exhausted enclosure
(2) PEL levels when the monitoring point is in an area outside an exhausted enclosure
(3) Twenty-five percent of LFL when the monitoring point is within or outside an exhausted enclosure
**10.9.3.2 Shutoff of Gas Supply.** Gas-monitoring systems shall automatically close the nearest isolation valve upon high level (IDLH, PEL, and LEL) detection alarms:
(1) At local gas boxes near the tool or in the tool gas jungle
(2) At valve manifold boxes, shut down individual sticks
(3) At the gas source
(4) At the bulk source

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F148–06/07

## 1803.16 (New); Table 1804.2.2.1 (IBC [F] Table 415.8.2.1.1); Table 1805.2.2; 1802.1 (IBC [F] 415.2); 202 (IBC 202)

**Proponent:** James V. McManus, ATMI, Inc. and Matheson Tri-Gas, Inc.

**1. Add new text as follows:**

**1803.16 Sub-atmospheric gas systems.** General safety provisions specific to sub-atmospheric gas systems (SAGS) shall be in accordance with Sections 1803.16.1 through 1803.16.6.

**1803.16.1 SAGS Type 1 storage and use.** The storage and use of SAGS Type 1 gas source packages shall comply with this section and other applicable provisions of this code specified for sub-atmospheric gases.

**1803.16.2 SAGS Type 2 storage and use.** The storage and use of SAGS Type 2 gas source packages containing compressed gas shall comply with this section and other applicable provisions of this code specified for compressed gases.

**1803.16.3 Location:** Sub-atmospheric gas systems that store gas sub-atmospherically shall not be restricted as to location in a fabrication area.

**1803.16.4 Continuous gas detection system:** A continuous gas detection system shall be provided for sub-atmospheric gas systems and shall comply with the Section 1803.13 and other provisions of this code. Sub-atmospheric gas systems containing highly toxic and toxic gases shall be monitored as per Chapter 37 of this code.

**1803.16.5 Purge gas.** Purge gas used for sub-atmospheric gas systems that contain sub-atmospheric gas shall be allowed to be supplied from either a house system or from dedicated purge gas cylinders. Purge gas used for sub-atmospheric gas systems that contain compressed gas shall be supplied from dedicated purge gas cylinders.

**1803.16.6 Exhausted enclosures.** Sub-atmospheric gas systems containing sub-atmospheric gas shall be placed in exhausted enclosures of noncombustible construction. Ventilation inside the enclosure shall be not less than 50 cfm and shall be sufficient to maintain vapors within the enclosure below 25% of the lower flammable limit (LFL) and below immediately dangerous to life and health concentration (IDLH) based on the potential leak release rate of the sub-atmospheric system.

**2. Revise tables as follows:**

**IFC TABLE 1804.2.2.1**
**(IBC TABLE 415.8.2.1.1)**
**QUANTITY LIMITS FOR HAZARDOUS MATERIALS IN A SINGLE FABRICATION AREA IN GROUP H-5[a]**

| HAZARD CATEGORY | SOLIDS (pounds/square foot) | LIQUIDS (gallons/square foot) | GAS (cubic feet@NTP/square foot) |
|---|---|---|---|
| Flammable gas<br>Gaseous<br>Liquefied | Not applicable | Not applicable | Notes d and f |
| Pyrophoric | Note b | 0.00125 | Notes d, ~~and~~ e and f |
| Highly toxics | Not Limited | Not Limited | Notes d and f |
| Toxics | Not Limited | Not Limited | Notes d and f |

(Portions of table not shown do not change)

a. through c. (No change to current text)
d. The aggregate quantity of flammable, pyrophoric, toxic and highly toxic gases shall not exceed 9,000 cubic feet at NTP.
e. (No change to current text)
f. When SAGS Type 1 gas sources are used for flammable, pyrophoric, toxic or highly toxic gases the amount of gas per container shall be multiplied by 0.1 to determine the aggregate quantity specified in Note d.

**TABLE 1805.2.2**
**MAXIMUM QUANTITIES OF HPM AT A WORKSTATION [e]**

| PM CLASSIFICATION | STATE | MAXIMUM QUANTITY |
|---|---|---|
| Flammable, highly toxic and toxic combined | Gas | 3 Cylinders [h] |

(Portions of table not shown do not change)

a. through g. (No change to current text))
h. The number of Type 1 SAGS systems shall be limited to 10 containers or an aggregate of 150 gallons of total container internal volume.

**3. Add new definitions as follows:**

**1802.1 (IBC [F] 415.2) Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this Code, have the meanings shown herein.

**SUB-ATMOSPHERIC GAS.** A gas that is at a pressure of less than 14.7 psia (101 kPa) under normal temperature and pressure (68 ºF and 14.7 psia).

**SUB-ATMOSPHERIC GAS SYTEMS (SAGS).** Sub-atmospheric gas system types are as follows:

**Type 1: Sub-atmospheric Gas Storage and Delivery System.** A gas source package that limits worse case gas release potential by storing and delivering gas at sub-atmospheric pressure. The system includes a container (e.g. gas cylinder and outlet valve) that stores and delivers gas at a pressure of less then 14.7 psia under normal temperature and pressure (68 ºF and 14.7 psia). Under normal operation, the package allows for gas flow from the package only when the cylinder valve outlet is exposed to a pressure of less than one atmosphere at normal temperature and pressure.

**Type 2: Sub-atmospheric Gas Delivery System.** A gas source package that stores compressed gas and delivers gas sub-atmospherically. The system includes a compressed gas container (e.g. gas cylinder and outlet valve) that stores gas under pressure and delivers gas at a pressure of less then 14.7 psia under normal temperature and pressure (68 ºF and 14.7 psia). Under normal operation, the package allows for gas flow from the package only when the cylinder valve outlet is exposed to a pressure of less than one atmosphere at normal temperature and pressure (68 ºF and 14.7 psia). This type of gas package reduces the hazard associated with inadvertent release from the cylinder valve outlet when compared to standard compressed gas cylinder packages.

**SECTION 202 (IBC 202)**
**GENERAL DEFINITIONS**

**SUB-ATMOSPHERIC GAS.** See Section 1802.1 (IBC [F] 415.2)

**SUBATMOSPHERIC GAS SYSTEM (SAGS).** See Section 1802.1 (IBC [F] 415.2)

**Type1: Sub-atmospheric Gas Storage and Delivery System.** See Section 1802 (IBC [F] 415.2)
**Type 2: Sub-atmospheric Gas Delivery System.** See Section 1802 (IBC [F] 415.2)

**Reason:** The hazards associated with sub-atmospheric gas systems ("SAGS") are significantly different than compressed gases. SAGS systems are normally employed as safer alternatives for the storage and delivery of toxic and highly gases. There are no current definitions in the code for SAGS or provisions for the storage and use of these systems. These types of gas source packages are widely used in the semiconductor industry and there has been a great deal of inconsistency when users, suppliers and AHJ's interpret the current codes in order to properly specify the requirements for these systems. Additionally, since there are two types of SAGS currently in use, (one that stores and delivers gas sub-atmospherically and one that stores the gas in a compressed state and delivers sub-atmospherically) further classification is necessary to properly define the various systems and stipulate the use and handling requirements for each type of system.

Type 1 SAGS include a container and outlet valve containing gas in a chemically or physically altered state which removes the pressure normally associated with the gas. For example, phosphine gas can be adsorbed onto a solid microporous material and stored sub-atmospherically (< 14.7 psia) whereas the gas would normally be at a pressure of 590 psig in the liquefied state. With this type of SAG system the adsorbent interaction with the gas has changed the physical properties of the gas to that of one more like a solid or liquid. By removing the pressure normally associated with the gas, the risk of a hazardous gas release during storage and use is significantly reduced. Extensive testing of SAGS Types 1 systems has shown the worst case release rate to be at least 100,000 times less than a standard compressed gas cylinder.

Type 2 SAGS are compressed gas cylinders containing compressed gas with an integral mechanical device (e.g. regulator) that reduces the pressure at the cylinder valve outlet to less than 14.7 psia. By reducing the pressure at the cylinder valve outlet the risk of a hazardous gas release during delivery to process equipment is reduced.

**Reasons for increasing quantity limits for Type 1 SAGS**

Type 1 SAGS containing flammable, pyrophoric, toxic or highly toxic materials are at a pressure < 14.7 psia at normal pressure and temperature (NTP) resulting in negligible rates of release in the event of a container failure. The worst case release rate for an arsine SAG Type 1 container is 0.03 mg/min at NTP whereas a liquefied arsine cylinder containing 1 lb. (0.454 Kg) of arsine could release its entire contents in less than 30 minutes. (See IFC Table 3704.2.2.7.5).

Type 1 SAGS technology is now proven and mature with over 12 years of experience and with 30,000 containers in service world-wide. There has been no reported incident using these types of containers that has resulted in injury, fatality or facility damage. There have been several occurrences where Type 1 SAGS containers have been exposed to fires in semiconductor fabrication facilities, none of which has resulted in catastrophic damage to the containers.

**Reasons for maintaining existing quantity limits for Type 2 SAGS**

Type 2 SAGS are compressed gas cylinders containing compressed gas or liquefied gas and the worst case release potentials can be the same as for standard compressed gas cylinders.

Type 2 SAGS technology is relatively new and unproven and therefore caution is changing quantity limits should be observed until the reliability of these systems can be verified.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F149–06/07
## 1805.2.2

**Proponent:** Lynne M. Kilpatrick, Fire Department, City of Seattle, WA

**Revise as follows:**

**1805.2.2 Workstations.** Workstations in fabrication areas shall be constructed of materials compatible with the materials used and stored at the workstation. The portion of the workstation that serves as a cabinet for HPM gases ~~and flammable liquids~~ shall be noncombustible and, if of metal, shall be not less than 0.0478-inch (18 gage) (1.2mm) steel. The portion of the workstation that serves as a liquid storage cabinet for flammable and combustible liquids shall be listed in accordance with UL 1275.

**Reason:** As written this section creates confusion between a gas cabinet and liquids storage cabinet. Having both in the same sentence can have owners and designers placing the same requirements on the proper storage cabinet for gas cylinders and flammable liquids containers. A listed flammable liquid storage cabinet provides the needed protection measures for liquids, such as fire endurance test, sump leakage test, door cycling test and a loading testing. All these tested features provide specific protection for hazardous liquid storage cabinets, but may not be appropriate for gas storage. By providing a separate sentence for the gas storage and a new one for the liquid storage the section provides clearer direction to the code official on the application of the protection features. Including this requirement for a UL listed cabinet in this code cycle provides some advance notice of the potential cost increase prior to publication in the 2009 IFC and allows for business to prepare for such a change.

**Cost Impact:** The code change proposal will increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F150–06/07
## Table 1805.2.2, 1802.1 (New)

**Proponent:** Ron Fuhrhop, Praxair, Inc.

**1. Add table footnote as follows:**

**TABLE 1805.2.2**
**MAXIMUM QUANTITIES OF HPM AT A WORKSTATION**

| HPM CLASSIFICATION | STATE | MAXIMUM QUANTITY |
|---|---|---|
| Flammable, highly toxic, pyrophoric, and toxic combined | Gas | 3 cylinders [h] |

h. Up to 9 cylinders shall be allowed when the cylinders in excess of 3 are sub-atmospheric gas delivery systems. Each sub-atmospheric gas delivery system shall be limited to an internal water volume of 0.177 cu ft (5.0 L).

(Portions of table and footnotes not shown do not change)

**2. Add new definition as follows:**

**1802.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**SUB-ATMOSPHERIC GAS DELIVERY SYSTEM:** A system that includes a gas cylinder which under normal operation allows for gas flow from the cylinder only when the cylinder valve outlet is exposed to a pressure of less than one atmosphere pressure 14.7 psia (101 kPa).

**Reason:** This code change proposal adds a definition to address the technology of sub-atmospheric gas delivery systems (SAGDSs). It adjusts the quantity limits to recognize the enhanced safety of these new systems and to meet current process requirements.

The proposed definition is identical, except for pressure units, to that recently approved for the 2006 Edition of NFPA 318, Standard for the Protection of Semiconductor Fabrication Facilities. The definition can be found in Section 3.3.27.5. Importantly, this definition allows the use of all technologies currently available as SAGDSs. The internal water volume of 0.177 cu ft (5.0 L) also accommodates all current SAGDSs cylinder sizes.

A primary goal of SAGDSs is to improve safety by reducing the risk of a gas release. The risk is reduced, because SAGDSs only deliver gas when a vacuum is applied to the cylinder connection. In a SAGDS, the cylinder valve can be opened, but no gas is released until the pressure at the outlet connection is below atmospheric pressure. This is in contrast to a typical gas cylinder, which releases gas when the cylinder valve is opened. The semiconductor industry has used SAGDSs successfully for ten years.

This change is in response to the current need for up to nine (9) gas cylinders in an ion implanter, which is the work station most likely to use SAGDSs. Prior to 1990, 3 cylinders were adequate to supply most ion implanters.

The total amount of HPM gas in a fabrication area, as regulated by Table 1804.2.1, remains unchanged.

**Cost Impact:** The cost may be the same or it may be reduced. Cost reduction would occur if industry or the fire service does not have to develop or review practical difficulties or alternate methods evaluations to use more than 3 cylinders at a workstation.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

# F151–06/07
## Table 1805.2.2

**Proponent:** Pat McLaughlin, McLaughlin & Associates, representing Semiconductor Industry Association

**Revise table by deleting footnote a as follows:**

**TABLE 1805.2.2**
**MAXIMUM QUANTITIES OF HPM AT A WORKSTATION[e]**

| HPM CLASSIFICATION | STATE | MAXIMUM QUANTITY |
|---|---|---|
| Flammable, highly toxic, pyrophoric and toxic combined | Gas | 3 cylinders |
| Flammable | Liquid<br>Solid | 15 gallons ~~[a,]~~ [b, c]<br>5 pounds [b, c] |
| Corrosive | Gas<br>Liquid<br><br><br><br>Solid | 3 cylinders<br>Use-open system<br>25 gallons ~~[a,]~~ [c]<br>Use-closed system:<br>150 gallons [a, c, f]<br>20 pounds [b, c] |
| Highly Toxic | Liquid<br>Solid | 15 gallons ~~[a,]~~ [b]<br>5 pounds |
| Oxidizer | Gas<br>Liquid<br><br><br><br>Solid | 3 cylinders<br>Use-open system<br>12 gallons [c]<br>Use-closed system<br>60 gallons ~~[a,]~~ [c]<br>20 pounds [b,c] |
| Pyrophoric | Liquid<br>Solid | 0.5 gallons [d, g]<br>See Table 1804.2.2.1 |
| Toxic | Liquid<br><br><br><br>Solid | Use-open system<br>15 gallons [c]<br>Use-closed system<br>60 gallons ~~[a,]~~ [c]<br>5 pounds [b,c] |
| Unstable reactive Class 3 | Liquid<br>Solid | 0.5 gallon [b, c]<br>5 pounds [b, c] |
| Water-reactive Class 3 | Liquid<br>Solid | 0.5 gallons [d, g]<br>See Table 1804.2.2.1 |

For SI: 1 pound = 0.454 kg. 1 gallon = 3.785 L.

~~a. DOT shipping containers with capacities of greater than 5.3 gallons shall not be located within a workstation.~~

(Renumber footnotes b through g to become a through f.)

**Reason:** IFC Section 1805.2.3 requires that workstations have the following safety features for spill control and containment:

Each workstation utilizing HPM liquids shall have all of the following:
1. Drainage piping systems connected to a compatible system for disposition of such liquids.
2. The work surface provided with a slope or other means for directing spilled materials to the containment or drainage system.
3. An approved means of containing or directing spilled or leaked liquids to the drainage system.

Allowing use of >5.3 gallon DOT containers an H-5 Occupancy will be consistent with what is allowed in the other H Occupancy groups, including sometimes without drainage, spill control or containment as is required in H-5 Occupancies.

This change will not increase degree of hazard at workstations because of the safety conditions required in IFC 1805.2.3..

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

# F152–06/07
## Table 1805.2.2

**Proponent:** Pat McLaughlin, McLaughlin & Associates, representing Semiconductor Industry Association

**Revise table as follows:**

**TABLE 1805.2.2**
**MAXIMUM QUANTITIES OF HPM AT A WORKSTATION[e]**

| HPM CLASSIFICATION | STATE | MAXIMUM QUANTITY |
|---|---|---|
| Flammable, highly toxic, pyrophoric and toxic combined | Gas | ~~3 cylinders~~ Combined aggregate volume of all cylinders at a workstation shall not exceed an internal cylinder volume of 39.6 gallons [150 liters] or 5.29 cf. |
| Corrosive | Gas | ~~3 cylinders~~ Combined aggregate volume of all cylinders at a workstation shall not exceed an internal cylinder volume of 39.6 gallons [150 liters] or 5.29 cf. |
| | Liquid | Use-open system 25 gallons ~~a,~~ [c] Use-closed system: 150 gallons [a, c, f] |
| | Solid | 20 pounds [b, c] |
| Oxidizer | Gas | ~~3 cylinders~~ Combined aggregate volume of all cylinders at a workstation shall not exceed an internal cylinder volume of 39.6 gallons [150 liters] or 5.29 cf. |
| | Liquid | Use-open system 12 gallons [c] Use-closed system 60 gallons ~~a,~~ [c] |
| | Solid | 20 pounds [b,c] |

(Portions of table and footnotes not shown do not change)

**Reason:** The intent of the code in limiting the number of hazardous gas cylinders at a workstation is to limit the potential for harm to personnel within the facility. If the number of cylinders is limited to 3, as required by the code, the operators will have to frequently change out one type of gas with another in order to complete the manufacturing process. The only time an employee comes in contact with a hazardous gas cylinder is during change outs. Therefore by limiting the number of cylinders to 3, without regard to volume, in this particular instance the end result will be to increase the potential interaction between the operators and hazardous gases and thereby increase the potential for an accident.
Under normal conditions in a many semiconductor workstations, a cylinder is changed on average once every 4 months but if only 3 gas cylinders are allowed, without considering the cylinder volume, then average 5 cylinder change outs per week may be necessary.
The following safety features result in an increase rather than a decrease in the safety level, and with more efficiency.

VOLUME OF HPM GAS CONTAINERS

The maximum volume requested is the same as that contained in 3 standard cylinders while the actual quantity will be significantly less.

Some workstation gases are supplied in Air Products cylinder size D/4X (or equivalent) and in Praxair cylinder size of G (or equivalent) such that maximum 2 G type cylinders and maximum 6 D type cylinders will be located in any one workstation. This equates to 6 x 3L = 18L plus 2 x 7L = 14L for a total of 32L which is less than 1/4$^{th}$ of that possible with 3 standard size cylinders.

The state of the art workstations today is a very precise machine and requires very small quantity of gas during operation. This improved precision allows less quantity of gas to be used during the process and therefore makes it safer than that anticipated by the code requirement which does not limit the quantity of gas in each cylinder.

Cylinder on the left is an “A” cylinder, next to d & 4X size cylinders.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F153–06/07
## 1903.2

**Proponent:** Greg Rogers, South Kitsap Fire & Rescue, representing ICC Joint Fire Service Review Committee

**Revise as follows:**

**1903.2 Dust control.** Equipment or machinery located inside buildings which generates or emits combustible dust shall be provided with an approved dust collection and exhaust system installed in accordance with Chapter 13 of this code and Chapter 5 of the *International Mechanical Code*. Equipment or systems that are used to collect, process or convey combustible dusts shall be provided with an approved explosion control system.

**Reason:** The *International Mechanical Code,* Section 503.1 contains an important provision that requires electrical interlocks so that dust-producing equipment can’t run unless the dust collection system runs. This feature was also in legacy code *Uniform Fire Code/1997, Section* 7604 but was not brought into *International Fire Code*, Chapter 13 (corollary chapter to UFC 76) during IFC drafting. Fine-tuning the references will assist the fire code official in finding this important information.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F154–06/07
## 2209.4.1 (New)

**Proponent:** Thomas Joseph, Chair, Hydrogen Industry Panel on Codes

**Add new text as follows:**

**2209.4.1 Dispensing systems.** Dispensing systems shall be equipped with an overpressure protection device set at 140 percent of the service pressure of the fueling nozzle it supplies.

**Reason:** To prevent overpressure of the vehicle fuel system. Overpressure protection of the vehicles is provided by the fueling station system. This addition will ensure that overpressure protection of the vehicles is provided by the fueling system. CSA is currently in the process of developing hydrogen dispenser standards HGV 4.1. However CSA’s dispenser standard efforts will not be completed within ICC’s 2006/2007 code cycle. To ensure safe fueling in the interim, overpressure protection should be added to this code cycle.

Nearly all of the hydrogen fuel cell vehicles that are currently deployed or will be deployed in the near future rely on the dispenser for overpressure protection. Similar language has been adopted in NFPA 52 2006 Edition and in Michigan's Department of Environmental Quality Waste and Hazardous Materials Division proposed hydrogen storage and dispensing rules. Additionally, similar language has been incorporated in the upcoming Society of Automotive Engineers SAE J2579 *Recommended Practice for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles*. SAE J2579 is being developed by the SAE Fuel Cell Vehicle (FCV) Safety Working Group (SWG) to provide recommended practices for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles.

**Cost Impact:** The code change proposal will increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F155–06/07

## 2209.5 (New), 2202.1, 2209.3.2.3, 907.2.24 (New) [IBC [F] 907.2.24 (New)]

**Proponent:** Thomas Joseph, Chair, Hydrogen Industry Panel on Codes

**1. Add new text as follows:**

**2209.5 Indoor attended fast-fill hydrogen fuel-dispensing.** Attended indoor fast-fill hydrogen fuel-dispensing shall be in accordance with Sections 2209.5.1 through 2209.5.7, Chapters 30 and 35, and the *International Fuel Gas Code*.

**2209.5.1 Location of ancillary equipment.** Liquid storage, vaporization and gas storage equipment shall be located outdoors in accordance with Section 2209.3.2.1. Gas compression and processing equipment shall be listed and approved for indoor use or located outdoors in accordance with Section 2209.3.2.1.

**2209.5.2 Safety precautions.** Safety precautions shall be provided in accordance with Section 2209.5.

**2209.5.2.1 Fire alarm and detection system.** An approved manual and automatic fire alarm system shall be installed throughout buildings housing indoor attended fast-fill hydrogen fuel-dispensing areas in accordance with Section 907.2. Activation of the system shall shut down the dispenser, stop flow of gas into the room and where mechanical ventilation is provided, activate the ventilation system.

**2209.5.3 Ventilation.** Ventilation for attended indoor fast-fill hydrogen fuel-dispensing shall be in accordance with the *International Mechanical Code* and Sections 2209.5.3.1 and 2209.5.3.2.

**Exception:** Indoor attended fast-fill hydrogen fuel-dispensing areas not exceeding the space volume and maximum fuel delivery mass per refueling event as depicted in Figure 2209.5.3.

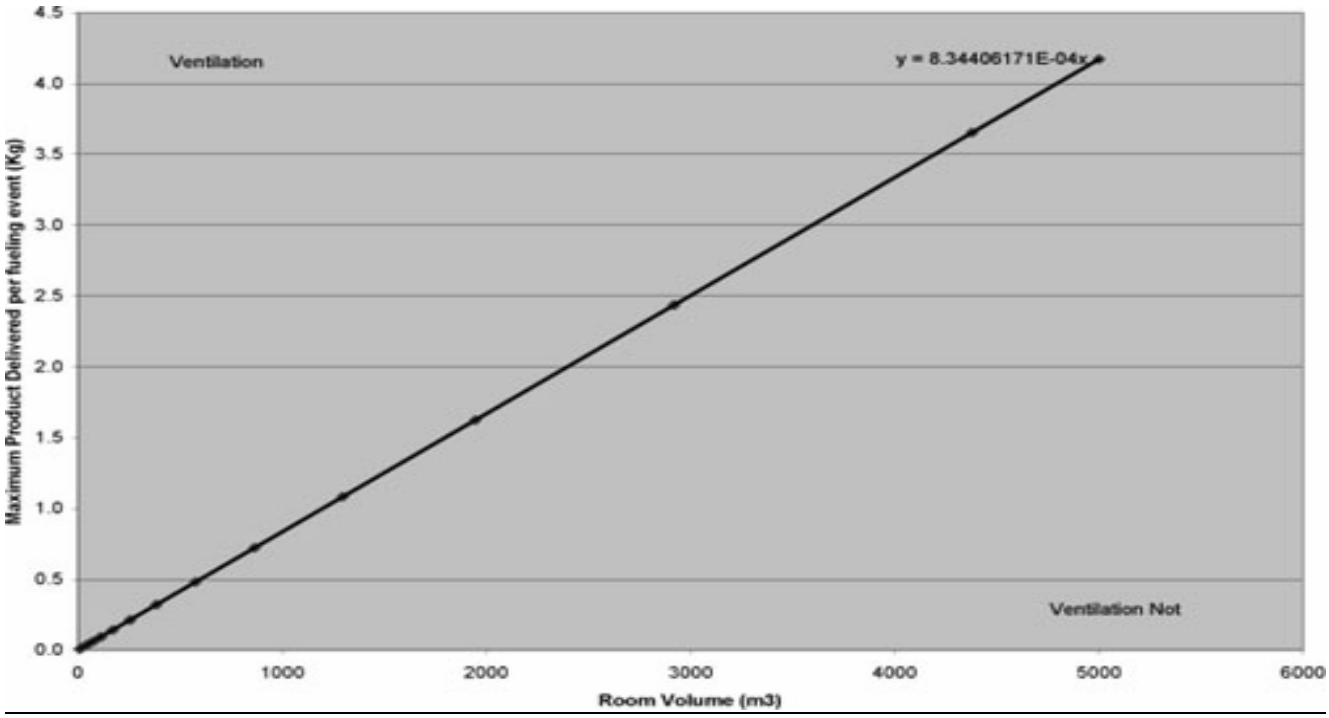


**FIGURE 2209.5.3**
**INDOOR ATTENDED FAST-FILL HYDROGEN FUEL-DISPENSING LIMITATIONS.**

**2209.5.3.1 Design.** Indoor locations shall be ventilated utilizing air supply inlets and exhaust outlets arranged to provide uniform air movement to the extent practical. Inlets shall be uniformly arranged on exterior walls near floor level. Outlets shall be located at the high point of the room in exterior walls or the roof.

Ventilation shall be by a continuous mechanical ventilation system or by a mechanical ventilation system activated by a continuously monitoring natural gas detection system where a gas concentration of not more than 25 percent of the lower flammable limit (LFL) is present. In either case, the system shall shut down the fueling system in the event of failure of the ventilation system.

The ventilation rate shall be at least 1 cubic foot per minute per 12 cubic feet (0.00139 m3/s m3) of room volume.

**2209.5.3.2 Operation.** The mechanical ventilation system shall operate continuously for ten (10) seconds prior to dispenser operation, during fueling, and for one minute after fueling has been completed. Failure of the ventilation system shall shut down the dispenser.

**Exception:** Mechanical ventilation systems that are interlocked with a gas detection system designed in accordance with Section 2209.5.4.

**2209.5.4 Gas detection system.** Indoor attended fast-fill hydrogen fuel-dispensing areas shall be provided with an approved flammable gas detection system.

**2209.5.4.1 System design.** The flammable gas detection system shall be calibrated to the types of fuels or gases used by vehicles to be refueled. The gas detection system shall be designed to activate when the level of flammable gas exceeds 25 percent of the lower flammable limit (LFL).

**2209.5.4.2 Operation.** Activation of the gas detection system shall result in all the following:

1. Initiation of distinct audible and visual alarm signals throughout the building.
2. Deactivation of all heating systems located in the Indoor attended fast-fill hydrogen fuel-dispensing area.
3. Activation of the mechanical ventilation system, when the system is interlocked with gas detection.
4. The dispenser is shut down and the flow of hydrogen fuel into the building is stopped.

**2209.5.4.3 Failure of the gas detection system.** Failure of the gas detection system shall result in the deactivation of the heating system, activation of the mechanical ventilation system and where the system is interlocked with gas detection, cause a trouble signal to sound in an approved location.

**2209.5.4.4 Reactivation.** Reactivation of defueling equipment or dispensing operations, including gas flow or gas venting into or out of the building shall be by manual restart and conducted by trained personnel.

**2209.5.5 Dispenser communication system.** The dispensing device shall be provided with a communication system that shall monitor vehicle fuel tank temperature, and pressure and activate when any one of these operational parameters exceeds the corresponding onboard fuel storage system design parameter for temperature, pressure or fuel mass of the onboard fuel storage system.

Activation of the system shall shut down the dispenser; stop the flow of gas into the room, and where mechanical ventilation is provided, activate the ventilation system.

**2209.5.6 Electrical area classification.** The area classification for the dispenser shall be Class 1, Division 2 within 15 feet of the point of transfer to the onboard fuel storage system during filling. The area classification shall extend outward in the shape of a cylinder from the point of transfer and from floor to ceiling in accordance with the ICC *Electrical Code*.

**Exception:** Vehicles located within the refueling area and having no open flames.

**2209.5.7 Fire-resistance-rated construction.** Interior wall and floor construction within 15 feet of the dispenser shall have a fire-resistance rating of not less than 2 hours. Enclosures shall be constructed as fire barriers in accordance with Chapter 7 of the *International Building Code*.

**2202.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**FAST-FILL FUEL-DISPENSING SYSTEM.** A storage and dispensing system designed to fill motor vehicle fuel tanks with compressed, gasified fuels. The vehicle fuel tank is filled by connecting to a system designed to provide a fuel fill rate greater than or equal to 12 Standard Cubic Feet per Minute (SCFM). The main valve can also be placed in the time-fill position to allow for filling at rates less than 12 SCFM.

**TIME-FILL FUEL-DISPENSING SYSTEM.** A storage and dispensing system designed to fill motor vehicle fuel tanks with compressed, gasified fuels. The vehicle fuel tank is filled overnight or while parked in a fleet yard by connecting to a system designed to provide a fuel fill rate below 12 Standard Cubic Feet per Minute (SCFM). The main valve can also be placed in the fast-fill position to allow for filling at rates greater than 12 SCFM.

**2. Revise as follows:**

**2209.3.2.3 Indoors.** Generation, compression, storage and dispensing equipment shall be located in indoor rooms or areas constructed in accordance with the requirements of the *International Building Code*, the *International Fuel Gas Code* and the *International Mechanical Code* and one of the following:

1. Inside a building in hydrogen cutoff room designed and constructed in accordance with Section 420 of the *International Building Code*.
2. Inside a building not in a hydrogen cutoff room where the gaseous hydrogen system is listed and labeled for indoor installation and installed in accordance with the manufacturer's installation instructions.
3. Inside a building in a dedicated time-fill hydrogen fuel dispensing area having an aggregate hydrogen delivery capacity no greater than 12 SCFM and designed and constructed in accordance with Section 703.1 of the *International Fuel Gas Code*.
4. Inside a building in a dedicated fast-fill hydrogen fuel dispensing area designed and constructed in accordance with Section 2209.5.

**3. Add new text as follows:**

**907.2.24 Indoor attended fast-fill hydrogen fuel-dispensing areas.** An approved manual and automatic fire alarm system shall be installed throughout buildings housing indoor attended fast-fill hydrogen fuel-dispensing areas. The detection system shall be supervised by an approved central, proprietary, or remote station service or a local alarm which will sound an audible signal at a constantly attended location

**Reason:** Add new requirements to the Code. Current provisions of the code do not address the requirements for indoor attended fast fill systems.

Fast fill hydrogen fuel dispensing can be safely accomplished with the requirements added by this new section 2209.5. The provisions ensure safety by requiring the largest volume/stored energy components (storage and vaporization) to be located outside and remaining indoor equipment to be listed and approved. To reduce the likelihood and duration of a fire, requirements for fire alarm and detection systems, ventilation systems, flammable gas detection systems, electrical area classification, and fire-resistance-rated construction are specified. The section on dispenser communication with the fuel tank details system shutdowns for events other than fire.

**Cost Impact:** The code change proposal will increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F156–06/07

## 2209.5.1.1(New), Chapter 45; IBC 406.5.2 (New), Chapter 35

**Proponent:** Thomas Joseph, Chair, Hydrogen Industry Panel on Codes

**THIS PROPOSAL IS ON THE AGENDA OF THE IFC AND THE IBC GENERAL CODE DEVELOPMENT COMMITTEES. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.**

**PART I – IFC**

**1. Add new text as follows:**

**2209.5.1.1 Vehicle fueling pad.** The vehicle fueling pad shall be constructed of a non-coated concrete pavement or shall have a resistivity not exceeding criteria of 1 megohm as measured using the methodology specified in *EN 1081.*

**2. Add new standard to Chapter 45 as follows:**

European Committee for Standardization (EN)
Central Secretariat
Rue de Stassart 36
B-10 50 Brussels

European Standard EN 1081: 1998 Resilient Floor Coverings – Determination of the Electrical Resistance

**PART II – IBC General**

**406.5.2 Vehicle fueling pad.** The vehicle fueling pad shall be constructed of a non-coated concrete pavement or shall have a resistivity not exceeding criteria of 1 megohm as measured using the methodology specified in *EN 1081.*

**2. Add new standard to Chapter 35 as follows:**

European Committee for Standardization (EN)
Central Secretariat
Rue de Stassart 36
B-10 50 Brussels

European Standard EN 1081: 1998 Resilient Floor Coverings – Determination of the Electrical Resistance

**Reason:** The current language does not address safety issues associated with electrostatic discharges (ESD).

Fueling surfaces for hydrogen powered vehicles should be at least as protective regarding ESD issues as those fueling surfaces used for petroleum powered vehicles. The 1 megohm criteria is cited from the *American Petroleum Institute (API) 2003 Recommended Practices (RP)*.

Substantiation: Paving material meeting the criteria specified in the language offered as Section 2209.5.1.1 will ensure the dissipation of static charge build up on the vehicle before the driver opens the door to fuel. Material Similar language has been used in Michigan's proposed Hydrogen Storage and Dispensing Rules.

**Cost Impact:** The code change proposal will increase the cost of construction.

**Analysis:** Results of review of the proposed standard(s) will be posted on the ICC Website by August 20, 2006.

**PART I – IFC**

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|---|---|---|---|---|
| Public Hearing: | Committee: | AS | AM | D |
| | Assembly: | ASF | AMF | DF |

**PART II – IBC**

| | | | | |
|---|---|---|---|---|
| Public Hearing: | Committee: | AS | AM | D |
| | Assembly: | ASF | AMF | DF |

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# F157–06/07
## 2211.7.2, 2211.7.2.1

**Proponent:** Greg Rogers, South Kitsap Fire & Rescue, representing ICC Joint Fire Service Review Committee

**Revise as follows:**

**2211.7.2 Gas detection system.** Repair garages used for repair of vehicles fueled by nonodorized gases, such as hydrogen and nonodorized LNG, shall be provided with a~~n approved~~ flammable gas detection system.

**2211.7.2.1 System design.** The flammable gas detection system shall be listed and shall be calibrated to the types of fuels or gases used by vehicles to be repaired. The gas detection system shall be designed to activate when the level of flammable gas exceeds 25 percent of the lower flammable limit (LFL). Gas detection shall also be provided in lubrication or chassis repair pits of repair garages used for repairing nonodorized LNG-fueled vehicles.

**Reason:** Consistency with other gas detection requirements in Chapter 22. (See 2208.2.2 and 2209.2.2)

**Cost Impact:** The code change proposal will not increase the cost of construction.

| | | | | |
|---|---|---|---|---|
| Public Hearing: | Committee: | AS | AM | D |
| | Assembly: | ASF | AMF | DF |

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# F158–06/07
## Table 2306.2, 2306.7

**Proponent:** Richard Schulte, Schulte & Associates

**1. Revise table as follows:**

**TABLE 2306.2**
**GENERAL FIRE PROTECTION AND LIFE SAFETY REQUIREMENTS**

| COMMODITY CLASS | ALL STORAGE AREAS (See Sections 2306, 2307 and 2308)[b] | | | | |
|---|---|---|---|---|---|
| | Automatic fire-extinguishing system (see Section 2306.4) | Fire detection system (see Section 2306.5) | Building access (see Section 2306.6) | ~~Smoke and heat removal (see Section 2306.7)~~ | Draft curtains (see Section 2306.7) |
| I - IV | Not Required[a] | Not Required | Not Required[c] | ~~Not Required~~ | Not Required |
| | Not Required[a] | Yes[i] | Not Required[c] | ~~Not Required~~ | Not Required |
| | Yes | Not Required | Not Required[c] | ~~Not Required~~ | Not Required |
| | Yes | Not Required | Not Required[e] | ~~Not Required~~ | Not Required |
| | Not Required[a] | Yes | Yes | ~~Yes~~[j] | Yes [j] |
| | Yes | Not Required | Yes | ~~Yes~~[j] | Not Required |
| | Yes | Not Required | Yes | ~~Yes~~[j] | Not Required |
| | Yes | Not Required | Yes | ~~Yes~~[j] | Not Required |
| High Hazard | Not Required[a] | Not Required | Not Required[e] | ~~Not Required~~ | Not Required |
| | Yes | Not Required | Not Required[e] | ~~Not Required~~ | Not Required |
| | Yes | Not Required | Not Required[e] | ~~Not Required~~ | Not Required |
| | Not Required[a] | Yes | Yes | ~~Yes~~[j] | Yes [j] |
| | Yes | Not Required | Yes | ~~Yes~~[j] | Not Required |
| | Yes | Not Required | Yes | ~~Yes~~[j] | Not Required |

a. through i. (No change to current text)

~~j. Not required when storage areas are protected by early suppression fast response (ESFR) sprinkler systems installed in accordance with NFPA 13.~~

(Portions of table not shown do not change)

**2. Delete without substitution:**

~~**2306.7 Smoke and heat removal.** Where smoke and heat removal are required by Table 2306.2, smoke and heat vents shall be provided in accordance with Section 910. Where draft curtains are required by Table 2306.3, they shall be provided in accordance with Section 910.3.4.~~

**Reason:** The purpose of this proposal is to delete the requirements for smoke and heat removal in buildings which contain high-piled combustible storage.

Buildings which contain high-piled storage and which are required to be provided with roof vents will be provided with sprinkler protection. The sprinkler protection by itself will provide adequate occupant fire safety, firefighter safety and property protection to comply with the intent of the code. If the sprinkler protection successfully operates and controls the fire, there is no need to provide roof vents/draft curtains. If the sprinkler protection fails to control the fire, roof vents and draft curtains will provide little in the way of protection for the occupants or for the building. Since roof vents/draft curtains provide little, if any benefit, the cost/benefit ratio is large.

In a memorandum dated September 10, 1999, the American Architectural Manufacturers Association (AAMA) announced the commencement of AAMA Smoke Vent Task Group's research project on the use of smoke/heat vents. The announcement states that the purpose of this research project is to "study the interaction between sprinklers, smoke/heat vents and draft curtains" and "to develop scientifically based engineering design criteria for the installation of draft curtains and vents."

The AAMA memorandum is essentially an admission by the AAMA Smoke Vent Task Group in 1999 that we do <u>not</u> presently have sufficient information on the interaction between sprinklers, smoke/heat vents and draft curtains to utilize smoke/heat and draft curtains in buildings which are protected by sprinklers. Given this admission by the AAMA, it would seem questionable that the International Building Code and International Fire Code should mandate the use of smoke/heat vents and draft curtains in buildings which are protected throughout by a sprinkler system.

To date, the AAMA Smoke Vent Task Group has yet to complete the research project announced in September, 1999.

Chapter 10 in Section 5 of the 15th Edition of the Fire Protection Handbook published by the National Fire Protection Association in 1981 states the following:

> "Even though there is no universally accepted conclusion from either fire experience or research, concern has been raised by a recent series of model studies that indicate the following trends when the present Smoke and Heat Venting Guide [NFPA 204M] is implemented:
>
> 1. Venting delays loss of visibility;
> 2. Venting results in increased fuel consumption; and
> 3. Depending on the location of the fire relative to the vents, the necessary water demand to achieve control is either increased or decreased over an unvented condition. With the fire directly under the vent, water demand is decreased. With the fire equidistant from the vents, water demand is increased."

Chapter 6 in the 1991 edition of NFPA 204M, the Guide for Smoke and Heat Venting, specifically addresses the use of smoke/heat vents in sprinklered buildings. Section 6-1 in this edition of NFPA 204M states the following:

> "A broadly accepted equivalent design basis for using both sprinklers and vents together for hazard control (e.g. property protection, life safety, water usage, obscuration, etc.) has not been universally recognized."

Section 6-2 in the 1991 edition of NFPA 204M further states the following:

> "For occupancies that present a high challenge to sprinkler systems, concern has been raised that inclusion of automatic roof venting may be detrimental to the performance of automatic sprinklers."

In addition to this statement, Chapter 6 in the 1991 edition of NFPA 204M contains the exact same statement quoted above from the 15th edition on the NFPA Fire Protection Handbook.

Chapter 8 in the 1998 edition of NFPA 204 contains the same statements regarding the use of smoke/heat vents in sprinklered buildings as contained in the 1991 edition of NFPA 204M and also the 15th edition of the Fire Protection Handbook. In addition, the 1998 edition of NFPA 204 states the following regarding the use of curtain boards:

> "Large-sale fire tests [Troup 1994] indicates that the presence of curtain boards can cause increases in sprinkler operation, smoke production, and fire damage (i.e. sprinklers opened will away from the fire)."

The issue of the use of roof vents in sprinklered buildings is also addressed in Chapter 11 of the 2002 edition of NFPA 204. Section 11.1 in the 2002 edition of NFPA 204 reads as follows:

> "Where provided, the design of the venting for sprinklered buildings shall be based on a performance analysis acceptable to the authority having jurisdiction, demonstrating that the established objectives are met."(See Annex F.3.)"

The provisions for roof vents contained in both the International Building Code and the International Fire Code are specification-oriented and do not require a "performance analysis" required by NFPA 204-2002.

Annex F.3 in the 2002 edition of NFPA 204 contains similar statements regarding the use of roof vents in sprinklered buildings as those contained in previous editions of NFPA 204 (and NFPA 204M). In addition, Annex F.3 of the 2002 edition of NFPA 204 includes the following statements:

> "Vents that are open prior to sprinkler operation in a region surrounding the ignition point, within a radius of 1-1/2 sprinkler spacings, can interfere with the opening of sprinklers capable of delivering water to the fire."

> "Draft curtains can delay or prevent operation and can interfere with the discharge of sprinklers capable of delivering water to the fire."

The above is an indication that, from the early 1980's to the present day, questions still persist about whether it is appropriate to use of smoke/heat vents and draft curtains in buildings which are protected by sprinklers.

The installation of roof vents in sprinklered buildings which contain high-piled storage is also specifically addressed in NFPA 13. Section 7.4.1.3.1 in the 1999 edition of NFPA 13 reads as follows:

> "Sprinkler protection criteria is based on the assumption that roof vents and draft curtains are not being used."

Section C-7.4.1.3.1 in the 1999 edition of NFPA 13 also addresses this issue as follows:

> ". . . The design curves are based upon the absence of roof vents or draft curtains in the building."

Section 2-6.1 in the 1995 edition of NFPA 13E, the Guide for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems states the following with regard to routine ventilation in sprinklered storage buildings:

> "Occupancies with a wide variety of configurations and a wide range of storage commodities might need special procedures, particularly where storage heights are in excess of 15 feet. In some cases, routine ventilation procedures in the early stages of a fire can hinder effective sprinkler operation. It is desirable for the fire department to discuss its pre-fire plan for warehouse occupancies with the occupant, sprinkler designer, and insurance carrier to determine if a modification in procedures is appropriate."

Section 2-6.2 in NFPA 13E (1995 edition) further states the following:

> "For those cases where search and rescue operations have been completed prior to ventilation work being performed by the fire department, it might be appropriate to allow the automatic sprinklers to continue to operate without further ventilation to enable them to achieve full control of the fire. This might take 20 to 30 min[utes] or more."

The information from NFPA 13E regarding the use of ventilation in storage buildings is further supported by information contained in NFPA 231 and NFPA 231C.

Section 3-2 in the 1998 edition of NFPA 231, the Standard for General Storage, states the following with the respect to the use of smoke/heat vents and draft curtains in sprinklered storage buildings:

> "The protection outlined in the standard shall apply to buildings with or without roof vents and draft curtains."

The exception to this section in NFPA 231 states the following:

> "Where local codes require heat and smoke vents in buildings that are protected by ESFR sprinklers, the vents shall be manually operated or shall have an operating mechanism with a standard response fusible element that is rated no less that 360F. Drop out vents shall not be permitted."

Section A-3-2 in NFPA 231 provides additional information regarding the use of smoke/ heat vents in sprinklered buildings to which NFPA 231 is applicable. This section states the following:

"Smoke removal is important to manual fire fighting and overhaul. Since most fire tests were conducted without smoke and heat venting, the protection specified in Sections 5-1, 6-1 and 7-1 was developed without the use of such venting. However, venting through eaveline windows, doors, monitors, or gravity or mechanical exhaust systems is essential to smoke removal after control of the fire is achieved. (See NFPA 204, Guide for Smoke and Heat Venting.)"

While section 3-2 in NFPA 231 states that the use of smoke/heat vents is acceptable in buildings where NFPA 231 is applicable, the explanatory material contained in Appendix A of NFPA 231 clearly indicates that the use of manually operated roof vents or some other method of ventilation is preferred. The fact that this exception regarding the use of vents with ESFR sprinklers is included in NFPA 231 is an admission that heat/roof vents can affect the operation of ESFR sprinklers. Given the exception to section 3-2 in NFPA 231, along with the information on venting in sprinklered buildings provided in NFPA 204, certainly the wisdom of providing automatic smoke/heat vents in buildings protected by standard sprinklers should be questioned.

NFPA 231C, the Standard for Rack Storage of Materials, also addresses the use of smoke/ heat vents in sprinklered buildings. Section 3-3 in the 1998 edition of NFPA 231C reads as follows:

"Design curves are based on the assumption that roof vents and draft curtains are not being used."

Explanatory material provided in section B-3-3 in NFPA 231 provides further information on the use of smoke/heat vents in sprinklered storage buildings which contain storage racks. This section reads as follows:

"Tests were conducted as a part of this program with eave line windows and louvers open to simulate smoke and heat venting. These tests opened 87.5 percent and 91 percent more sprinklers that did comparative tests without windows and louvers open. Venting tests that have been conducted in other programs were without the benefit of sprinkler protection and, as such, are not considered in this report, which covers only buildings protected by sprinklers. The design curves are based upon the absence of roof vents or draft curtains in the building. During mop-up operations, ventilating systems, were installed, should be capable of manual exhaust operations."

NFPA 231C also contains information on fire department operations for buildings protected by sprinkler systems designed to comply with NFPA 231C. Section A-12-6 in NFPA 231C reads as follows:

"Sprinkler protection installed as required in this standard is expected to protect the building occupancy without supplemental fire department activity. Fires that occur in rack storage occupancies are likely to be controlled within the limits outlined in B-1.1, since no significant building damage is expected. The first fire department pumper arriving at a rack storage-type fire should connect immediately to the sprinkler siamese fire department connection and start pumping operations.

In the test series for storage up to 25 ft [feet], the average time from ignition to smoke obscuration in the test building was about 13 minutes. The first sprinkler operating time in these same fires averaged about 3 minutes. Considering response time for the waterflow device to transmit a waterflow signal, approximately 9 minutes remains between the time of receipt of a waterflow alarm signal at fire department headquarters and the time of smoke obscuration with the building as an overall average.

In the test series for storage over 25 ft [feet], the visibility time was extended. If the fire department or plant protection department arrives at the building in time to have sufficient visibility to locate the fire, suppression activities with small hose lines should be started. . . . . .Manual fire-fighting operations in such a warehouse should not be considered a substitute for sprinkler operation.

Smoke removal capability should be provided. Examples of smoke removal equipment include:

(a) Mechanical air-handling systems
(b) Powered exhaust fans
(c) Roof-mounted gravity vents
(d) Perimeter gravity vents

Whichever system is selected, it should be designed for manual actuation by the fire department, thus allowing personnel to coordinate the smoke removal (ventilation) with mop-up operations."

During the testing program, the installed automatic extinguishing system was capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition. Ventilation operations and mop-up were not started until this point. The use of smoke removal equipment is important."

While it has been stated by proponents of heat/smoke vents that the use of eave line windows is different from the operation of automatic smoke/heat vents, the explanatory materials contained in NFPA 231C clearly states that automatic venting should not be provided. Given the explanatory material cited above, it can be concluded that providing automatic smoke/heat vents in a building which is required to comply with NFPA 231C is, in fact, a violation of NFPA 231C.

The purpose of providing heat/smoke vents in a storage building is to vent both heat and smoke to improve visibility within the building and prevent structural damage to the roof of the building. Venting heat and smoke from the building will more safely permit the fire department to enter the building and attack the fire. Given the information provided in both NFPA 13E and in NFPA 231C, the question is why should the fire department enter the building to attack the fire. NFPA 231C clearly indicates that a sprinkler system designed per NFPA 231C is "capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition." If the sprinkler system is capable of achieving this level of control, why should the fire department enter the building and put its personnel at risk? Providing smoke/heat vents in the building encourages fire department personnel to enter the building and puts firefighters at risk.

Recently (April 2005), the National Institute of Occupational Safety and Health (NIOSH) issued a NIOSH Alert titled “Preventing Injuries and Deaths of Firefighters Due to Truss System Failures”. Page 7 of the NIOSH Alert includes the following statement:

“Fire fighters should be discouraged from risking their lives solely for property protection activities.”

Given that sprinkler protection is “capable of controlling the fire and reducing all temperatures to ambient within 30 minutes of ignition” and that “fire fighters should be discouraged from risking their lives solely for property protection activities” means that the proper fire fighting strategy in large one story industrial and storage buildings is to delay manual fire fighting activity for a period of at least 30 minutes to allow the sprinkler system to extinguish the fire. In the event that the sprinkler system fails to control and extinguish the fire, no interior manual fire fighting should be attempted merely to protect property. Hence, there is no need to provide roof vents to assist fire fighting in large industrial and storage buildings.

Factory Mutual's opinion of the use of automatic smoke/heat vents is expressed by the following excerpt from FM Data Sheet 8-33 dated January, 1984:

"Factory Mutual recommended protection is based on roof vents and draft curtains not being provided. Fire tests have not shown automatic vents to be cost effective and they may even increase sprinkler water demand. Hence, permanent heat and smoke vents, if any, should be arranged for manual operation. Smoke removal during mop-up operations can frequently be achieved through eave-line windows, doors, monitors, non-automatic exhaust systems (gravity or mechanical), or manually operated heat and smoke vents. Fire departments can cut holes in steel or wood roofs and also use their smoke exhausters."

If the premier property insurer in the United States is on record as stating that the installation of smoke/heat vents is not cost effective (as early as 1984), then the question should be asked-why should the membership of the International Code Council mandate this fire protection technology?

Prior to the development of the International Fire Code, two of the three model fire prevention codes used in the United States, the Uniform Fire Code and the Standard Fire Prevention Code, required the installation of the smoke/heat vents in large storage buildings, while the third model fire prevention code, the BOCA National Fire Prevention Code, did not include requirements for smoke/heat vents. Given this, it should be a relatively easy research task to compare the property losses from fires in storage buildings in jurisdictions using the BOCA National Fire Prevention Code and the losses from fire in storage buildings located in jurisdictions using the two other model fire prevention codes. If the fire loss statistics for storage buildings in BOCA jurisdictions is not significantly higher than the fire loss statistics in ICBO and SBCCI jurisdictions, this would be an indication that the installation of smoke/heat vents is simply not effective. Prior to commencing the AAMA study of smoke/heat vents, the AAMA should concentrate on providing statistics which demonstrate the effectiveness of vents.

Given the technical information presented above, along with the fact that the manufacturers of smoke/heat vents have presented no statistics that their products are, in fact, effective at reducing property losses, the membership of the ICC should remove the requirements for smoke/heat vents (until such time as the industry provides conclusive proof that vents actually work as represented).

The fire protection field has wrestled with this issue for more that 30 years. There is absolutely no reason why the vent industry couldn't have conducted its proposed research 25 years ago. Eliminating the requirement for vents in the code should be an incentive for the vent manufacturers to quickly complete its testing program and provide conclusive proof one way or the other on the need for vents.

It should be noted that a similar proposal to delete the requirements for roof vents was submitted to the ICC in 2000 (Birmingham, Alabama). The committee hearing this proposal voted to deny the proposal given that the vent industry was involved in a testing program announced in September 1999. Since the committee's denial of this proposal, the vent industry has not published any results from their research program. This fact is a tantamount admission by the vent industry that the proposal to eliminate the requirement for roof vents in sprinklered buildings has merit.

It is my opinion that the installation of roof vents and draft curtains in sprinklered buildings is in the realm of "junk science". In the absence of the independent research which conclusively demonstrates that the installation of roof vents and draft curtains is not only not detrimental to the operation of sprinklers, but is also effective, the requirements for the installation of roof vents and draft curtains should be removed from the IFC.

**Bibliography:**

Fire Protection Handbook-15th Edition (1981)
FM Data Sheet 8-33, January, 1984
NFPA 13, 1999 edition
NFPA 13E, 1995 edition
NFPA 204M, 1991 edition
NFPA 204, 1998 edition.
NFPA 204, 2002 edition.
NFPA 231, 1998 edition
NFPA 231C, 1998 edition
"Preventing Injuries and Deaths of Firefighters Due to Truss System Failures, NIOSH Alert, April 2005

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F159–06/07

## 2401.1, 2403.2

**Proponent:** Gregory G. Victor, Fire Department, Glendale, AZ, representing himself

**Revise as follows:**

**2401.1 Scope.** Tents~~, canopies~~ and membrane structures having an area in excess of 200 square feet (19 m2) and canopies in excess of 400 square feet (37 m2) shall comply with this chapter. The provisions of Section 2403 are applicable only to temporary tents, canopies and membrane structures. The provisions of Section 2404 are applicable to temporary and permanent tents, canopies and membrane structures.

**Exception:** Structures used exclusively for recreational camping purposes.

**2403.2 Approval required.** Tents, canopies and membrane structures ~~having an area in excess of 200 square feet (19 m2 ) and canopies in excess of 400 square feet (37 m2)~~ regulated by this Chapter shall not be erected, operated or maintained for any purpose without first obtaining ~~a permit and~~ approval from the fire code official.

~~**Exceptions:**~~

1. ~~Tents used exclusively for recreational camping purposes.~~
2. ~~Fabric canopies open on all sides which comply with all of the following:~~
   2.1. ~~Individual canopies having a maximum size of 700 square feet (65 $m^2$).~~

~~2.2. The aggregate area of multiple canopies placed side by side without a fire break clearance of 12 feet (3658 mm), not exceeding 700 square feet (65 m2) total.~~

~~2.3. A minimum clearance of 12 feet (3658mm) to all structures and other tents.~~

**Reason:** The purpose of this proposal is to clarify the scope of this Chapter and to simplify the requirements for permits. Current text sets the scope of this Chapter as all tents canopies and membrane structures in the universe. This proposal attempts to limit this scope to those tents canopies and membrane structures that require a permit by relocating that information provided in 2403.2 to 2401.1, the Scope section. Additionally deleting the exceptions in 2403.2 and adding an expanded exception that exempts all structures of this type that are use exclusively for recreational camping purposes. Exception 2 is specifically identified in

Section 2403.4 deals with permit requirements by referring the reader to Sections 105.6 and 105.7. There is no need to have an additional permit requirement in Section 2403.2 and therefore it is proposed for deletion. In addition Exception 2 to Section 2403.2 will be deleted as well since those exceptions are duplicated in Sections 105.6 and 105.7 making them unnecessary here.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F160–06/07
## 2403.12.6.1

**Proponent:** Rick Thornberry, P.E., The Code Consortium, Inc., representing American Pyrotechnics Association

**Revise as follows:**

**2403.12.6.1 Exit sign illumination.** Exit signs shall be ~~of an approved~~ listed and labeled as a self-luminous type having a minimum duration of 90 minutes luminosity or shall be internally or externally illuminated by luminaires supplied in the following manner:

1. Two separate circuits, one of which shall be separate from all other circuits, for occupant loads of 300 or less; or
2. Two separate sources of power, one of which shall be an approved emergency system, shall be provided when the occupant load exceeds 300. Emergency systems shall be supplied from storage batteries or from the on-site generator set, and the system shall be installed in accordance with the ICC *Electrical Code.* The emergency system provided shall have a minimum duration of 90 minutes when operated at full design demand.

**Reason:** This code change proposal accomplishes basically two things. First, it specifies that self-luminous type exit signs shall be labeled rather than approved as they are now available based on testing in accordance with nationally recognized standards. Second, it specifies the minimum duration that the self-luminous sign must maintain its luminosity or the emergency power must maintain its operation at full design demand at 90 minutes. This is consistent with the requirements for the illumination of exit signs in Section 1011.5.3 of the 2006 *International Building Code*.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F161–06/07
## 2404.1

**Proponent:** Rick Thornberry, P.E., The Code Consortium, Inc., representing American Pyrotechnics Association

**Revise as follows:**

**2401.1 Scope.** Tents, canopies and membrane structures shall comply with this chapter. The provisions of Section 2403 are applicable only to temporary tents, canopies and membrane structures. The provisions of Section 2404 are applicable to temporary and permanent tents, canopies and membrane structures.

**Reason:** This code change proposal simply clarifies the scoping statement for Chapter 24. Membrane structures are defined differently than tents and canopies so they need to be included when referring to the requirements of Sections 2403 and 2404.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F162–06/07
## 2404.5, 2404.21, 2404.22

**Proponent:** Rick Thornberry, P.E., The Code Consortium, Inc., representing American Pyrotechnics Association

**Revise as follows:**

**2404.5 Combustible materials.** Hay, straw, shavings or similar combustible materials shall not be located within any tent, canopy or membrane structure containing an assembly occupancy, except the materials necessary for the daily feeding and caring of animals. Sawdust and shavings utilized for a public performance or exhibit shall not be prohibited provided the sawdust and shavings are kept damp. Combustible materials shall not be permitted under stands or seats at any time. ~~The areas within and adjacent to the tent or air-supported structure shall be maintained clear of all combustible materials or vegetation that could create a fire hazard within 20 feet (6096 mm) of the structure. Combustible trash shall be removed at least once a day from the structure during the period the structure is occupied by the public.~~

**2404.21 Combustible Vegetation ~~removal~~.** Combustible vegetation that could create a fire hazard shall be removed from the area occupied by a tent, canopy or membrane structure, and from areas within 30 feet (9144 mm) of such structures.

**2404.22 Combustible waste material.** The floor surface inside tents, canopies or membrane structures and the grounds outside and within a 30 foot (9144 mm) perimeter shall be kept clear of combustible waste and other combustible materials that could create a fire hazard. Such waste shall be stored in approved containers and shall be ~~until~~ removed from the premises at least once a day during the period the structure is occupied by the public.

**Reason:** This code change proposal is similar to a companion a code change proposal which intends to accomplish the same thing: to correlate and clarify the requirements for combustible materials and vegetation within and in close proximity to tents, canopies, and membrane structures. These three sections deal with those issues but are not consistent. In this code change proposal we do not modify the separation distance of 30 feet for combustibles in Sections 2404.21 and 2404.22. We simply maintain the current requirements but deleted the separation distance requirement of 20 feet contained in Section 2404.5 which is in conflict. This gives the Committee the choice of which separation distances are appropriate so that they can approve one of these code changes in order to correlate the code regarding these combustible materials and their proximity to tents, canopies, and membrane structures.

**Cost Impact:** The code change proposal will not increase the cost of construction.

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|---|---|---|---|---|
| Public Hearing: | Committee: | AS | AM | D |
| | Assembly: | ASF | AMF | DF |

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# F163–06/07
## 2404.5, 2404.21, 2404.22

**Proponent:** Rick Thornberry, P.E., The Code Consortium, Inc., representing American Pyrotechnics Association

**Revise as follows:**

**2404.5 Combustible materials.** Hay, straw, shavings or similar combustible materials shall not be located within any tent, canopy or membrane structure containing an assembly occupancy, except the materials necessary for the daily feeding and caring of animals. Sawdust and shavings utilized for a public performance or exhibit shall not be prohibited provided the sawdust and shavings are kept damp. Combustible materials shall not be permitted under stands or seats at any time. ~~The areas within and adjacent to the tent or air-supported structure shall be maintained clear of all combustible materials or vegetation that could create a fire hazard within 20 feet (6096 mm) of the structure. Combustible trash shall be removed at least once a day from the structure during the period the structure is occupied by the public.~~

**2404.21 Combustible Vegetation ~~removal~~.** Combustible vegetation that could create a fire hazard shall be removed from the area occupied by a tent, canopy or membrane structure, and from areas within ~~30~~ 20 feet (~~9144~~ 6096 mm) of such structures.

**2404.22 Combustible waste material.** The floor surface inside tents, canopies or membrane structures and the grounds outside and within a ~~30~~ 20 foot (~~9144~~ 6096 mm) perimeter shall be kept clear of combustible waste and other combustible materials that could create a fire hazard. Such waste shall be stored in approved containers and shall be ~~until~~ removed from the premises at least once a day during the period the structure is occupied by the public.

**Reason:** The purpose of this code change proposal is to correlate the various subsections of Section 2404 that address the requirements for combustible materials and the required separation distances for combustible materials from tents, canopies, and membrane structures. The separation distance of 20 feet was used for both Sections 2404.21 and 2404.22 in lieu of the 30 feet currently prescribed based on the provisions in

Section 2404.5 which specified a minimum 20 foot clearance for combustible materials and vegetation. It should be noted that a separate code change proposal has been submitted to modify both Sections 2404.21 and 2404.22 similar to this code change proposal with the exception that the 30 foot separation distance is maintained. This will give the Committee the option to decide which separation distance is more appropriate so that either one of the code change proposals can be approved to help clarify the code and correlate the requirements for combustible materials and vegetation in proximity to tents, canopies, and membrane structure.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F164–06/07
## 2404.11

**Proponent:** Rick Thornberry, P.E., The Code Consortium, Inc., representing American Pyrotechnics Association

**Revise as follows:**

**2404.11 Clearance.** There shall be a minimum clearance of at least 3 feet (914 mm) between the fabric envelope and all contents located inside ~~the tent or~~ membrane structures.

**Reason:** This code change proposal corrects an error that was made when this chapter was completely revised to reorganize and clarify the requirements for tents, canopies, and membrane structures. We talked with the proponent of that code change proposal who indicated that it was not his intent to require that the fabric envelope and the contents of tents be separated by 3 feet. This is specifically a requirement for membrane structures which is the same as contained from the original source documents from which the rewrite was developed. It is important to maintain the minimum clearance of 3 feet between the fabric envelope and the contents of membrane structures since the fabric envelope may be a structural element, so to speak, of the membrane structure and should be available for inspection, as well as to prevent accidental contact that may tear or otherwise damage the fabric envelope. This is not the case for tents where the fabric envelope is simply provided as a weather and sun shield and is not structural. To our knowledge there was no similar requirement in any of the previous legacy model fire codes that were used to develop the *International Fire Code*. We are also not aware of any technical justification to support the 3 foot clearance between the fabric envelope and the contents within a tent.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F165–06/07
## 2605.2.1 (New)

**Proponent:** Larry Fluer, Fluer, Inc., representing Compressed Gas Association

**Revise as follows:**

**2605.2 Cylinder and container storage, handling and use.** Storage, handling and use of compressed gas cylinders, containers and tanks shall be in accordance with this section and Chapter 30.

**2605.2.1 Cylinders connected for use.** The storage or use of a single cylinder of oxygen and a single cylinder of fuel-gas located on a cart shall be allowed without requiring the cylinders to be separated in accordance with Sections 2703.9.8 or 2703.10.3.6 when the cylinders are connected to regulators, ready for service, equipped with apparatus designed for cutting or welding and the following:

1. Carts shall be kept away from the cutting or welding operation in accordance with Section 2605.5 or fire-resistant shields shall be provided.
2. Cylinders shall be secured to the cart to resist movement.
3. Carts shall be in accordance with Section 2703.10.3.
4. Cylinder valves not having fixed hand wheels shall have keys, handles, or nonadjustable wrenches on valve stems while the cylinders are in service.
5. Cylinder valve outlet connections shall conform to the requirements of CGA V-1.
6. Cylinder valves shall be closed when work is finished.
7. Cylinder valves shall be closed before moving the cart.

**Reason:** The use of “welding carts” has been common practice as a means to secure cylinders of oxygen and fuel-gas used in cutting and welding operations. The carts serve as a means to secure cylinders as well as a means to hold flexible hose, torches and in some cases safety equipment such as goggles or eye shields and welding rod. The requirements for separation of incompatible materials under the requirements of Sections 2703.9.8 and 2703.10.3.6 presents a practical difficulty when the quantity of materials is limited. Excepting a single cylinder of oxygen and fuel-gas

with additional controls to address the use condition provides a more comprehensive approach to safe use compared to that of prohibition that is out of convention. Specifying the minimum control for valves and their operation to include mandating the use of standard connections as prescribed by standards referenced in Chapter 45 (CGA V-1)l enhances the overall safety of the system.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F166–06/07
## 2610 (New), 1417.4 (New)

**Proponent:** Jesse J. Beitel, Hughes Associates, Inc., representing National Roofing Contractors Association

**Add new text as follows:**

**SECTION 2610**
**TORCH-APPLIED ROOF SYSTEM OR PRODUCTS**

**2610.1 General:** Torch-applied roof products and systems shall comply with Sections 2610.2 through 2610.4.

**2610.2 Installation:** Torch-applied roof products and systems shall be installed by roof torch applicators who have undergone training from an approved roof torch-applicator training program.

**2610.3 Portable fire extinguishers.** During roof torching operations, each roof torch applicator shall have a fully-charged portable fire extinguisher with a minimum 3-A 40-B:C rating within 10 feet (3 m) of torching operations. An additional fully-charged portable fire extinguisher with a minimum 3-A 40-B:C rating shall be positioned within the day's work area that is being covered with new roofing. Fire extinguishers shall comply with Section 906.

**2610.4 Fire watch.** A fire watch shall be conducted within the day's work area that is being covered with new roofing for a minimum period of two hours after the last roof torch has been extinguished. The fire watch shall be performed by an individual who has undergone training from an approved roof torch-applicator training program

**1417.4 Torch-applied roof systems and products:** Installation of torch-applied roof systems and products shall be in accordance with Section 2610.

**Reason:** The purpose of this proposal is to add additional requirements concerning the use of open- flame torches in roofing operations. This proposed code change adds language to the Code that would require roofing contractors who install torch-applied roofing products (e.g., polymer-modified bitumen sheet products) to train their workers on the safe use of torching equipment in order to prevent fires. For more than 20 years, many roofing contractors who have safely installed torch-applied roof products and systems have implemented the Midwest Roofing Contractors Association's (MRCA's) Certified Roof Torch Applicator (CERTA) training program for their torch applicators. The language "...approved roof torch-applicator training program..." is used here to allow for use of the CERTA program or other recognized roof torch safety programs (e.g., manufacturer's training, apprenticeship training programs) at the discretion and approval of the building official. The proposed change's requirements for the positioning of fire extinguishers and the fire watch are consistent with roofing industry best practices of those who safely use torch-applied roof products and systems.

The new Section is added to Chapter 26 since this Chapter applies to welding to other hot work and the Chapter contains a definition for Torch-applied Roof System. In the existing Section 1417 Safeguarding Roofing Operations, a new Section 1417.4 simply adds a cross reference to the new Section 2610.

**Cost Impact:** The code change proposal will increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F167–06/07
## 2701.1

**Proponent:** George A. Kerchner, Wiley Rein & Fielding, representing Battery Council International

**Revise as follows:**

**2701.1 Scope.** Prevention, control and mitigation of dangerous conditions related to storage, dispensing, use and handling of hazardous materials shall be in accordance with this chapter.

This chapter shall apply to all hazardous materials, including those materials regulated elsewhere in this code, except that when specific requirements are provided in other chapters, those specific requirements shall apply in accordance with the applicable chapter. Where a material has multiple hazards, all hazards shall be addressed.

**Exceptions:**

1. The quantities of alcoholic beverages, medicines, foodstuffs, cosmetics, and consumer or industrial products, containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solutions not being flammable, ~~in retail and wholesale sale occupancies,~~ are unlimited when packaged in individual containers not exceeding 1.3 gallons (5 L).
2. Application and release of pesticide and agricultural products and materials intended for use in weed abatement, erosion control, soil amendment or similar applications when applied in accordance with the manufacturers' instructions and label directions.
3. The off-site transportation of hazardous materials when in accordance with Department of Transportation (DOTn) regulations.
4. Building materials not otherwise regulated by this code.
5. Refrigeration systems (see Section 606).
6. Stationary storage battery systems regulated by Section 608.
7. The display, storage, sale or use of fireworks and explosives in accordance with Chapter 33.
8. Corrosives utilized in personal and household products in the manufacturers' original consumer packaging in Group M occupancies.
9. The storage of distilled spirits and wines in wooden barrels and casks.
10. The use of wall-mounted dispensers containing alcohol-based hand rubs classified as Class I or II liquids when in accordance with Section 3405.5.

**Reason:** Products listed under Exception 1. in Section 2701.1 pose very little risk in storage due to the limited quantity of material in each individual container and the packaging that is provided for retail distribution. Limiting this exception to retail and wholesale sales occupancies also creates confusion for fire code officials and companies that temporarily store materials in buildings other than retail and wholesale occupancies. Therefore, eliminating the reference to "retail and wholesale sales occupancies" will clarify the applicability of this provision in the IFC.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F168–06/07

## Table 2703.1.1(1) [IBC Table [F] 307.1(1)], Table 2703.1.1(2) [IBC Table [F] 307.1(2)], 2703.9.10 (New), Chapter 45

**Proponent:** Lynne M. Kilpatrick, Fire Department, City of Seattle, WA

**1. Revise tables as follows:**

**TABLE 2703.1.1(1) [IBC [F] TABLE 307.1(1)]**
**MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA**
**OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD [a,j] [m, n, p]**

e. Maximum allowable quantities shall be increased 100 percent when stored in approved ~~storage cabinets~~, gas cabinets, exhausted enclosures, listed storage cabinets or listed safety cans. Where Note d also applies, the increase for both notes shall be applied accumulatively.

(Portions of table and footnotes not shown do not change)

**TABLE 2703.1.1(2) [IBC [F] TABLE 307.1(2)]**
**MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA**
**OF HAZARDOUS MATERIALS POSING A HEALTH HAZARD [a, b, c, j]**

f. Maximum allowable quantities shall be increased 100 percent when stored in approved ~~storage cabinets,~~ gas cabinets, ~~or~~ exhausted enclosures or listed storage cabinets. Where Note e also applies, the increase for both notes shall be applied accumulatively.

**2. Add new text as follows:**

**2703.9.10 Safety cans.** Safety cans shall be listed in accordance with UL 30 when used to increase the maximum allowable quantities of flammable or combustible liquids in accordance with Table 2703.1.1(1) or Table 2703.1.1(3). Safety cans listed in accordance with UL 1313 are allowed for flammable and combustible liquids when not used to increase the maximum allowable quantities and for other hazardous material liquids in accordance with the listing.

**3. Add standard to Chapter 45 as follows:**

**Underwriters Laboratories**

UL1313-98 Standard for Nonmetallic Safety Cans for Petroleum Products .....2703.9.10

**Reason: Part 1**: The addition of "listed" in the footnote Table 2703.1.1 (1) and Table 2703.1.1 (2) for the safety cans and storage cabinets is to ensure that if a 100% increase in the maximum allowable quantity is to be applied for the material, the safety cans or the storage cabinets have met rigorous testing requirements.

UL 30 should be used for requirements covering metal safety cans that have nominal capacities of five gallons (18.9 L) or less and that are primarily intended to store and handle flammable and combustible liquids, such as gasoline, naphtha, kerosene, acetone, MEK, and similar liquids. The standard has over 75 years of experience testing safety cans and conducts 10 differtent testing phases that include a stability test, drop test, leakage test, handle and nozzle strength test, and fire exposure test.

UL 1313 should be used for requirements that cover nonmetallic safety cans having nominal capacities of 5 Imperial gallons or less and are primarly for the storage of combustible and some flammable liquids. This standard has 15 performance tests including, drop test, leak test, direct flame test, two different fire exposures test to name a few. Footnote (e) is located in many of the material categorize beyond flammable and combustible liquids. The use of this standard allows different materials that can be compatible to the can's construction material and product stored. This change will provide the code official an opportunity to ensure that products that are not compatible with the listed safety can are not stored improperly.

The standard UL 1275 for liquid storage cabinets is a critical safety feature in the storage of flammable and combustible liquids. The use of these cabinets continues to be an option that provides the code official and owner's flexibility for where the liquids can be stored and the ability for smaller (120 gallons) amounts to be located within manufacturing areas to reduce handling throughout the site. UL 1275 provides specific construction requirements for the cabinet, including sheet metal thickness, type joints, air space for the double walls, and venting to name a few. The standard includes a rigorous fire endurance test and leakage test. These add up to a cabinet that provides the needed protection feature to justify the doubling of the maximum allowable quantity for a control area. Currently, UL 1275 has tested many metal and wood cabinets.

**Part 2:** The addition of this new section will provide guidance to the code user regarding listed safety cans when they are utilized for general safety reasons and when utilized to take advantage of increasing the maximum allowable quantities of hazardous material liquids in a control area. This new Section requires the use of metal safety cans for flammable and combustible liquids if those cans are being used to increase quantities in a control area. It would allow for nonmetallic safety cans listed to UL1313 to be utilized to increase the maximum allowable quantities of other hazardous material liquids in accordance with Table 2703.1.1(1) and for the general safety of flammable and combustible liquids. Including this requirement for a UL listed safety cans in this code cycle provides some advance notice of the potential cost increase prior to publication in the 2009 IFC and allows for business to prepare for such a change.

**Cost Impact:** The code change proposal will increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F169–06/07

## Tables 2703.1.1(1) [IBC Table [F]307.1(1)], 2703.1.1.(2) [IBC Table [F]307.1(2)], 2703.1.1(3), 2703.1.1(4)

**Proponent:** Larry Fluer, Fluer, Inc., representing Compressed Gas Association

**1. Revise tables as follows:**

**TABLE 2703.1.1(1) [IBC [F] 307.1(1)]**
**MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIAL POSING A PHYSICAL HAZARD[a,j,m,n]**

| MATERIAL | CLASS | GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED | STORAGE[b] | | | USE-CLOSED SYSTEMS[b] | | |
|---|---|---|---|---|---|---|---|---|
| | | | Solid pounds (cubic feet) | Liquid gallons (pounds) | Gas cubic feet at NTP | Solid pounds (cubic feet) | Liquid gallons (pounds) | Gas cubic feet at NTP |
| Flammable gas | Gaseous | H-2 | Not Applicable | Not Applicable | 1,000[d, e] | Not Applicable | Not Applicable | 1,000[d, e] |
| | Liquefied | | | (150) ~~30~~[d, e] | Not Applicable | | (150) ~~30~~[d, e] | Not Applicable |
| Oxidizing gas | Gaseous | H-3 | Not Applicable | Not Applicable | 1,500[d, e] | Not Applicable | Not Applicable | 1,500[d, e] |
| | Liquefied | | | (150) ~~15~~[d, e] | Not Applicable | | (150) ~~15~~[d, e] | Not Applicable |

(Portions of table and footnotes not shown do not change)

**TABLE 2703.1.1(2) [IBC [F[ 307.1(2)]**
**MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIAL POSING A HEALTH HAZARD[a,b,c,j]**

| Material | STORAGE[d] | | | USE - CLOSED SYSTEMS[d] | | | USE - OPEN SYSTEMS[d] | |
|---|---|---|---|---|---|---|---|---|
| | Solid pounds[e,f] | Liquid gallons (pounds)[e,f] | Gas Cubic feet (pounds)[e] | Solid pounds[e] | Liquid gallons[e] | Gas Cubic feet (pounds)[e] | Solid pounds[e] | Liquid gallons[e] |
| Corrosives | 5000 | 500 | Gaseous 810[f, g] Liquefied (150)[i] | 5000 | 500 | Gaseous 810[f, g] Liquefied (150)[i] | 1000 | 100 |
| Highly Toxics | 10 | (10)[i] | Gaseous 20[h] Liquefied (4)[h, i] | 10 | (10)[i] | Gaseous 20[h] Liquefied (4)[h,i] | 3 | (3)[i] |
| Toxics | 500 | (500)[i] | Gaseous 810[f] Liquefied (150)[f,i] | 500 | (500)[i] | Gaseous 810[f] Liquefied (150)[f,i] | 125 | (125)[i] |

a. through f. (No change to current text)

~~g. A single cylinder containing 150 pounds or less of anhydrous ammonia in a single control area in a nonsprinklered building shall be considered a maximum allowable quantity. Two cylinders, each containing 150 pounds or less in a single control area shall be considered a maximum allowable quantity provided the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.~~

h. through j. Renumber to become g. through l (No change to current text)

**TABLE 2703.1.1(3)**
**MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIAL POSING A PHYSICAL HAZARD IN AN OUTDOOR CONTROL AREA[a,b,c]**

| MATERIAL | CLASS | GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED | STORAGE[b] | | | USE-CLOSED SYSTEMS[b] | | |
|---|---|---|---|---|---|---|---|---|
| | | | Solid pounds (cubic feet) | Liquid gallons (pounds) | Gas cubic feet at NTP | Solid pounds (cubic feet) | Liquid gallons (pounds) | Gas cubic feet at NTP |
| Flammable gas | Gaseous | H-2 | Not Applicable | Not Applicable | 3000 | Not Applicable | Not Applicable | 1500 |
| | Liquefied | | | (300) ~~30~~ | Not Applicable | | (150) ~~15~~ | Not Applicable |
| Oxidizing gas | Gaseous | H-3 | Not Applicable | Not Applicable | 6000 | Not Applicable | Not Applicable | 3000 |
| | Liquefied | | | (600) ~~60~~ | Not Applicable | | (300) ~~30~~ | Not Applicable |

(Portions of table and footnotes not shown do not change)

**TABLE 2703.1.1(4)**
**MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIAL POSING A HEALTH HAZARD IN AN OUTDOOR CONTROL AREA[a,b,c]**

| Material | STORAGE | | | USE - CLOSED SYSTEMS | | | USE - OPEN SYSTEMS | |
|---|---|---|---|---|---|---|---|---|
| | Solid pounds | Liquid gallons (pounds) | Gas Cubic feet (pounds) | Solid pounds | Liquid gallons | Gas Cubic feet (pounds) | Solid pounds | Liquid gallons |
| Corrosives | 20,000 | 2,000 | Gaseous 1,620[g] Liquefied (300)[f] | 10,000 | 1,000 | Gaseous 810[~~g~~] Liquefied (150)[f] | 1,000 | 100 |
| Highly Toxics | 20 | (20)[f] | Gaseous 40[d] Liquefied (8)[d,f] | 10 | (10)[f] | Gaseous 20[d] Liquefied (4)[d,f] | 3 | (3)[f] |
| Toxics | 1,000 | (1,000)[e,f] | Gaseous 1,620 Liquefied (300)[f] | 500 | 50[c] | Gaseous 810 Liquefied (150)[f] | 25 | (25)[e,f] |

a. through f. (No change to current text)

~~g. Two cylinders, each cylinder containing 150 pounds or less of anhydrous ammonia, shall be considered a maximum allowable quantity in an outdoor control area.~~

**Reason: (General) applicable to all tables:** The unit of measure for liquefied gases has historically been incorporated into the MAQ tables in terms of gallons as it has been conventional to think of ordinary liquids in terms of gallons. From a practical standpoint the use of gallons as a unit of measure for liquefied gases introduces an inconsistency into the concept due to the fact that unlike most liquids the density of liquefied gases varies widely. In commerce, liquefied gases are packaged and distributed based on weight being used as the unit of measure. Revising the MAQ tables to reflect threshold quantities in terms with units of measure that are readily available from the commercial market will greatly simplify the use of the code thereby making it more user friendly. To do so requires that a model be used as the basis for comparison. This approach was taken when thresholds were revised to base certain health hazard thresholds levels using a "chlorine index" as the model. A similar approach is proposed as a means to simplify the use of these tables.

**Table 2703.1.1(1): Flammable gases (liquefied):** In the case of liquefied flammable gases probably the most commonly encountered liquefied gas is LPG. LPG as defined can consist of propane, butane, propylene or others either in a mixed or pure form. NFPA 58 Table B.1.2(a) lists the approximate densities of commercial propane and butane at 60 degrees F as 4.20 and 4.81 pounds per gallon respectively. Converting the 30 gallon quantity to pounds and rounding up to the closest five pounds yields a quantity of 150 pounds on a weight basis. The density of butane is greater than that of propane therefore representing the worst case where mixtures of propane and butane are involved. The result of converting the 30 gallon threshold to a 150 pound threshold is in keeping with the philosophical approach used with gases such as ammonia and chlorine as they appear in Table 2703.1.1(2).

**Oxidizing gases (liquefied):** The threshold level of 15 gallons for oxidizing gases can be expressed in terms of weight based on using any of a number of oxidizing gases as the baseline. However, given the fact that a single cylinder of chlorine (an oxidizing, corrosive and toxic gas) has been used as the baseline in Table 2703.1.1(2) it is reasonable to use a single cylinder of chlorine as the baseline for the establishment of quantity in Table 2703.1.1(1) as well. To test the assumption a comparison was made to the 1500 cubic foot baseline maximum quantity for a non-liquefied gas using oxygen as the model. Using a specific volume for oxygen of 12.1 cubic feet per pound translates the 1500 cubic feet allowed for the baseline MAQ to 125 pounds if this gas was considered on a weight basis. The use of 150 pounds as a baseline quantity for liquefied oxidizing gases resolves the problem where a single cylinder of chlorine would NOT trip the H-4 threshold, but WOULD trip the H-3 threshold where arguably the inherent health hazards of the gas may represent a greater concern for public safety than do the physical hazards of the same gas.

It is recognized that this approach may appear to represent a major increase in the threshold for liquefied oxidizing gases; however, it brings the threshold levels into parity with those of liquefied flammable gases which may represent the greater hazard given the potential for fire and/or explosion. The example using oxygen as the baseline shows that an increase is justified. By supporting the change there is established a clear rationale that is based on practical examples of materials commonly found in commerce which have generally been accepted for use as the threshold for an increased level of control. In addition, the use of weight as a unit of measure brings the code into sync with units typically used by the suppliers of these products thereby mitigating the need for elaborate conversions into units of measure not found in common use.

**Table 2703.1.1(2):** The MAQ for corrosive and toxic gases established in Table 2703.1.1(2) of 810 cubic feet was based on a single cylinder of chlorine. Footnote g in the table was added to recognize that a single cylinder of ammonia should be allowed, however, the use of 810 did not allow for this given the fact that by comparison a 150 pound cylinder of ammonia contains over 3,300 cubic feet of gas. The preferred solution in lieu of trying to justify or create a series of footnotes to address individual gases is to use an index system that establishes a standardized approach. The concept of using a widely distributed gas such as chlorine as an index to establish the unit of measure has been established. However, the unit of measure in terms of weight was not carried into the table when it was formulated thereby creating the need for the use of footnotes to address ammonia. Compressed gases may be in liquid form or they may be gaseous. By maintaining the use of chlorine as the index to the table for toxic and corrosive properties and listing the threshold for liquefied gases as well as those that are nonliquefied eliminates the need for elaborate conversions in units of measure using data that in many cases is not readily available. The index used to establish the weight threshold is based on the use of arsine, a highly toxic gas with a specific volume of 5.0 cubic feet per pound.

It may be argued that by recognizing the common forms of gases, e.g., liquefied and nonliquefied allows a defacto increase in the threshold levels applied. It is possible that one could have a toxic gas that is liquefied and also one that is nonliquefied in the same area therefore doubling the aggregate quantity of gas if all was considered. While this is theoretically possible, it is not considered to be the norm. In addition, there is precedent in using the approach as established in Table 2703.1.1(1) for flammable and oxidizing gases.

**Table 2703.1.1(3):** The concept of "outdoor control areas" was introduced into the code as a means to establish a threshold where the general provisions of Chapter 27 would apply. When Table 2703.1.1(3) was created the logic for assignment of threshold values was primarily based on the use of multipliers representing a multiple increase of the basic tabular values shown in Table 2703.1.1(1). In the First Draft of the code Table 2703.1.1(3) was Table 2803.1-C and the quantities of gaseous and liquefied flammable gases were limited to 1500 cubic feet and 15 gallons respectively. The result was that the threshold level for liquefied flammable gases in interior areas was greater than that allowed for the same commodity when stored in outdoor areas. Assuming that the threshold level of 30 gallons for indoor areas was correct, the value of 15 gallons shown for outdoor areas is believed to have been in error. Code change F1324-98 submitted by proponent Mr. George G. Verbryck increased the threshold quantities for flammable and oxidizing gases (as well as a number of other commodities including combustible liquids, cryogenics, flammable liquids, flammable solids, organic peroxides, oxidizers, pyrophorics, unstable reactives and water reactives) <u>in storage in outdoor areas</u> by a factor of 2 resulting in the increase to for liquefied flammable gases from 15 to 30 gallons, and the inconsistency was perpetuated.

There may be those that argue that the 30 gallon threshold imposed by Table 2703.1.1(1) should have been 15 gallons when the First Draft was printed; however, it appears that the 30 gallon limit was established and the inconsistencies that followed have been perpetuated. The proposed code change is made to 1) correct the inconsistency in the table for liquefied flammable gases, and 2) to change the unit of measure to units of weight rather than those of volume to eliminate confusing and elaborate calculations thereby bringing the code closer into harmony with the commercial environment. The index system used to obtain a unit of measure for weight is based on multiples for a single 150 pound cylinder of butane for flammable gases and a single 150 pound cylinder for chlorine. The change made for oxidizing gases has been made for consistency and to correlate in concept with conversion to a weight basis.

**Table 2703.1.1(4):** A weight unit of measure has been established for liquefied gases, and the table has been revised to recognize that these materials may exist in liquid as well as gaseous form. The index system used to establish the quantity for toxics and corrosives is based on multiples of a single 150 pound cylinder of chlorine. The index system used to establish the threshold quantity for highly toxic liquefied gases is based on arsine, a highly toxic gas with a specific volume of 5.0 cubic feet per pound.

In preparing this code change it appears that the quantities listed for toxic solids and liquids in open use are in error, and that the 25 pounds indicated should be 125 pounds in each case. The original code change was introduced as F1309-98 by Mr. George V. Verbryck. By using weight rather than cubic footage as a unit of measure, there is not need to perpetuate footnote g as the variability of density has been accommodated. Both ammonia and chlorine are packaged as liquefied compressed gases.

**Cost Impact:** The code change proposal will not increase the cost of construction.

| | | | | |
|---|---|---|---|---|
| Public Hearing: | Committee | AS | AM | D |
| | Assembly: | ASF | AMF | DF |

# F170–06/07
## 2704.7 (IBC [F] 414.5.4)

**Proponent:** Patrick A. McLaughlin, McLaughlin & Associates, representing The Sherwin Williams Company

**Revise as follows:**

**2704.7 (IBC [F] 414.5.4) Standby or emergency power.** Where mechanical ventilation, treatment systems, temperature control, alarm, detection or other electrically operated systems are required, such systems shall be provided with an emergency or standby power system in accordance with the *ICC Electrical Code* and Section 604.

**Exceptions:**

1. Standby or emergency power for mechanical ventilation for storage of flammable and combustible liquids in single story occupancies.
~~1.~~ 2. Storage areas for Class 1 and 2 oxidizers.
~~2.~~ 3 Storage areas for Class III, IV and V organic peroxides.
~~3.~~ 4. For storage areas for highly toxic or toxic materials, see Sections 3704.2.2.8 and 3704.3.2.6.
~~4.~~ 5. Standby power for mechanical ventilation, treatment systems and temperature control systems shall not be required where an approved fail-safe engineered system is installed.

**Reason:** The proposal will coordinate the IFC and NFPA 30 requirements for standby power for flammable and combustible liquids storage ventilation. We do not see the need for standby power for ventilation for these materials in storage. In fact, ventilation systems are normally shut down during fire emergencies to limit fire growth.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee AS AM D
Assembly: ASF AMF DF

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# F171–06/07
## 2704.7 (IBC [F] 414.5.4)

**Proponent:** Larry Fluer, Fluer, Inc., representing Compressed Gas Association

**Revise as follows:**

**2704.7 Standby or emergency power.** Where mechanical ventilation, treatment systems, temperature control, alarm, detection or other electrically operated systems are required, such systems shall be provided with an emergency or standby power system in accordance with the ICC *Electrical Code* and Section 604.

**Exceptions:**

1. Storage areas for Class 1 and 2 oxidizers.
2. Storage areas for Class II, III, IV and V organic peroxides.
3. Storage areas for asphyxiant, irritant and radioactive gases.
4.~~3.~~ For storage areas for highly toxic or toxic materials, see Sections 3704.2.2.8 and 3704.3.2.6.
5.~~4.~~ Standby power for mechanical ventilation, treatment systems and temperature control systems shall not be required where an approved fail-safe engineered system is installed.

**Reason:** Unlike the requirements for other hazard categories which use the Maximum Allowable Quantity Per Control Area (MAQ) as a trigger threshold, the requirement for ventilation in storage areas containing asphyxiant, irritant and radioactive gases is not quantity based. Ventilation under the requirements of Section 3007.2 is only required in storage areas when the building is occupied.

Providing ventilation in areas where compressed gases are stored or used is fundamental, whether standby power as a redundant control is fundamental for any quantity of this particular group of gases is warranted is questionable given the fact that standby or emergency power is not required for flammables, corrosives, oxidizing, toxic, highly toxic, unstable reactive or other hazard classes until the MAQ is exceeded. An MAQ was not established for this group of materials when the provision was introduced to the code based on the lack of defined physical or health hazards that represent the Group H occupancies in general.

The construction of compressed gas containers is robust compared to the containers used for other materials that may be of glass, plastic or paper. The integrity of the containers alone represents a major safeguard against likely failure. While leakage from containers is a consideration the concern the reestablishment of power to the ventilation system within a 60 second period is not warranted given the fact that the requirement could be imposed for insignificant quantities of the gas, and given the fact that occupancy of a storage area during power out conditions is not the norm.

The change to Exception 2 to add Class II organic peroxides to the list of exceptions is to correlate the requirements with Section 3904.1.11 which requires standby power only for Class I and unclassified detonable organic peroxides.

IBC: Correlation with IFC Section 2704.7. Exception No. 1, the characters for oxidizers should be Arabic not Roman. Exception. 2 is to correlate with IFC Section 3904.1.11.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

# F172–06/07
## 3003.7.11 through 3003.7.11.2 (New), 3504.2.2 (New), Chapter 45

**Proponent:** Paul J. Buehler, Jr., Plug Power, Inc.

**1. Add new text as follows:**

**3003.7.11 Outdoor hydrogen storage cabinets.** Bottled hydrogen gas may be stored in quantities of up to 4,225 scf in specially designed hydrogen storage cabinets meeting Telcordia GR-487-CORE. Cabinets used for this purpose must be also be listed by a nationally recognized testing laboratory. Such cabinets shall be deemed to meet the requirements of Sections 3003.7.2, 3003.7.4, 3003.7.5, and 3003.13.

**3003.7.11.1 Combustible waste, vegetation and similar materials.** Combustible waste, vegetation and similar materials shall be kept a minimum of 3 feet (914 mm) from outdoor hydrogen storage cabinets.

**3003.7.11.2 Electrical equipment.** Unclassified electrical equipment shall be located no closer than 5 feet (1520 mm) from the Outdoor Hydrogen Storage Cabinet.

**Exceptions:**

1. Unfused transfer switches mounted in outdoor rated NEMA enclosures may be located within 5 feet (1520 m) provided that the device is no taller than 4 feet (1220 mm) above finished grade.
2. Landline and wireless telephone equipment may be located within 5 feet (1520 mm) of outdoor hydrogen storage cabinets provided that the telephone equipment is housed in Network Equipment Building Systems (NEBS) rated enclosures meeting Telcordia GR-487-CORE.

**2. Add new text as follows:**

**3504.2.2 Outdoor hydrogen storage cabinets.** Storage of up to 4,225 standard cubic feet of bottled hydrogen gas in an outdoor hydrogen storage cabinet shall be in accordance with Section 3003.7.11.

**3. Add referenced standard to Chapter 45 as follows:**

Telcordia Technologies, Inc.
One Telcordia Drive
Piscataway, NJ 08854-4156

Telecordia GR-487-CORE -00 General Requirements for Electronic Equipment Cabinets

**Reason:** Revise outdated material because current *International Fire Code* and NFPA 55 sections do not deal with the storage of bottled hydrogen out of doors inside cabinets, but rather only consider "naked" cylinders or indoor gas cabinets per Sections 2703.8.6 and 3006.2.3.

This amendment is to facilitate the placement of bottled hydrogen in proximity to low powered electrical equipment meeting only the highest standards of the telecommunications industry. This is superior to current code language because it deals with increasingly common use of a flammable gas in frequently encountered situations. Current work in the fuel cell industry has indicated that hydrogen fuel must fit into locations not anticipated in prior revisions to the codes. Therefore, the fuel cell industry is performing basic research and testing on fuel cells and the associated hydrogen storage. This testing has led to several conclusions: that hydrogen gas is not as persistent as once thought; and that methods of enclosure for hydrogen cylinders and telecommunications equipment have not been duly noted by existing codes. Therefore, this amendment attempts to include both of these facets into the upcoming code.

Substantiation: Cabinets meeting Telcordia NEBS criteria are certified for use in locations likely to encounter gun shot, brush fire, and/or earthquake hazards. Telecommunications equipment is also effectively sealed inside weather-proof and EMI rated cabinets. The enclosed telecommunications equipment is low power and is not an ordinary arc/spark hazard, although it is not usually considered to be intrinsically safe. Likewise, stored hydrogen cylinders located inside a cabinet meeting the same standards are protected from the same brush fire, gun shot and earthquake hazards as the telecommunications equipment.

Current hydrogen research by Swain and Tchouvelev has yielded data suggesting that hydrogen gas does not sink and pool, but rather dissipates upward quickly in open air in a predictable manner. Furthermore, fully charged standard gas cylinders evacuate (blow down) in between 100 and 120 seconds. Thus, the exposure time is limited to this blow down period.

Current design Outdoor Hydrogen Storage Cabinets thus protect stored hydrogen in a manner which was not anticipated previously. Furthermore, there are other safeguards built into such cabinets. The stored hydrogen is connected to some device which consumes the hydrogen through the use of valves, regulators and piping.

A small or large leak internal to the Outdoor Hydrogen Storage Cabinet will result in a buoyant release of hydrogen gas through the ridge vent. Such a leak could be the result of a Pressure Relief Device (PRD) activation, or as the result of a plumbing failure at a weld or threaded connection, etc. The leaked hydrogen gas will then buoyantly exit at the elevation of the ridge vent, nominally 70+ inches above finished grade and dissipate into the atmosphere quickly. This is in stark contrast to a PRD release on a bottle not inside a container, which would result in hydrogen gas being expelled in a plane parallel to the long side of the bottle as jets in four directions.

Likewise, there are safeguards against leaks between the Outdoor Hydrogen Storage Cabinet and the hydrogen consuming device. In the event that there is a plumbing rupture, an excess flow valve operates which then sends the hydrogen up the vent stack for a sonic release. The vent stack is designed and oriented following CGA 5.5 guidelines. The amount of hydrogen expelled through the leaking hose will be just the amount in the plumbing in between the excess flow valve and the consuming device. One such Outdoor Hydrogen Storage Cabinet utilizes ¼" diameter tubing (6.35 mm) with a length of approximately 124 inches (3149.6 mm), rendering a volume of 6.1 cubic inches (99.75 $cm^3$).

Assume that the majority of the plumbing is internal to the Outdoor Hydrogen Storage Cabinet except for the last 6 inches (152.4 mm) and that in the worst case the connection hose is essentially on the ground or very close to the ground. Thus, if a 5 foot (1524 mm) radius were to be drawn around such a hose, it would depict a hemisphere (as the hose is near to the ground). The volume of such a hemisphere is 452,389 cubic inches (7,414,655 $cm^3$). Therefore, the volume of expelled hydrogen is $1.34x10^{-7}$ % of the hemisphere's volume; this is clearly less than 4% LFL in free air.

**Bibliography:**
International Journal of Hydrogen Energy 30 (2005) 1447 – 1455, M.R. Swain, et.al, *Ignition of lean hydrogen – air mixtures*
"An Experimental Investigation into the Ignition of Leaking Hydrogen", M.R. Swain, Unpublished
Telcordia GR-487-CORE, *Generic Requirements for Electronic Equipment Cabinets*
"Hydrogen Clearance Distances", Stuart Energy Systems Corporation, 12 Sep 2004

**Cost Impact:** The code change proposal will not increase the cost of construction.

**Analysis:** Results of review of the proposed standard(s) will be posted on the ICC Website by August 20, 2006.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F173–06/07
## 3006.2

**Proponent:** Lynne M. Kilpatrick, Fire Department, City of Seattle, WA

**Revise as follows:**

**3006.2 Interior supply location.** Medical gases shall be stored in areas dedicated to the storage of such gases without other storage or uses. Where containers of medical gases in quantities greater than the permit amount are located inside buildings, they shall be in a 1-hour exterior room, a 1-hour interior room or a gas cabinet in accordance with Section 3006.2.1, 3006.2.2 or 3006.2.3. Storage of hazardous medical gases exceeding the maximum allowable quantity per control area as set forth in Section 2703.1 shall also be in accordance with Chapter 27 and the appropriate material specific chapters.

**Reason:** The proposed code change clarifies that even though a medical gas room in accordance with Section 3006.2 is provided for medical gas quantities over the permit threshold, once the maximum allowable quantity has been exceeded any additional requirements set forth in Chapter 27 and the hazard specific chapters for storage of hazardous gases must also be met.

**Cost Impact:** The code change proposal will increase the cost of construction when the maximum allowable quantity is exceeded.

Public Hearing: Committee AS AM D
Assembly: ASF AMF DF

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# F174–06/07
## 3202.1

**Proponent:** Larry Fluer, Fluer, Inc., representing Compressed Gas Association

**Add new definition as follows:**

**3202.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**OXIDIZING CRYOGENIC FLUID.** An oxidizing gas in the cryogenic state.

**Reason:** The term "oxidizing cryogenic fluid" is used in Section 3201.1 in this form, and in Table 2703.1.1(1) and Appendix F Table F101.2 as cryogenic, oxidizing. The term needs to be defined so that it is clear. Section 3202.1 is used to define flammable cryogenic fluid and although the term may be used elsewhere, it seems most appropriate to include the definition in Chapter 32 given the fact that Chapter 32 is titled "Cryogenic Fluids."

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F175–06/07
**3204.3.1.3**

**Proponent:** John C. Dean, The National Association of State Fire Marshals

**Revise as follows:**

**3204.3.1.3 Drainage.** The area surrounding stationary containers shall be provided with a means to prevent accidental discharge of fluids from endangering personnel, containers, equipment and adjacent structures or to enter enclosed spaces. The stationary container shall not be placed where spilled or discharged fluids will be retained around the container. Site preparation shall include provisions for retention of spilled liquid hydrogen (LH2) within the limits of the refueling site property and for surface water drainage. Confinement of LH2 shall not result in a condition of pooled LH2 or the liquefaction of air. Site preparation shall be designed to limit the area or volume where an ignitable concentration (LFL of 4%) of gaseous hydrogen may exist. Diking, crushed stone, and other barriers may be used provided they meet the requirements of this section. Where land is available, and adjacent structures and property will not be adversely affected, the LH2 shall be diverted away from the tank to an evaporating bed.

> **Exception:** These provisions shall not apply when it is determined by the fire code official that the container does not constitute a hazard after consideration of such special features such as crushed rock utilized as a heat sink, topographical conditions, nature of occupancy, proximity to structures on the same or adjacent property, and the capacity and construction of containers and character of fluids to be stored.

**Reason:** There has been considerable discussion on the requirement for, or prohibition of, or restriction on, the use of diking around above-ground LH2 storage. The proposed language captures the intent to prevent liquid hydrogen from entering areas not zoned/rated for flammable gas, and to control the ground-level vapor cloud, to the extent possible, to within areas designed to address a flammable mixture. There seems to be reasonable agreement that the LH2 will vaporize quickly and the resulting thermal- and momentum-induced turbulent flow with air will allow it to warm and disperse to safe concentrations.

Concurrently, when the air mass near the hydrogen spill drops to a temperature of -317.8 degrees F, the air will start to liquefy. This point is 105.4 degrees above the boiling point of hydrogen (-423.2 degrees F), and therefore it is not necessary to have a pool of liquid hydrogen to get liquefaction of air; all that is needed is a lot of very cold hydrogen gas. Once the liquid air is formed, it will fractionally distill, enriching the oxygen content and increasing the potential for a rapid exothermic reaction. Thus, both liquefaction of air and potential pooling of hydrogen are problems that need to be considered.

There are advantages and disadvantages to diking. The disadvantage is that it may increase the resident time of a vapor cloud over the affected area. However, this is also considered a positive, as it reduces the total affected area. This may be particularly important if adjacent property is not properly zoned to address a hydrogen leak. The proposed language serves to minimize the affected area to the extent possible, while still preventing additional hazards from forming.[1]

[1] Proposed changes are based on findings from NASFM's Ad Hoc committee consisting of emergency responders, federal and state authorities, and industry experts all having experience with and/or code enforcement authority over fixed outdoor hydrogen storage systems.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F176–06/07
**3301.1.3**

**Proponent:** Rick Thornberry, P.E., The Code Consortium, Inc., representing American Pyrotechnics Association

**Revise as follows:**

**3301.1.3 Fireworks.** The possession, manufacture, storage, sale, handling and use of fireworks are prohibited.

**Exceptions:**

1. Storage and handling of fireworks as allowed in Section 3304.
2. Manufacture, assembly and testing of fireworks as allowed in Section 3305.
3. The use of fireworks for fireworks displays as allowed in Section 3308.
4. The possession, storage, sale, handling and use of specific types of Division 1.4G fireworks where allowed by applicable laws, ordinances and regulations, provided such fireworks comply with CPSC 16 CFR, Parts 1 500 and 1507, and DOTn 49 CFR, Parts 100-178, for consumer fireworks.

**Reason:** This code change proposal simply clarifies Exception 3 to Section 3301.1.3. It utilizes the defined term "fireworks display" which is defined in Section 3302.1. This would also make it consistent with the title to Section 3308 which is referenced in this exception.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F177–06/07
## 3301.1.3

**Proponent:** Rick Thornberry, P.E., The Code Consortium, Inc., representing American Pyrotechnics Association

**Revise as follows:**

**3301.1.3 Fireworks.** The possession, manufacture, storage, sale, handling and use of fireworks are prohibited.

**Exceptions:**

1. Storage and handling of fireworks as allowed in Section 3304.
2. Manufacture, assembly and testing of fireworks as allowed in Section 3305.
3. The use of fireworks for display as allowed in Section 3308.
4. The possession, storage, sale, handling and use of specific types of Division 1.4G fireworks where allowed or otherwise not prohibited by applicable laws, ordinances and regulations, provided such fireworks comply with CPSC 16 CFR, Parts 1500 and 1507, and DOTn 49 CFR, Parts 100-178, for consumer fireworks.

**Reason:** This code change proposal is a follow up to Code Change Proposal F219-04/05 which was approved as modified during the last code development cycle. When the International Fire Code Committee approved this code change as modified, we expressed our concerns that we were still not certain that it resolved the issue of how this exception would apply legalistically in the various states and local jurisdictions throughout the country that regulate consumer fireworks. Upon further detailed review of the impact of the code change, we believe that an additional modification would be appropriate to fully clarify the exception and make it consistent with state and local laws, ordinances, and regulations throughout the country.

Under the United States system of laws, the general rule is that anything is allowed unless it is specifically prohibited by a law, ordinance, or regulation. So, basically, consumer fireworks are allowed everywhere in the U.S. unless a state or local jurisdiction takes specific action to prohibit or otherwise limit their use. But the key point is that a jurisdiction doesn't need to take specific action to allow consumer fireworks as the current wording in the Exception 4 implies. Therefore, we believe it would be more appropriate to use the phrase "otherwise not prohibited" as an alternate to the word "allowed". We believe that this still meets the intent of the original code change proposal to assure that compliance is met with all applicable laws which include ordinances and regulations, both state and local.

Under the current wording recently approved by the Committee modified Code Change Proposal F219-04/05 there could be problems in jurisdictions where, for example, a state has prohibited the use of consumer fireworks but allows for a local exemption. Then a local jurisdiction within that state passes a law allowing consumer fireworks. In that case, the applicable state law does not allow consumer fireworks, per se, yet the state law is constructed so that a local jurisdiction can allow them if they pass an ordinance doing so. But if a state does not pass a law prohibiting consumer fireworks, then there would be no applicable law, ordinance, or regulation that would specifically allow them since they would not be prohibited. The other side of the coin is the case where the state does not prohibit the use of consumer fireworks since no law was passed attempting to do that, but a local jurisdiction passes an ordinance or implements a regulation that specifically prohibits consumer fireworks. In that case, the Exception 4 as currently written would apply as would the exception as further modified by this code change proposal. So that situation would be covered. However, the previous situation is not covered by the current text of Exception 4 but would be covered by the proposed modifications in this code change proposal to modify Exception 4. Therefore, we believe the appropriate approach for modifying Exception 4 would be to approve this code change proposal. This would avoid any potential conflict between local ordinances and regulations and state laws and regulations.

**Cost Impact:** The code change proposal will not increase the cost of construction.

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| Public Hearing: | Committee: | AS | AM | D |
| | Assembly: | ASF | AMF | DF |

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# F178–06/07
## 3306.5.2.1

**Proponent:** Greg Rogers, South Kitsap Fire & Rescue, representing ICC Joint Fire Service Review Committee

**Revise as follows:**

**3306.5.2.1 Smokeless propellant.** Commercial stocks of smokeless propellants shall be stored as follows:

1. Quantities exceeding 20 pounds (9 kg), but not exceeding 100 pounds (45 kg) shall be stored in portable wooden boxes having walls of at least 1 inch (25 mm) nominal thickness.
2. Quantities exceeding 100 pounds (45 kg), but not exceeding 800 pounds (363 kg), shall be stored in nonportable storage cabinets having walls at least 1 inch (25 mm) nominal thickness. Not more than 400 pounds (182 kg) shall be stored in any one cabinet, and cabinets shall be separated by a distance of at least 25 feet (7620 mm) or by a fire partition having a fire-resistance rating of at least 1 hour.
3. Storage of quantities exceeding 800 pounds (363 kg), but not exceeding 5,000 pounds (2270 kg) in a building s shall comply with all of the following:
   3.1. The warehouse or storage room is unaccessible to unauthorized personnel.
   3.2. Smokeless propellant shall be stored in nonportable storage cabinets having wood walls at least 1 inch (25 mm) nominal thickness and having shelves with no more than 3 feet (914 mm) of separation between shelves.

3.3. No more than 400 pounds (182 kg) is stored in any one cabinet.
3.4. Cabinets shall be located against walls of the storage room or warehouse with at least 40 feet (12 192 mm) between cabinets. The minimum required separation between cabinets shall be allowed to be reduced to 20 feet (6096 mm) provided that barricades twice the height of the cabinets are attached to the wall, midway between each cabinet. The barricades must extend a minimum of 10 feet (3048 mm) outward, be firmly attached to the wall, and be constructed of steel not less than 0.25 inch thick (6.4 mm), 2-inch (51 mm) nominal thickness wood, brick, or concrete block.
3.5. Smokeless propellant shall be separated from materials classified as combustible liquids, flammable liquids, flammable solids, or oxidizing materials by a distance of 25 feet (7620 mm) by a fire partition having a fire-resistance rating of 1 hour.
3.6. The building shall be equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

4. Smokeless propellants not stored according to Item 1, 2, or 3 above shall be stored in a Type 2 or 4 magazine in accordance with Section 3304 and NFPA 495.

**Reason:** This is the same type change made and approved for F225-04/05. The charging statement of item 3 requires that the storage of propellants "comply with all" of the provisions below. This proposal will eliminate the conflict between items 3.4 and 3.5.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F179–06/07
## 3307.4

**Proponent:** Greg Rogers, South Kitsap Fire & Rescue, representing ICC Joint Fire Service Review Committee

**Revise as follows:**

**3307.4 Restricted hours.** Surface-blasting operations shall only be conducted during daylight hours between sunrise and sunset. Other blasting shall be performed during daylight hours unless otherwise approved by the fire code official.

**Reason:** This change is to provide some specificity on the acceptable daylight hours that a blasting operation may take place. The time of sunrise and sunset is commonly advertised through various media sources.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F180–06/07
## 3308.1 through 3308.4, 3308.5.3 through 3308.5.5, 3308.8, 3308.9, 3302.1

**Proponent:** Rick Thornberry, P.E., The Code Consortium, Inc., representing American Pyrotechnics Association

**1. Revise as follows:**

**SECTION 3308**

**FIREWORKS DISPLAYS**

**3308.1 General.** ~~The display of~~ Outdoor fireworks displays, ~~including~~ use of pyrotechnics before a proximate audience ~~displays,~~ and pyrotechnic special effects in motion picture, television, theatrical, and group entertainment productions, shall comply with this ~~chapter~~ section and NFPA 1123 or NFPA 1126.

**3308.2 Permit application.** Prior to issuing permits for a fireworks display, plans for the fireworks display, inspections of the display site and demonstrations of the display operations shall be approved. A plan establishing procedures to follow and actions to be taken in the event that a shell fails to ignite in, or discharge from, a mortar or fails to function over the fallout area or other malfunctions shall be provided to the fire code official.

**3308.2.1 Outdoor fireworks displays.** In addition to the requirements of Section 403, permit applications for outdoor fireworks displays using Division 1.3G fireworks shall include a diagram of the location at which the fireworks display

will be conducted, including the site from which fireworks will discharged; the location of buildings, highways, overhead obstructions and utilities; and the lines behind which the audience will be restrained.

**3308.2.2 Use of pyrotechnics before a proximate audience ~~displays~~.** Where the separation distances required in Section 3308.4 and NFPA 1123 are unavailable or cannot be secured, ~~only proximate audience~~ fireworks displays shall be conducted in accordance with NFPA 1126 for proximate audiences ~~shall be allowed~~. Applications for use of pyrotechnics before a proximate audience ~~displays~~ shall include plans indicating the required clearances for spectators and combustibles, crowd control measures, smoke control measures, and requirements for standby personnel and equipment when provision of such personnel or equipment is required by the fire code official.

**3308.3 Approved fireworks displays.** Approved fireworks displays shall include only the approved ~~Division~~ fireworks 1.3G, ~~Division~~ fireworks 1.4G, ~~and~~ ~~Division~~ fireworks 1.4S, and pyrotechnic articles, 1.4G ~~fireworks,~~ which shall be handled by an approved competent operator. ~~and~~ The approved fireworks shall be arranged, located, discharged and fire in a manner that will not pose a hazard to property or endanger any person.

**3308.4 Clearance.** Spectators, spectator parking areas, and dwellings, buildings or structures shall not be located within the display site.

**Exceptions:**

1. This provision shall not apply to pyrotechnic special effects and fireworks displays using Division 1.4G materials before a proximate audience in accordance with NFPA 1126.
2. This provision shall not apply to unoccupied dwellings, buildings and structures with the approval of the building owner and the fire code official.

**3308.5.3 Inspection.** Shells shall be inspected by the operator or assistants after delivery to the display site. Shells having tears, leaks, broken fuses or signs of having been wet shall be set aside and shall not be fired. Aerial shells shall be checked for proper fit in mortars prior to discharge. Aerial shells that do not fit properly shall not be fired. After the fireworks display, damaged, deteriorated or dud shells shall either be returned to the supplier or destroyed in accordance with the supplier's instructions and Section 3304.10.

**Exception:** Minor repairs to fuses shall be allowed. For electrically ignited displays, attachment of electric matches and similar tasks shall be allowed.

**3308.5.4 Sorting and separation.** After delivery to the display site and prior to the fireworks display, all shells shall be separated according to size and their designation as salutes.

**Exception:** For electrically fired displays, or displays where all shells are loaded into mortars prior to the show, there is no requirement for separation of shells according to size or their designation as salutes.

**3308.5.5 Ready boxes.** Display fireworks, ~~(Division~~ 1.3G~~)~~, that will be temporarily stored at the site during the fireworks display shall be stored in ready boxes located upwind and at least 25 feet (7620 mm) from the mortar placement and separated according to size and their designation as salutes.

**Exception:** For electrically fired fireworks displays, or fireworks displays where all shells are loaded into mortars prior to the show, there is no requirement for separation of shells according to size, their designation as salutes, or for the use of ready boxes.

**3308.8 Fireworks display supervision.** Whenever in the opinion of the fire code official or the operator a hazardous condition exists, the fireworks display shall be discontinued immediately until such time as the dangerous situation is corrected.

**3308.9 Post-fireworks display inspection.** After the fireworks display, the firing crew shall conduct an inspection of the fallout area for the purpose of locating unexploded aerial shells or live components. This inspection shall be conducted before public access to the site shall be allowed. Where fireworks are displayed at night and it is not possible to inspect the site thoroughly, the operator or designated assistant shall inspect the entire site at first light. A report identifying any shells that fail to ignite in, or discharge from, a mortar or fail to function over the fallout area or otherwise malfunction shall be filed with the fire code official.

**2. Add new definitions to Section 3302.1 to read as follows:**

**PYROTECHNICS.** Controlled exothermic chemical reactions timed to create the effects of heat, hot gas, sound, dispersion of aerosols, emission of visible light, or a combination of such effects to achieve the maximum effect from the least volume of pyrotechnic composition.

**PYROTECHNIC ARTICLE.** A pyrotechnic device for use in the entertainment industry, which is not classified as fireworks.

**Reason:** This is a clean up code change that basically makes editorial corrections throughout this section so the section internally correlates and uses appropriate terms including defined terms such as "fireworks display". This will also make this section more consistent with NFPA 1123, 1124, and 1126. In fact, the proposed two new definitions for "Pyrotechnics" and "Pyrotechnic Article" are consistent with those in NFPA 1124 without, hopefully, invoking any copyright infringement issues. It should be noted that only those sections and subsections where revisions are proposed have been shown in this code change proposal. Therefore, any sections or subsections which have not been incorporated into this code change proposal are not intended to be revised.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F181–06/07
## 3308.11

**Proponent:** Greg Rogers, South Kitsap Fire & Rescue, representing ICC Joint Fire Service Review Committee

**Delete without substitution:**

~~**3308.11 Retail display and sale.** Fireworks displayed for retail sale shall not be made readily accessible to the public. A minimum of one pressurized-water portable fire extinguisher complying with Section 906 shall be located not more than 15 feet (4572 mm) and not less than10 feet (3048 mm) from the hazard. "No Smoking" signs complying with Section 310 shall be conspicuously posted in areas where fireworks are stored or displayed for retail sale.~~

**Reason:** Section 3301.1.3 prohibits consumer fireworks unless specifically authorized by state or jurisdictional statute or ordinance as allowed in Exception 4 to Section 3301.1.3. Therefore, the statute or ordinance should include the provisions for the retail display of fireworks and the provisions for the structure that contains the retail operation.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F182–06/07
## 3308.11

**Proponent:** Rick Thornberry, P.E., The Code Consortium, Inc., representing American Pyrotechnics Association

**Delete without substitution:**

~~**3308.11 Retail display and sale** Fireworks displayed for retail sale shall not be made readily accessible to the public. A minimum of one pressurized-water portable fire extinguisher complying with Section 906 shall be located not more than 15 feet (4572 mm) and not less than 10 feet (3048 mm) from the hazard "No Smoking" signs complying with Section 310 shall be conspicuously posted in areas where fireworks are stored or displayed for retail sale.~~

**Reason:** Section 3308.11 Retail Display and Sale is proposed to be deleted from Section 3308 Fireworks Display since it is inappropriate in this location and is not applicable. Section 3308 addresses fireworks displays which are defined in Section 3302.1 as follows: "A presentation of fireworks for a public or private gathering." Section 3308.11 appears to address fireworks that are put on "display" in a retail sales environment so that consumers may purchase them. This type of "display" is not intended to be captured by the definition for "fireworks display"

Furthermore, this is an over simplistic approach to attempt to address the fire safety requirements for the retail sales of consumer fireworks where allowed by local and/or state laws, regulations, and ordinances It provides very little criteria or guidance for the protection of this type of retail sales venue. The retail sales of consumer fireworks requires much more attention to detail and a comprehensive approach to assure a reasonable level of fire and life safety for those members of the public who enter the retail sales establishments where consumer fireworks are sold

In an effort to address this very important issue for consumer fire safety, we have submitted a companion code change proposal that references NFPA 1124 into the International Fire Code to establish the requirements for regulating the retail sales of consumer fireworks. Therefore, we urge the Committee to approve this code change proposal to delete Section 3308.11 and the companion code change proposal to adopt the reference to NFPA 1124 for regulating the retail sales of consumer fireworks.

**Cost Impact:** The code change proposal will increase the cost of construction

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F183–06/07
## 3309 (New)

**Proponent:** Rick Thornberry, P.E., The Code Consortium, Inc., representing American Pyrotechnics Association

**Add new section as follows:**

**SECTION 3309**
**RETAIL SALES OF CONSUMER FIREWORKS**

**3309.1 General.** Where the retail sales of consumer fireworks, 1.4G is allowed by Section 3301.1.3, Exception 4, such retail sales shall comply with NFPA 1124.

**Reason:** The purpose of this proposed code change is to adopt by reference NFPA 1124-2006 for the purpose of regulating the retail sales of consumer fireworks, 1.4G where such sales are allowed by Exception 4 to Section 3301.1.3. It should be noted that currently at least 45 states and the District of Columbia allow some form of retail sales of consumer fireworks, 1.4G. However, the International Fire Code (IFC) basically ignores this fact and contains no comprehensive set of regulations that will provide a reasonable level of fire and life safety for the retail sales venues where consumer fireworks are sold to the public. The venues in which the retail sales of consumer fireworks are allowed by state and local jurisdictions vary significantly throughout this country. Sales are allowed to occur in such venues as tents, portable stands, trailers, permanent stands, fireworks only type stores, and general merchandise stores where fireworks may be sold as a side line or only during seasonal periods. Consumer fireworks sales also may be year round or only during certain time periods of the year such as July 4th and New Years.

NFPA 1124 has incorporated a Chapter 7 Retail Sales of Consumer Fireworks to provide such a comprehensive set of regulations. The newest edition, the 2006, has been updated to better serve the code enforcers needs by reformatting Chapter 7 to relate to specific retail sales venues, as well as provide general requirements that apply to all sales venues. This will facilitate its use by those who must comply, as well as by the enforcers who go into the field to verify that a retail sales venue has complied with the regulations. It should also be noted that the vast majority of requirements in Chapter 7 of NFPA 1124 are intended to apply to existing retail sales venues, as well as new. Thus, if adopted, it will increase the current level of fire and life safety provided in those existing consumer fireworks retail sales venues. For the Committee's information a document is included with the code change proposal which provides a highlight overview of the more significant aspects and requirements of Chapter 7 of NFPA 1124. This will facilitate a quick review of the multifaceted approach Chapter 7 takes to assuring that a reasonable level of fire and life safety is provided where consumers are involved in purchasing consumer fireworks.

We believe that after you have thoroughly reviewed Chapter 7 of NFPA 1124, you will agree that it should be incorporated by reference into the IFC so that jurisdictions that allow the retail sales of consumer fireworks will have a very useful tool for enforcing a reasonable level of fire and life safety in consumer fireworks retail sales venues in their jurisdictions.

**Cost Impact:** The code change proposal will increase the cost of construction.

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# F184–06/07
## 3402.1

**Proponent:** Nancy Morrison, GOJO Industries, Inc.

**Revise definition as follows:**

**3402.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**ALCOHOL-BASED HAND RUB**. An alcohol-containing preparation designed for application to the hands for reducing the number of viable microorganisms on the hands and containing ethanol or isopropanol in an amount not exceeding ~~70~~ 95 percent by volume.

**Reason:** The purpose of the change is to match definition in the fire code to allowable alcohol range recognized for use by other regulatory agencies.

The acceptable alcohol range for use by healthcare personnel is 60-95% alcohol by volume as referenced in multiple governmental and independent expert guidelines.

**Bibliography**
Substantiation:
Topical Antimicrobial Drug Products for Human use; Tentative Final Monograph for Health Care Antiseptic Drug Products (Federal Register, Vol. 59, No. 116, Friday, June 17, 1994)
Ethyl Alcohol is listed as an approved active ingredient with an acceptable concentration range of 60-95% by volume.
Isopropyl alcohol is listed as an approved active ingredient with an acceptable concentration range of 70-90.1% by volume.

CDC Guideline for Hand Hygiene in Health-Care Settings, Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force, 2002
Definition of an alcohol based hand rub:
Alcohol-based hand rub. An alcohol-containing preparation designed for application to the hands for reducing the number of viable microorganisms on the hands. In the United States, such preparations usually contain 60%–95% ethanol or isopropanol.

WHO Guidelines on Hand Hygiene in Health Care (Advanced Draft 2005)
WHO recommends an alcohol-based formulation for healthcare settings. "The antimicrobial activity of alcohols results from their ability to denature proteins. Alcohol solutions containing 60–80% alcohol are most effective" (Section 9.3).

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F185–06/07
## 3403.6.7.1 (New)

**Proponent:** Michael G. Kraft, Division of State Fire Marshal, State of Ohio

**Add new text as follows:**

**3403.6.7.1 Tanks storing Class I or II liquids.** All aboveground tanks utilized for the storage of Class I or Class II combustible liquids, shall be equipped with an approved automatic-closing, heat-actuated valve or a normally closed, remotely activated valve or other approved device on each liquid transfer connection located below normal liquid levels, such valves shall be located within two feet of the shell of the tank.

**Reason:** This code requirement is an acceptable method, and commonly provided on existing tank installations, as the element necessary to protect the exposed storage tank contents from a pool fire impinging on the tank or connected piping. Moreover, firefighter safety should be accomplished by virtue of such fusible-link type valves that are self-closing, rather than having to place a firefighter into a pool of flammable liquid to close the valves.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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# F186–06/07
## 3404.2.1

**Proponent:** Richard S. Kraus, PSC Petroleum Safety Consultants, representing Petroleum Safety Consultants/American Petroleum Institute

**Revise as follows:**

**3404.2.1 Change of tank contents.** Tanks subject to change in contents shall be in accordance with Section 3404.2.7. Prior to a change in contents, the fire code official is authorized to require testing of a tank. Class I and unstable liquids shall be stored in tanks designed for such use.

Tanks that have previously contained Class I liquids shall not be loaded with Class II or Class III liquids until such tanks and all piping, pumps, hoses and meters connected thereto have been completely drained and flushed.

**Exception:** Tanks located within refineries, chemical process facilities, bulk plants and terminals covered by Section 3406.

**Reason:** To provide for continued industry storage tank operating practices while maintaining safety requirements at smaller facilities and casual users. These requirements originated with loading and unloading tank vehicles and were subsequently applied to all storage tanks. While it is a good idea to assure safe operating practices when switch loading tank trucks, the same requirements do not apply to large aboveground and underground storage tanks that are inherently grounded, thus able to more readily dissipate a static charge. Tanks within the facilities (to be exempted) that are typically used for different products (classes of liquids) at different times of the year (sometimes referred to as swing tanks). In process plants during process changes, tanks may hold a variety of products over a short period of time.

Tanks change contents on a regular basis within these facilities. The tanks are tested based on API (and EPA and fire code) requirements. It is very impractical and expensive to flush, clean and test tanks in the exempted facilities every time there is a product change. This would add substantial cost to the price of gasoline and fuel oil. Doing this in refineries and process plants would severely impact productivity. It is MORE important to assure that products are stored in suitable tanks – i.e., do not put Class I or unstable liquids in tanks intended to store Class II or III liquids.

**Cost Impact:** The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

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