907.2.1.1 System initiation in Group A occupancies with an occupant load of 1,000 or more. Activation of the fire alarm in Group A occupancies with an occupant load of 1,000 or more shall initiate a signal using an emergency voice/alarm communications system in accordance with ~~NFPA 72~~ Section 907.6.2.2.

Exception: Where approved, the prerecorded announcement is allowed to be manually deactivated for a period of time, not to exceed 3 minutes, for the sole purpose of allowing a live voice announcement from an approved, constantly attended location.

~~**909.2.1.2 Emergency power.**~~ (Relocated to Section 907.6.2.2.3)

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

1. The combined Group B occupant load of all floors is ~~having an occupant load of~~ 500 or more. ~~persons or~~
2. The Group B occupant load is more than 100 persons 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.

907.2.3 Group E. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in Group E occupancies. When automatic sprinkler systems or smoke detectors are installed, such systems or detectors shall be connected to the building fire alarm system.

Exceptions:

1. A manual fire alarm system is not required in Group E occupancies with an occupant load of less than 50.
2. Manual fire alarm boxes are not required in Group E occupancies where all of the following apply:
   2.1. Interior corridors are protected by smoke detectors ~~with alarm verification~~.
   2.2. Auditoriums, cafeterias, gymnasiums and ~~the like~~ similar areas are protected by heat detectors or other approved detection devices.
   2.3. Shops and laboratories involving dusts or vapors are protected by heat detectors or other approved detection devices.
   ~~2.4. Off premises monitoring is provided.~~
~~2.5.~~ 2.4. The capability to activate the evacuation signal from a central point is provided.
~~2.6~~. 2.5. In buildings where normally occupied spaces are provided with a two-way communication system between such spaces and a constantly attended receiving station from where a general evacuation alarm can be sounded, except in locations specifically designated by the fire code official.
3. Manual fire alarm boxes shall not be required in Group E occupancies where the building is equipped throughout with an approved automatic sprinkler system, the notification appliances will activate on sprinkler water flow and manual activation is provided from a normally occupied location.

907.2.4 Group F. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in Group F occupancies where both of the following conditions exist:

1. The Group F occupancy is ~~that are~~ two or more stories in height; and
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/alarm communication 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**~~ **907.3.4 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 r~~equired 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: Devices 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.

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.

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** **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**

New Section	Was
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
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 , #4	907.7, 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	907.2.12.2 907.2.12.2.3
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

New Section	Was
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.

Committee Action: Approved as Modified

Modify the proposal as follows:

907.1 General. This section covers the application, installation, performance and maintenance of fire alarm systems and their components in new and existing buildings and structures. The requirements of Section 907.2 are applicable to new buildings and structures. The requirements of Section 907.3 are applicable to existing buildings and structures. ~~as follows:~~

~~1. The requirements of Section 907.2 are applicable to new buildings and structures.~~
~~2. The requirements of Section 907.3 are applicable to existing buildings and structures.~~

907.1.1 Construction documents ~~Shop drawings.~~ Construction documents ~~Shop drawings~~ for fire alarm systems shall be submitted for review and approval prior to system installation. Construction documents ~~shop drawings~~ shall include, but not be limited to, all of the following:

1. A floor plan which indicates the use of all rooms.
2. Locations of alarm-initiating and notification appliances.
3. Location of fire alarm control unit, transponders, and notification power supplies.
4. Annunciators.
5. Power connection.
6. Battery calculations.
7. Conductor type and sizes.
8. Voltage drop calculations.
9. Manufacturer data sheets indicating model numbers and listing information for equipment, devices and materials.
10. Details of ceiling height and construction.
11. The interface of fire safety control functions.
12. Classification of the supervising station.

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.

907.2.10.1 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.

~~**907.2.17.3**~~ **907.2.18 Deep underground buildings.** (Proposed text is unchanged)

~~**907.2.17.3.1**~~ **907.2.18.1 Public address system.** (Proposed text is unchanged)
~~**907.2.18**~~ **907.2.19 Covered mall buildings.** (Proposed text is unchanged)

~~**907.2.19**~~ **907.2.20 Residential aircraft hangars.** (Proposed text is unchanged)

~~**907.2.20**~~ **907.2.21 Airport traffic control towers.** (Proposed text is unchanged)

~~**907.2.21**~~ **907.2.22 Battery rooms.** (Proposed text is unchanged)

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.

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

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.

907.4 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 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 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.

907.4.1 Duct smoke detectors. Duct smoke detectors shall be connected to the building's fire alarm control unit when a fire alarm system is required by Section 907.2 ~~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.

907.6 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 a fire alarm system is required by another section of this code ~~provided~~, it shall be activated by:

1. Automatic fire detectors.
2. Sprinkler water-flow devices.
3. 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.~~

907.6.2.3.4 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.

(Portions of proposal not shown remain unchanged)

Committee Reason: Based on the proponent's reason statement. The proposal achieves the proponent's stated goals and is a substantial improvement over the current Section 907. The committee felt that the proposal as modified is a good starting point for future improvements. The modifications, which deal with concerns brought up in testimony and committee discussion, delete redundant text

(907.1), retain use of a defined term (907.1.1), correct an error in including the term “dwelling units” in Group R-1 requirements (907.2.8.1, 907.2.8.2, 907.2.10.1, 907.3.3.1), clarify applicability to all deep underground buildings (907.2.18), retain a reasonable exception (907.3), retain applicability only to required systems (907.4, 907.4.1), clarify applicability only with a required alarm system (907.6), correlate with the action on F100-06/07 (907.6, Ex. 3), and recognize that the requirement can be met by simple installation of a relay in the unit (907.6.2.3).

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Gene Boecker, Code Consultants, Inc., requests Approval as Modified by this public comment for Part I.

Modify only Section 907.2.9.1 of the proposal as follows:

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 continuous 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. Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and the occupant notification appliances will automatically activate throughout the notification zones upon a sprinkler water flow.
3. A ~~manual~~ fire alarm system is not required in buildings ~~not more than two stories in height~~ that do not have corridors serving dwelling units provided that dwelling units are protected by an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, and 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.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: During the ICC committee hearings public testimony mentioned that the deletion of exception 1 could possibly result in eliminating an existing option. The task group preparing the original code change did not consider the changes made to the set of exceptions as altering the outcome since new construction for all Group R Occupancies will need to be sprinklered.

However, testimony and subsequent discussions indicated that the exceptions may have benefit for existing buildings undergoing alterations or additions. Consequently, the task group has determined that the best course of action would be to return the two exceptions (existing #1 and #3) to their prior condition so that the potential impact could be better evaluated and addressed in a subsequent proposal.

A change is proposed to exception #2 to add clarification and make the language consistent with that used elsewhere in the code.

The intent of the original code change was not to alter the application of the code except as it involves clarifications and updates to technical provisions. Thus these exceptions can be returned to their prior place within the code until the situation can be more completely investigated and addressed.

Public Comment 2:

Gene Boecker, Code Consultants, Inc., requests Approval as Modified by this public comment for Part I.

Modify only Section 907.5.1 of the proposal as follows:

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, notification appliance circuit power extenders, and supervising station transmitting equipment.

Editorially, revise the exception to be identified as Exception Number 1 and add the following second exception:

2 The smoke detector shall not required where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2.

Commenter’s Reason: During the preparation of the code change, efforts were made to include items that were anticipated as a part of the revised NFPA 72 standard. The deadline for proposal submittal was prior to the final action of the NFPA 72 committee. During public

testimony at the ICC hearings in Orlando, it was noted that one of the differences was that the NFPA 72 committee adopted language that allowed for the omission of the smoke detector if the building was sprinklered.

This modification would modify the code language and insert into the code the exception, making the IBC and IFC consistent with the fire alarm requirements in NFPA 72. This concept was discussed by the task group working on the original code change proposal. We have subsequently discussed this with the individual who raised the issue at the ICC committee hearings and resolved the issue with the original task group. This proposed modification is the result.

We believe, consistent with the NFPA 72 committee, that the need for the smoke detector is diminished if not totally eliminated by the presence of the sprinkler system throughout the building. The intent of the smoke detector was to provide an early warning device should a fire originate in the area of the fire alarm control unit. The sprinkler system, with its integral connection to the fire alarm control unit, accomplishes that purpose. This issue has been discussed at numerous code hearings in the past. A vote in favor of this modification would be consistent with the prior actions.

Public Comment 3:

Gene Boecker, Code Consultants, Inc., requests Approval as Modified by this public comment for Part I.

Modify proposal as follows:

907.2.1 Group A. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in Group A occupancies having an occupant load of 300 or more. Portions of Group E occupancies occupied for assembly purposes shall be provided with a fire alarm system as required for the Group E occupancy.

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

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

1. (No change to current text)
2. (No change to current text)

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

907.2.3 Group E. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in Group E occupancies. When automatic sprinkler systems or smoke detectors are installed, such systems or detectors shall be connected to the building fire alarm system.

Exceptions:

1. (No change to current text)
2. (No change to current text)
3. Manual fire alarm boxes shall not be required in Group E occupancies where the building is equipped throughout with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1, the notification appliances will activate on sprinkler water flow and manual activation is provided from a normally occupied location.

907.2.4 Group F. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in Group F occupancies where both of the following conditions exist:

1. (No change to current text)
2. (No change to current text)

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

907.2.6.1 Group I-1. An automatic smoke detection system shall be installed in corridors, waiting areas open to corridors and habitable spaces other than sleeping rooms and kitchens. 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 installed in accordance with Section 903.3.1.1.
2. (No change to current text)

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

Exceptions:

1. (No change to current text)

2. (No change to current text)
3. Smoke detectors are not required in sleeping units with four or fewer occupants in smoke compartments that are equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

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 500 or more persons.
2. The Group M occupant load is more than 100 persons above or below the lowest level of exit discharge.

Exceptions:

1. (No change to current text)
2. Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 and the occupant notification appliances will automatically activate throughout the notification zones upon sprinkler water flow.

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. Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 and the occupant notification appliances will automatically activate throughout the notification zones upon a sprinkler water flow.
2. (No change to current text)

(Portions of proposal not shown remain unchanged)

Commenter's Reason: One of the efforts of the task group was to revise language for consistency with that used elsewhere in the code. During the rewrite it was determined that the *"equipped throughout with an automatic sprinkler system"* phrase should be used where applicable since it is used in other places in Chapter 9 and 10.

Inadvertently, the task group overlooked the reference language that is used non-consistently. In order to use language that is consistent and more specific, the reference language should be added to avoid confusion regarding whether one or both types of dominant sprinkler designs are acceptable. Elsewhere in the code reference is made to the applicable section for installation, This amendment would continue that application.

Public Comment 4:

Jeffrey Shapiro, PE, FSFPE, International Code Consultants, representing National Multi Housing Industry, requests Approval as Modified by this public comment for Part I.

Modify only Sections 907.2 and 907.2.9.1 of proposal as follows:

907.2 Where required—new buildings and structures. An approved manual, automatic or manual and automatic fire alarm system installed in accordance with the provisions of this code and NFPA 72 shall be provided in new buildings and structures in accordance with Sections 907.2.1 through 907.2.21 and provide occupant notification in accordance with Section 907.6, unless other requirements are provided by another section of this code. 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.

The automatic fire detectors shall be smoke detectors. Where ambient conditions prohibit installation of automatic smoke detection, other automatic fire detection shall be allowed. ~~A minimum of one manual fire alarm box shall be provided in an approved location to initiate a fire alarm signal for fire alarm systems employing automatic fire detectors or waterflow detection devices. Where other sections of this code allow elimination of fire alarm boxes due to sprinklers, a single fire alarm box shall be installed.~~

~~**Exception**: The manual fire alarm box is not required for fire alarm systems dedicated to elevator recall control and supervisory service.~~

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. Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and the occupant notification appliances will automatically activate throughout the notification zones upon a sprinkler water flow.

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,and 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.

(Portions of proposal not shown remain unchanged)

Commenter's Reason:
907.2: The provisions of this section are being largely returned by this comment to the 2006 IFC requirements. The allowance to use sprinkler protection in lieu of heat detectors was eliminated based on the proponent's claim that heat detectors are never required. This is incorrect, as the Exceptions in Section 907.2.3 do contain a requirement for heat detectors. Second, the requirement for a single manual pull box is being deleted to correlate with the committee's action, deleting a similar provision that had been proposed for Section 907.6, Exception 3. Proponents had argued unsuccessfully that the single pull box requirement was needed in this section because it is required by NFPA 72, but subsequent review of the NFPA 72 provision revealed that the provision was archaic and buried in that code where it would be easily overlooked.

The logic offered to justify the need for the single pull station is that this might be needed by a sprinkler technician to initiate an alarm if the sprinklers/water flow switches are out of service, yet the proposal provides no guidance with respect to where the pull box is to be located. This simply makes no sense. Assuming that the pull station is located in the valve room to avoid making it available to vandals, a technician working on any part of the sprinkler system other than the valve would be far away, and may or may not even know where the alarm box is. If the box were to be located for occupant use, how many occupants would know the location of a single pull box in a building? The proposed requirement simply invites false alarms, offers no safety benefit and needs to be deleted.

907.2.9.1: This comment recommends largely returning the provisions of this section to the 2006 IFC requirements. Revisions to Section 907.2.9.1, Exception 1 are being modified to reinstate the direct references to Sections 903.3.1.1 and 903.3.1.2 that were previously included in the code. Without these references, code users are given no guidance regarding which types of sprinkler systems qualify for the exception, and no technical justification was offered to justify that any change from the prior provisions is warranted.

Revisions to Section 907.2.9.1, Exception 2 will exactly reinstate the 2006 edition exception. The 2006 text of this exception was carefully crafted and agreed to by representatives of the fire alarm industry and the multi family industry, who jointly supported the exception just a few years ago. The proposed change significantly reduced the scope of the exception by limiting application to only include manual alarms in buildings not exceeding two stories in height. The proponent's reason statement for making this change incorrectly indicated that there is essentially no need for Exception 2 because Exception 1 makes Exception 2 essentially moot. Closer scrutiny reveals that Exception 1 applies only to the manual fire alarm boxes; whereas, Exception 2 applied to the entire fire alarm system, before it was modified by this change. Lacking a valid basis for changing the existing provision, This comment rolls the text back to the 2006 provisions.

Final Action: AS AM AMPC____ D

F122-06/07, Part II
IBC 907.3

Proposed Change as Submitted:

Proponent: Gene Boecker, Code Consultants, Inc.

PART II – IBC FIRE SAFETY

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 Section 907.3 in the IBC)

Reason: 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.

Committee Action: **Approved as Submitted**

Committee Reason: This proposal brings the reference into both the IBC and also the IEBC. This will provide a helpful reference where new work is being done within an existing building. An additional benefit will be that it will help coordinate the numbering between Chapter 9 of the IBC and IFC and help eliminate confusion that sometimes occurs because of the difference in the numbering.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Al Godwin, CBO, City of Fort Worth, Texas, requests Approval as Modified by this public comment for Part II.

(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*.

Commenter's Reason: All references to the *International Existing Building Code* were removed from the main set of I Codes before the printing of the 2006 editions. Re-inserting a new reference for alarms would be inappropriate.

The body should overturn the motion for AS, and approve a motion for Approved as Modified by Public Comment (AMPC) to prevent this action but keep the main provision of the code proposal.

Final Action: AS AM AMPC____ D

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

Proposed Change as Submitted:

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.

Committee Action: Disapproved

Committee Reason: Neither the proposal's reason statement nor the testimony offered presented any new information on this topic over that presented in previous code change cycles. There was no definitive information presented that smoke and heat vents do not contribute to fire control. The issues of interaction between smoke and heat vents and sprinklers have not been examined in detail and solutions proposed, such as was done with the issue of ESFR sprinklers vs smoke and heat vents. As they become known and solutions

developed, the issues should be brought to the IFC process rather than waiting while the NFPA 204 committee takes action. In cases where the sprinkler system does not suppress the fire but, rather, controls it, smoke continues to be generated. The discussions have focused on everything but the safety of the occupants, including firefighters. Smoke and heat vents provide the fire department with an important tool to remove the smoke for occupant safety and enhanced fire attack access, especially in very large area buildings where access from the exterior is limited at best. Firefighter safety is also improved by providing a faster, safer method of fire ventilation than cutting one or more holes in the roof. The current text presents a balanced approach between firefighter safety and building safety. The proposal could also inhibit international adoption of the code in countries where very large area buildings are often not sprinklered and they rely on smoke and heat vents for a basic level of protection.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Richard Schulte, Schulte & Associates, requests Approval as Submitted.

Commenter's Reason: The stated reasons for disapproval of the code change are not consistent with the published rationale for this proposal, nor the testimony heard by the committee. The published rationale provided in support of the code change proposal included passages from the NFPA Fire Protection Handbook, NFPA 13 and NFPA 204/204M over a 20 year period cited in previous proposals to delete the requirements for roof vents, as well as new information included in NIOSH 2005-132. Hence, a disapproval recommendation based upon the fact that no new information was presented to the committee is in error.

While there is still considerable debate over whether open vents will have a negligible or significant impact upon the operation of standard sprinklers, there are numerous other reason why these provisions should be deleted.

A review of the roof vent provisions presently included in the IBC/IFC indicates that draft curtains are not required in storage buildings which contain high-piled storage and that the area of curtained areas is permitted to be up to 50,000 square feet in industrial and storage buildings which do not contain high-piled storage. (The requirements for draft curtains were removed because of the detrimental effect of draft curtains on the operation of standard sprinklers.) Roof vents and draft curtains are a team. The effectiveness of roof vents is compromised when draft curtains are not provided in combination with roof vents. In other words, many of the benefits of the use of roof vents claimed by proponents of vents do not occur unless roof vents are used in combination with draft curtains.

Tests and research on the interaction of standard sprinklers, roof vents and draft curtains sponsored by the National Fire Protection Research Foundation (NFPRF) and conducted by Underwriters Laboratories in 1997/1998 conclusively demonstrated that roof vents will not automatically open in buildings which are protected by standard sprinklers where the sprinkler system is adequate (or slightly inadequate) for the hazard being protected.

This finding of the NFPRF research was confirmed in a major fire which occurred at a bulk retail facility in Tempe, Arizona on March 19, 1998. In this fire, only three of 29 automatic roof vents operated despite the fact that the sprinkler system was failing to control the fire and the fact that the temperature rating of the fusible links of the roof vents was 165oF, while the temperature rating of the sprinklers was 286oF. The NFPA fire investigation report on this fire indicates that when the fire department arrived at the building, the 100,000 square foot building (with a ceiling height which varied from 24 to 29 feet) was filled with smoke from floor to ceiling. The reason that automatic roof vents do not operate in sprinklered buildings is that sprinkler water spray efficiently cools the ceiling and limits the temperature at the ceiling to less than the operating temperature of the vents and also that water droplets from the sprinkler spray form on the vent activating mechanism.

The NFPRF research also confirmed a previous finding by Factory Mutual Research Corporation (FMRC) in 1994 that draft curtains significantly impact the operation of sprinklers. By limiting the spread of heat under the ceiling, draft curtains may cause a significantly larger number of sprinklers to operate and also cause a distortion of the sprinklers which actually do operate. In addition, the NFPRF research also determined that draft curtains may prevent sprinklers which would normally operate from operating, thus interfering with the “pre-wetting” mechanism necessary for standard sprinklers to control a fire in storage occupancies.

The fire in the Tempe bulk retail building also confirmed the NFPRF research finding that draft curtains interfered with “pre-wetting”. The NFPA investigation report indicates that fire was able to spread across an aisle which was 10 feet in width. A draft curtain (6 feet, 6 inches in depth) was located in the aisle (as recommended by NFPA 204). The draft curtain prevented sprinklers on the side of the draft curtain opposite the fire from operating, thus preventing “pre-wetting” from occurring and allowing the fire to spread across the aisle.

The committee’s rationale for disapproving the code change proposal includes the statement that “*the discussions have focused on everything but the safety of the occupants, including firefighters.*” This statement is also not consistent with the testimony. The testimony offered in support of this code change specifically focused on the issue of firefighter safety. The proponent read excerpts from NIOSH 2005-132, “*Preventing Injuries and Deaths of Firefighters Due to Truss System Failures*”. The testimony included the following four excerpts from NIOSH 2005-132:

> “Fire fighters should be discouraged from risking their lives solely for property protection activities.”
>
> “. . . however, under uncontrolled fire conditions, the time to truss failure is unpredictable.”
>
> “Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses.”
>
> “Use defensive strategies whenever trusses have been exposed to fire or structural integrity cannot be verified.”

The NIOSH recommendations clearly indicate that the use of interior manual firefighting is to be discouraged in large buildings where the sprinkler system has failed to control the fire. (One story industrial and storage buildings are typically constructed using non-rated roof construction supported on non-rated steel bar joists and steel trusses.) The issue of firefighter safety is also addressed by the NFPA statistic that no firefighter fatalities occurred in any building protected by a sprinkler system in 2005.

Regarding the issue of the safety to occupants, neither sprinklered or unsprinklered singlestory industrial or storage buildings present a major fire safety hazard to building occupants. The occupant fire safety risk of both sprinklered and unsprinklered single-story industrial or storage buildings is extremely low. (NFPA statistics for 2005 indicate that a total of 50 civilian fire deaths occurred in all of the commercial (non-residential) buildings in the United States. Commercial buildings include buildings which contain assembly, educational, health care, mercantile occupancies, as well as industrial and storage buildings.)

While the committee's stated rationale for disapproving this code change proposal indicates that the change as presented does not have merit, the ICC Code Technology Committee (CTC) conducted a public hearing on whether or not to form a study group on the issue of roof vents in sprinklered buildings on October 20, 2006, approximately 3-1/2 weeks after the code hearings in Orlando. After hearing representatives for the roof vent manufacturers (opponents of the code change proposal) make an extended presentation on roof vents, the CTC voted to form a study group based upon the same rationale as was presented to the code change committee.

There has been more than sufficient documentation submitted to demonstrate that the provisions for roof vents and draft curtains contained in the IBC and IFC are archaic. In fact, the manufacturers of roof vents admitted as much when the American Architectural Metals Association (AAMA) announced a new research project on the interaction of sprinklers and roof vents in September 1999 in response to the publication of the results of the NFPRF research in September 1998. AAMA's plans to conduct new research were dropped after the code change committee voted to disapprove code changes to delete the requirements for roof vents in the 2000 and 2001 editions of the IBC and IFC. In the summer of 2006, the AAMA once again announced a new research project on the interaction of sprinklers and vents. This time the AAMA is reacting to discussions of the topic by the CTC.

Given the above, it is requested that the membership overturn the committee's recommendation and approve code change F124-07 as submitted (AS).

Final Action: AS AM AMPC____ D

F125-06/07

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

Proposed Change as Submitted:

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.

Committee Action: Disapproved

Committee Reason: For consistency with the action on F124-06/07.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Richard Schulte, Schulte & Associates, requests Approval as Submitted.

Commenter's Reason: The stated reasons for disapproval of the code change are not consistent with the published rationale for this proposal, nor the testimony heard by the committee. The published rationale provided in support of the code change proposal included passages from the NFPA Fire Protection Handbook, NFPA 13 and NFPA 204/204M over a 20 year period cited in previous proposals to delete the requirements for roof vents, as well as new information included in NIOSH 2005-132. Hence, a disapproval recommendation based upon the fact that no new information was presented to the committee is in error.

While there is still considerable debate over whether open vents will have a negligible or significant impact upon the operation of standard sprinklers, there are numerous other reason why these provisions should be deleted.

A review of the roof vent provisions presently included in the IBC/IFC indicates that draft curtains are not required in storage buildings which contain high-piled storage and that the area of curtained areas is permitted to be up to 50,000 square feet in industrial and storage buildings which do not contain high-piled storage. (The requirements for draft curtains were removed because of the detrimental effect of draft curtains on the operation of standard sprinklers.) Roof vents and draft curtains are a team. The effectiveness of roof vents is compromised when draft curtains are not provided in combination with roof vents. In other words, many of the benefits of the use of roof vents claimed by proponents of vents do not occur unless roof vents are used in combination with draft curtains.

Tests and research on the interaction of standard sprinklers, roof vents and draft curtains sponsored by the National Fire Protection Research Foundation (NFPRF) and conducted by Underwriters Laboratories in 1997/1998 conclusively demonstrated that roof vents will not automatically open in buildings which are protected by standard sprinklers where the sprinkler system is adequate (or slightly inadequate) for the hazard being protected.

This finding of the NFPRF research was confirmed in a major fire which occurred at a bulk retail facility in Tempe, Arizona on March 19, 1998. In this fire, only three of 29 automatic roof vents operated despite the fact that the sprinkler system was failing to control the fire and the fact that the temperature rating of the fusible links of the roof vents was 165oF, while the temperature rating of the sprinklers was 286oF. The NFPA fire investigation report on this fire indicates that when the fire department arrived at the building, the 100,000 square foot building (with a ceiling height which varied from 24 to 29 feet) was filled with smoke from floor to ceiling. The reason that automatic roof vents do not operate in sprinklered buildings is that sprinkler water spray efficiently cools the ceiling and limits the temperature at the ceiling to less than the operating temperature of the vents and also that water droplets from the sprinkler spray form on the vent activating mechanism.

The NFPRF research also confirmed a previous finding by Factory Mutual Research Corporation (FMRC) in 1994 that draft curtains significantly impact the operation of sprinklers. By limiting the spread of heat under the ceiling, draft curtains may cause a significantly larger number of sprinklers to operate and also cause a distortion of the sprinklers which actually do operate. In addition, the NFPRF research also determined that draft curtains may prevent sprinklers which would normally operate from operating, thus interfering with the "pre-wetting" mechanism necessary for standard sprinklers to control a fire in storage occupancies.

The fire in the Tempe bulk retail building also confirmed the NFPRF research finding that draft curtains interfered with "pre-wetting". The NFPA investigation report indicates that fire was able to spread across an aisle which was 10 feet in width. A draft curtain (6 feet, 6 inches in depth) was located in the aisle (as recommended by NFPA 204). The draft curtain prevented sprinklers on the side of the draft curtain opposite the fire from operating, thus preventing "pre-wetting" from occurring and allowing the fire to spread across the aisle.

The committee's rationale for disapproving the code change proposal includes the statement that "*the discussions have focused on everything but the safety of the occupants, including firefighters.*" This statement is also not consistent with the testimony. The testimony offered in support of this code change specifically focused on the issue of firefighter safety. The proponent read excerpts from NIOSH 2005-132, "*Preventing Injuries and Deaths of Firefighters Due to Truss System Failures*". The testimony included the following four excerpts from NIOSH 2005-132:

> "Fire fighters should be discouraged from risking their lives solely for property protection activities."
>
> ". . . however, under uncontrolled fire conditions, the time to truss failure is unpredictable."
>
> "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."
>
> "Use defensive strategies whenever trusses have been exposed to fire or structural integrity cannot be verified."

The NIOSH recommendations clearly indicate that the use of interior manual firefighting is to be discouraged in large buildings where the sprinkler system has failed to control the fire. (One story industrial and storage buildings are typically constructed using non-rated roof construction supported on non-rated steel bar joists and steel trusses.) The issue of firefighter safety is also addressed by the NFPA statistic that no firefighter fatalities occurred in any building protected by a sprinkler system in 2005.

Regarding the issue of the safety to occupants, neither sprinklered or unsprinklered single story industrial or storage buildings present a major fire safety hazard to building occupants. The occupant fire safety risk of both sprinklered and unsprinklered single-story industrial or storage buildings is extremely low. (NFPA statistics for 2005 indicate that a total of 50 civilian fire deaths occurred in all of the commercial (non-residential) buildings in the United States. Commercial buildings include buildings which contain assembly, educational, health care, mercantile occupancies, as well as industrial and storage buildings.)

While the committee's stated rationale for disapproving this code change proposal indicates that the change as presented does not have merit, the ICC Code Technology Committee (CTC) conducted a public hearing on whether or not to form a study group on the issue of roof vents in sprinklered buildings on October 20, 2006, approximately 3-1/2 weeks after the code hearings in Orlando. After hearing representatives for the roof vent manufacturers (opponents of the code change proposal) make an extended presentation on roof vents, the CTC voted to form a study group based upon the same rationale as was presented to the code change committee.

There has been more than sufficient documentation submitted to demonstrate that the provisions for roof vents and draft curtains contained in the IBC and IFC are archaic. In fact, the manufacturers of roof vents admitted as much when the American Architectural Metals Association (AAMA) announced a new research project on the interaction of sprinklers and roof vents in September 1999 in response to the publication of the results of the NFPRF research in September 1998. AAMA's plans to conduct new research were dropped after the code change committee voted to disapprove code changes to delete the requirements for roof vents in the 2000 and 2001 editions of the IBC and IFC. In the summer of 2006, the AAMA once again announced a new research project on the interaction of sprinklers and vents. This time the AAMA is reacting to discussions of the topic by the CTC.

Given the above, it is requested that the membership overturn the committee's recommendation and approve code change F125-07 as submitted (AS).

Final Action: AS AM AMPC____ D

F129-06/07

910.3.2.2 (IBC [F] 910.3.2.2)

Proposed Change as Submitted:

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: These 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.

Committee Action: **Approved as Submitted**

Committee Reason: Based on the proponent's reason statement. The proposal provides needed criteria to prevent conflict between the timing of operation of the smoke and heat vents and the automatic sprinklers.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Rick Thornberry, PE, The Code Consortium, Inc., representing AAMA Smoke Vent Task Group, requests Disapproval.

Commenter's Reason: The AAMA Smoke Vent Task Group, which represents virtually all of the major manufacturers of smoke and heat vents in this country, is submitting this Public Comment to request that the ICC voting membership overturn the Committee recommendation for approval and subsequently disapprove this code change proposal.

If this code change proposal is not disapproved, it will significantly limit the design options for the automatic activation of smoke and heat vents where they are installed in sprinklered buildings. The Committee Reason states that this is being done to "provide the needed criteria to prevent conflict between the timing of the operation of the smoke and heat vents and the automatic sprinkler system." However, adequate technical justification has not been provided to demonstrate that the proposed temperature limits for the activation of the smoke and heat vents is appropriate for all conditions and design considerations in sprinklered buildings. Furthermore, the exception will still allow for the status quo of gravity operated drop out vents to activate as the code currently requires. So they can continue to be installed as previously allowed by the code. But those smoke and heat vents that are activated by other means must meet the proposed requirement for heat activation with a heat responsive device that has a temperature rating of at least 100°F greater than the operating temperature of the sprinkler.

Earlier drafts of the International Fire Code (IFC) did contain a similar requirement. But it was subsequently deleted by the IFC Code Development Committee prior to the publication of the 2000 IFC to allow for greater design flexibility for the installation of automatic smoke and heat vents in sprinklered buildings. For example, there are several design options that can be utilized in sprinklered buildings that are based on ganged operation of the smoke and heat vents by either smoke detection or automatic sprinkler system water flow. This

design approach is also consistent with current Section 910.4.3 which specifies that an automatic mechanical smoke exhaust system which is used as a substitute for smoke and heat vents can be activated by the automatic sprinkler system. The ganged operation of smoke and heat vents has been used in Europe successfully for many years and works very well with automatic sprinklers, especially in maintaining the smoke layer well above a person's head so that vision is not obscured, even though the automatic sprinkler system is operating. There may also be other design options that would otherwise be limited by this proposed new requirement.

This new requirement will also create a conflict with UL793 which is presently required for the listing of smoke and heat vents by Section 910.3.1. UL793 limits the maximum temperature rating of the fusible elements used to operate smoke and heat vents to 286°F. Since many sprinklers, especially in warehouse buildings, are designed to operate with fusible elements rated at 212°F or 286°F, the additional 100°F temperature differential specified in this proposal for the fusible elements used to operate smoke and heat vents would greatly exceed that specified in UL793, thus voiding the listing of the smoke and heat vent.

We also have concerns about the proposed phase that reads "operating temperature of the sprinkler." To us this is unenforceable since it is not always possible to determine the operating temperature of the sprinkler. Is the operating temperature the temperature of the hot gases adjacent to the sprinkler when it operates or is it the temperature of the fusible element that operates the sprinkler? Furthermore, which sprinkler is used to determine the operating temperature? The operating temperature of the sprinkler will vary depending upon the environmental conditions and the rate of heat release and growth of the fire to which the sprinkler is being exposed. Sprinklers do have thermal activated links or bulbs, for example, that have a temperature rating, but this temperature rating is based upon a specific test conducted by UL under prescribed temperature rise conditions which may not replicate all fires. Thus, the operating temperature of a sprinkler will vary from building to building and fire to fire, whereas the temperature rating of the thermal activation link or bulb in the sprinkler is known.

In conclusion, this proposed code change does not provide any significant improvement to the criteria used for the design of automatic smoke and heat vents in sprinklered buildings based on the current state of the art. In fact, it will only cause problems by limiting the possible design options for the automatic activation of smoke and heat vents without adequate technical justification. As the code is currently written, the determination of the appropriate automatic activation of the smoke and heat vents will be based on the engineering design as approved by the enforcing fire code official since Section 910.3.2 Vent Operation states that smoke and heat vents shall be capable of being operated by approved automatic and manual means. Therefore, we strongly believe this code change proposal should be disapproved by the ICC voting membership.

Final Action: AS AM AMPC____ D

F130-06/07
910 (IBC [F] 910)

Proposed Change as Submitted:

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 <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, 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.

Committee Action: Disapproved

Committee Reason: For consistency with the action on F124- and F125-06/07. The proposal could inhibit international adoption of the code in countries where very large area buildings are often not sprinklered and they rely on smoke and heat vents for a basic level of protection.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Frank Castelvecchi, PE, County of Henrico, Virginia, requests Approval as Submitted.

Commenter's Reason: If the sprinklers work the smoke and heat vents are not needed for occupant safety.

If the sprinklers don't work the smoke and heat vents won't make any difference, the building will still rapidly burn to the ground as Manual firefighting efforts in large open areas with large quantities of combustible materials present are neither safe nor effective. Smoke and heat vents have the potential to reduce sprinkler effectiveness.

Quirk in code would allow the stacking of two, 100,000 sq ft warehouses that require vents as a 2 story building and then vents are not required for either story with not alternative means of smoke removal required.

This requirement unnecessarily drives up the cost of construction without demonstratable benefit in sprinklered buildings and some testing has shown these vents have the potential to cause additional sprinkler heads not over the fire to open taxing the water supply putting the building and contents at greater risk than if they were not present.

Public Comment 2:

Richard Schulte, Schulte & Associates, requests Approval as Submitted.

Commenter's Reason: The stated reasons for disapproval of the code change are not consistent with the published rationale for this proposal, nor the testimony heard by the committee. The published rationale provided in support of the code change proposal included passages from the NFPA Fire Protection Handbook, NFPA 13 and NFPA 204/204M over a 20 year period cited in previous proposals to delete the requirements for roof vents, as well as new information included in NIOSH 2005-132. Hence, a disapproval recommendation based upon the fact that no new information was presented to the committee is in error.

While there is still considerable debate over whether open vents will have a negligible or significant impact upon the operation of standard sprinklers, there are numerous other reason why these provisions should be deleted.

A review of the roof vent provisions presently included in the IBC/IFC indicates that draft curtains are not required in storage buildings which contain high-piled storage and that the area of curtained areas is permitted to be up to 50,000 square feet in industrial and storage buildings which do not contain high-piled storage. (The requirements for draft curtains were removed because of the detrimental effect of draft curtains on the operation of standard sprinklers.) Roof vents and draft curtains are a team. The effectiveness of roof vents is compromised when draft curtains are not provided in combination with roof vents. In other words, many of the benefits of the use of roof vents claimed by proponents of vents do not occur unless roof vents are used in combination with draft curtains.

Tests and research on the interaction of standard sprinklers, roof vents and draft curtains sponsored by the National Fire Protection Research Foundation (NFPRF) and conducted by Underwriters Laboratories in 1997/1998 conclusively demonstrated that roof vents will not automatically open in buildings which are protected by standard sprinklers where the sprinkler system is adequate (or slightly inadequate) for the hazard being protected.

This finding of the NFPRF research was confirmed in a major fire which occurred at a bulk retail facility in Tempe, Arizona on March 19, 1998. In this fire, only three of 29 automatic roof vents operated despite the fact that the sprinkler system was failing to control the fire and the fact that the temperature rating of the fusible links of the roof vents was as 165^{o}F, while the temperature rating of the sprinklers was 286oF. The NFPA fire investigation report on this fire indicates that when the fire department arrived at the building, the 100,000 square foot building (with a ceiling height which varied from 24 to 29 feet) was filled with smoke from floor to ceiling. The reason that automatic roof vents do not operate in sprinklered buildings is that sprinkler water spray efficiently cools the ceiling and limits the temperature at the ceiling to less than the operating temperature of the vents and also that water droplets from the sprinkler spray form on the vent activating mechanism.

The NFPRF research also confirmed a previous finding by Factory Mutual Research Corporation (FMRC) in 1994 that draft curtains significantly impact the operation of sprinklers. By limiting the spread of heat under the ceiling, draft curtains may cause a significantly larger number of sprinklers to operate and also cause a distortion of the sprinklers which actually do operate. In addition, the NFPRF research also determined that draft curtains may prevent sprinklers which would normally operate from operating, thus interfering with the “pre-wetting” mechanism necessary for standard sprinklers to control a fire in storage occupancies.

The fire in the Tempe bulk retail building also confirmed the NFPRF research finding that draft curtains interfered with “pre-wetting”. The NFPA investigation report indicates that fire was able to spread across an aisle which was 10 feet in width. A draft curtain (6 feet, 6 inches in depth) was located in the aisle (as recommended by NFPA 204). The draft curtain prevented sprinklers on the side of the draft curtain opposite the fire from operating, thus preventing “pre-wetting” from occurring and allowing the fire to spread across the aisle.

The committee’s rationale for disapproving the code change proposal includes the statement that “*the discussions have focused on everything but the safety of the occupants, including firefighters.*” This statement is also not consistent with the testimony. The testimony offered in support of this code change specifically focused on the issue of firefighter safety. The proponent read excerpts from NIOSH 2005-132, “*Preventing Injuries and Deaths of Firefighters Due to Truss System Failures*”. The testimony included the following four excerpts from NIOSH 2005-132:

> “Fire fighters should be discouraged from risking their lives solely for property protection activities.”
>
> “. . . however, under uncontrolled fire conditions, the time to truss failure is unpredictable.”
>
> “Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses.”
>
> “Use defensive strategies whenever trusses have been exposed to fire or structural integrity cannot be verified.”

The NIOSH recommendations clearly indicate that the use of interior manual firefighting is to be discouraged in large buildings where the sprinkler system has failed to control the fire. (One story industrial and storage buildings are typically constructed using non-rated roof construction supported on non-rated steel bar joists and steel trusses.) The issue of firefighter safety is also addressed by the NFPA statistic that no firefighter fatalities occurred in any building protected by a sprinkler system in 2005.

Regarding the issue of the safety to occupants, neither sprinklered or unsprinklered singlestory industrial or storage buildings present a major fire safety hazard to building occupants. The occupant fire safety risk of both sprinklered and unsprinklered single-story industrial or storage buildings is extremely low. (NFPA statistics for 2005 indicate that a total of 50 civilian fire deaths occurred in all of the commercial (non-residential) buildings in the United States. Commercial buildings include buildings which contain assembly, educational, health care, mercantile occupancies, as well as industrial and storage buildings.)

While the committee’s stated rationale for disapproving this code change proposal indicates that the change as presented does not have merit, the ICC Code Technology Committee (CTC) conducted a public hearing on whether or not to form a study group on the issue of roof vents in sprinklered buildings on October 20, 2006, approximately 3-1/2 weeks after the code hearings in Orlando. After hearing representatives for the roof vent manufacturers (opponents of the code change proposal) make an extended presentation on roof vents, the CTC voted to form a study group based upon the same rationale as was presented to the code change committee.

There has been more than sufficient documentation submitted to demonstrate that the provisions for roof vents and draft curtains contained in the IBC and IFC are archaic. In fact, the manufacturers of roof vents admitted as much when the American Architectural

Metals Association (AAMA) announced a new research project on the interaction of sprinklers and roof vents in September 1999 in response to the publication of the results of the NFPRF research in September 1998. AAMA's plans to conduct new research were dropped after the code change committee voted to disapprove code changes to delete the requirements for roof vents in the 2000 and 2001 editions of the IBC and IFC. In the summer of 2006, the AAMA once again announced a new research project on the interaction of sprinklers and vents. This time the AAMA is reacting to discussions of the topic by the CTC.

Given the above, it is requested that the membership overturn the committee's recommendation and approve code change F130-06/07 as submitted (AS).

Final Action: AS AM AMPC____ D

F132-06/07
912.2 (IBC [F] 912.2)

Proposed Change as Submitted:

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.

Committee Action: **Approved as Modified**

Modify the proposal 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 chief ~~code official~~.

Committee Reason: The proposal will provide the desired correlation with Sections 912.2.1 and 912.2.2. The modification reflects the fact that FDC location is a matter of operational concern for the fire department.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Paul Hayward, Farmington City, Utah, representing Bonneville Chapter ICC, requests Approval as Submitted.

Commenter's Reason: This is the way it was submitted by the ICC Joint Fire Service Review Committee and they got it right. The Fire Code Official is the person that is in the trenches and should have authority to approve this item. In cases where he reports directly to the Chief, the Chief has authority to decide what should be done anyway. In cases where the Chief is more of a figurehead, the authority needs to go to the person in responsible charge who is performing the duties day in and day out. If there is a conflict between the Chief and the Fire Code Official such that this provision cannot be agreed to, then there are problems the Fire Code cannot contemplate regulating or fixing. It is almost humorous to think that the "fire code official" is not concerned with day-to-day operations or if a question arose the "fire chief" would not be consulted. What about those departments where a Battalion Chief is in charge of the incident and the "fire chief" isn't too involved? How does this change help that department? The authority will be delegated to someone else anyway. See F133-06/07 for identical reason.

Public Comment 2:

Michael G. Kraft, Ohio Division of State Fire Marshal, requests Approval as Submitted.

Commenter's Reason: This change is inconsistent with previous code changes to scope the approvals of Chapter 9 elements to the fire code official and is inconsistent with the subsections of 912.2. Moreover, the fire code official is the broader term that should be utilized for appropriate applicability to all jurisdictions. If the fire chief is added to the proposed text then it should be consistent throughout Section 912 but should not be in lieu of the fire code official as in the existing text.

Public Comment 3:

Robert F. Loeper, Jr., MCP, Radnor Township, Wayne, Pennsylvania, requests Approval as Submitted.

Commenter's Reason: The majority of ICC member jurisdictions do not have a Fire Chief on staff. Many jurisdictions have volunteer fire departments with volunteer fire chiefs who may not be available for submitting approvals for any code issues. The Fire Code Official must be aware of the needs and requirements of the responding fire department in his/her jurisdiction. This may include type of fire department connection and type of pipe threads as well as location of the fire department connection.

Fire Code Official, as defined in the IFC, may be the fire chief if so designated by the chief appointing authority of the jurisdiction.

Final Action: AS AM AMPC____ D

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

Proposed Change as Submitted:

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.

Committee Action: **Approved as Modified**

Modify the proposal 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. Access to fire department connections shall be approved by the fire chief ~~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 chief ~~code official~~ and maintained operational at all times.

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 chief ~~code official~~.

(Portions of proposal not shown remain unchanged.)

Committee Reason: The proposal clarifies the intent of the code with respect to maintaining FDC's accessible and unobstructed at all times. The modifications reflect the fact that access to FDC's is a matter of operational concern for the fire department.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Paul Hayward, Farmington City, Utah, representing Bonneville Chapter ICC, requests Approval as Submitted.

Commenter's Reason: This is the way it was submitted by the ICC Joint Fire Service Review Committee and they got it right. The Fire Code Official is the person that is in the trenches and should have authority to approve this item. In cases where he reports directly to the Chief, the Chief has authority to decide what should be done anyway. In cases where the Chief is more of a figurehead, the authority needs to go to the person in responsible charge who is performing the duties day in and day out. If there is a conflict between the Chief and the Fire Code Official such that this provision cannot be agreed to, then there are problems the Fire Code cannot contemplate regulating or fixing. It is almost humorous to think that the "fire code official" is not concerned with day-to-day operations or if a question arose the "fire chief" would not be consulted. What about those departments where a Battalion Chief is in charge of the incident and the "fire chief" isn't too involved? How does this change help that department? The authority will be delegated to someone else anyway. See F132-06/07 for identical reason.

Public Comment 2:

Michael G. Kraft, Ohio Division of State Fire Marshal, requests Approval as Submitted.

Commenter's Reason: This change is inconsistent with previous code changes to scope the approvals of Chapter 9 elements to the fire code official and is inconsistent with the subsections of 912.2. Moreover, the fire code official is the broader term that should be utilized for appropriate applicability to all jurisdictions. If the fire chief is added to the proposed text then it should be consistent throughout Section 912 but should not be in lieu of the fire code official as in the existing text.

Public Comment 3:

Robert F. Loeper, Jr., MCP, Radnor Township, Wayne, Pennsylvania, requests Approval as Submitted.

Commenter's Reason: The majority of ICC member jurisdictions do not have a Fire Chief on staff. Many jurisdictions have volunteer fire departments with volunteer fire chiefs who may not be available for submitting approvals for any code issues. The Fire Code Official must be aware of the needs and requirements of the responding fire department in his/her jurisdiction. This may include type of fire department connection and type of pipe threads as well as location of the fire department connection.

Fire Code Official, as defined in the IFC, may be the fire chief if so designated by the chief appointing authority of the jurisdiction.

Final Action: AS AM AMPC____ D

F136-06/07
1028.2

Proposed Change as Submitted:

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.

Committee Action: **Disapproved**

Committee Reason: The committee felt that the proposal adds nothing to the code and that the current text is adequate.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Ralph Vasami, The Kellen Company, representing The Door Safety Council, requests Approval as Modified by this public comment.

Modify proposal 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~~ in the means of egress serving unoccupied areas shall be ~~allowed only when approved by~~ removable or releasable from the inside without the use of a key, tool or special knowledge, and be subject to approval of the fire code official.

Commenter's 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. The modification addresses committee and stakeholder concerns regarding occupied vs. unoccupied buildings. By moving the security device requirement to an exception, the intent of the code is more clearly realized; exits in unoccupied buildings may be secured providing the fire code official approves the application. The proposed language will place proper balance between security and life safety concerns.

Final Action: AS AM AMPC____ D

F139-06/07
1028.8 (New)

Proposed Change as Submitted:

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

Add new text 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.

Committee Action: **Disapproved**

Committee Reason: The proposal contains subjective terminology which could lead to confusion and inconsistent enforcement. The proposal is also in the format of a "laundry list" which can become problematic if brought into code text and could create unwanted liability issues. The unsafe conditions listed in the proposal are already regulated by current text.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Wayne R. Jewell, Chair, ICC Hazard Abatement in Existing Buildings Committee, requests Approval as Submitted.

Commenter's Reason: In its action for disapproval, the committee noted that the conditions in the proposal are regulated in the text of the IFC. While section 110, addresses unsafe buildings and requires the abatement of such conditions, its only reference to means of egress is in section 110.1.1, which identifies ". . . inadequate means of egress . . ." While section 1027 does require the maintenance of means of egress, it does not identify any specific unsafe conditions. This proposal identifies specific conditions that can be cited in a violation notice or order to correct. This is an important change as many jurisdictions do not follow the Property Maintenance Code, and as such the inspection efforts in these areas do not have specific guidelines to ensure uniform inspection.

Final Action: AS AM AMPC____ D

F140-06/07
1106.5.1

Proposed Change as Submitted:

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.

Committee Action: **Disapproved**

Committee Reason: There was no technical substantiation provided for the proposal. Changing the technical term from aircraft fueling vehicles to aircraft fuel servicing vehicles would be inconsistent with the term used in the referenced standard, NFPA 407.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Michael J. Shimer, The Boeing Company, requests Approval as Modified by this public comment.

Modify proposal as follows:

1106.5.1 Positioning of aircraft fuel<u>ing</u> ~~servicing~~ vehicles. Aircraft fuel<u>ing</u> ~~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. <u>Aircraft fueling vehicles shall not be located, parked or permitted to stand under any portion of an aircraft.</u>

> <u>**Exception:** Aircraft fueling vehicles shall be allowed to be located under aircraft wings during underwing fueling of turbine-engine powered aircraft.</u>

Commenter's 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. During discussion of this item in Orlando, the committee felt that the provision was too broad in its scope and could apply to private or piston powered aircraft. Additionally, there was concern that proposed terminology was not consistent with NFPA 407. This public comment speaks to both concerns. First, a specific exception has been created that applies only to turbine-engine (jet) powered aircraft. Secondly, proposed terminology is now consistent with that used in NFPA 407. It should be noted that there was testimony in Orlando from the Houston, Texas Airport Authority speaking in favor of the proposal. Approval of this modified code change would reflect standard industry practices and eliminate a burdensome, unenforceable provision.

Final Action: AS AM AMPC____ D

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

Proposed Change as Submitted:

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.

Committee Action: Approved as Modified

Modify the proposal 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 all the following gas concentrations:

1. Immediately dangerous to life and health (IDLH) values when the monitoring point is within an exhausted enclosure, ventilated enclosure or gas cabinet.
2. Permissible exposure limit (PEL) levels when the monitoring point is in 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 25 percent of the lower flammable limit (LFL) when the monitoring is within or outside an exhausted enclosure, ventilated enclosure or gas cabinet.
4. Except as noted in this section, ~~M~~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 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.

Committee Reason: The proposal will provide better correlation with the IMC and industry standards. The modification makes the change applicable only to semiconductor facilities by retaining the current text of Section 3704.2.2.10, clarifying that the other provisions of Chapter 37 still apply and clarifying that the intent of the proposal was not to change the monitoring requirements in occupied spaces, which could include exhausted enclosures.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Ron Keefer, Menlo Park Fire Protection District, representing California Fire Chiefs Association, requests Approval as Modified by this public comment.

Further modify proposal 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 ~~all the following gas concentrations~~ twice (2X) the permissible exposure limit (PEL) or ceiling limit of the gas for which detection is provided. For flammable gases, the monitoring detection threshold level shall be vapor concentrations in excess of 25 percent of the lower flammable limit (LFL). Monitoring for highly toxic and toxic gases shall also comply with Chapter 37.

~~1. Immediately dangerous to life and health (IDLH) values when the monitoring point is within an exhausted enclosure, ventilated enclosure or gas cabinet.~~
~~2. Permissible exposure limit (PEL) levels when the monitoring point is in 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 25 percent of the lower flammable limit (LFL) when the monitoring is within or outside an exhausted enclosure, ventilated enclosure or gas cabinet.~~
~~4. Except as noted in this section, monitoring for highly toxic and toxic gases shall also comply with Chapter 37.~~

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The purpose of this proposal is to maintain the current safety factor afforded emergency responders by using the permissible exposure limit (PEL) for all monitoring locations within the fabrication area. The purpose of the gas monitoring system is to provide early detection that a leak has occurred and to provide time to identify and possible correct a problem before a large scale release occurs. An activation limit at IDLH would immediately place emergency responders in a life threatening environment if a breach in the gas cabinet, exhausted enclosure or exhaust system occurs.

Final Action: AS AM AMPC____ D

F155-06/07

2209.5 (New), 2202.1, 2209.3.2.3, 907.2.24 (New) [IBC [F] 907.2.24 (New)]

Proposed Change as Submitted:

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.

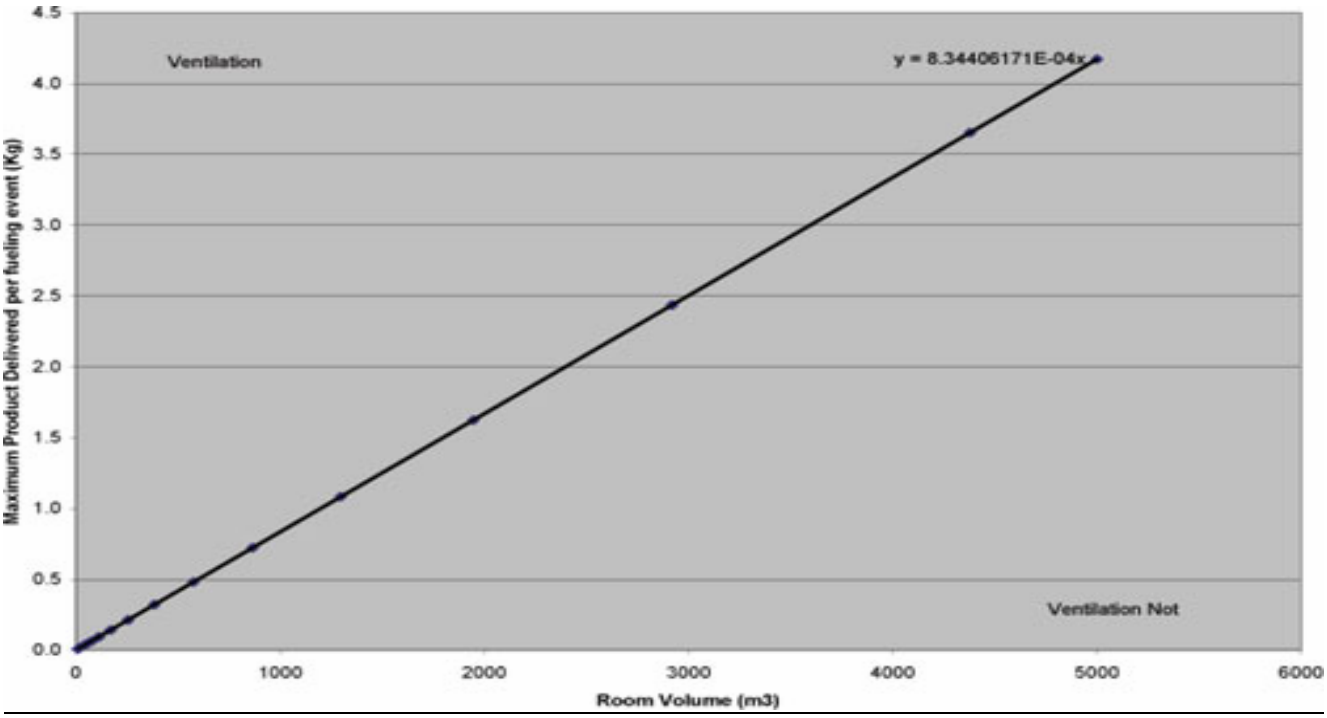

FIGURE 2209.5.3
INDOOR ATTENDED FAST-FILL HYDROGEN FUEL-DISPENSING LIMITATIONS.

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.

Committee Action: **Disapproved**

Committee Reason: The proponent requested disapproval to work through a number of technical issues with the proposal.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Thomas Joseph, Chair, Hydrogen Industry Panel on Codes, requests Approval as Modified by this public comment.

1. Modify proposal as follows:

2209.5 Indoor ~~attended~~ fast-fill hydrogen fuel-dispensing. ~~Attended~~ Indoor fast-fill hydrogen fuel-dispensing shall be conducted by a qualified operator and 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~~ or approved for indoor use or located outdoors in accordance with Section 2209.3.2.1.

2209.5.2 Safety precautions. In addition to the requirements of Section 2209.5 safety precautions shall be provided in accordance with Section ~~2209.5~~ 2209.6 for dispensing into motor vehicles at self-service hydrogen motor fuel dispensing facilities.

2209.5.2.1 Fire alarm and detection system. An approved manual and automatic fire alarm system shall be installed ~~throughout buildings housing~~ in indoor ~~attended~~ fast-fill hydrogen fuel-dispensing areas in accordance with Sections 907.2 and 2209.5.7. Activation of the system shall shut down the dispenser, stop flow of gas into the room and where mechanical ventilation is provided, and activate the ventilation system.

2209.5.3 Ventilation. Ventilation systems for ~~attended~~ indoor fast-fill hydrogen fuel- dispensing shall be in accordance with the *International Mechanical Code,* the *International Fuel Gas Code* and Section~~s~~ 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.~~

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.

Exception: Specially engineered installations as allowed by the *International Fuel Gas Code*.

~~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.~~

2209.5.3.1.1 Room ventilation rate. The room ventilation rate shall be ~~at least~~ not less than 1 cubic foot per minute per 12 cubic feet (0.00139 m3/s m3) of room volume.

Exception: Indoor fast-fill hydrogen fuel-dispensing areas exceeding the room volume and maximum fuel delivery mass per refueling event as depicted in Figure 2209.5.3.1.1 shall not require room ventilation beyond that required for the location in accordance with Section 703.1 of the *International Fuel Gas Code*.

FIGURE ~~2209.5.3~~ 2209.5.3.1.1
INDOOR ATTENDED FAST-FILL HYDROGEN FUEL-DISPENSING LIMITATIONS
(No change to figure)

2209.5.3.1.2 Dedicated dispensing area ventilation rate. The ventilation system serving the dispensing area shall be at least 1 cubic foot per minute (0.00047 m^3/s) per 12 cubic feet (0.34 m^3) of the Class 1, Division 2 cylinder volume (0.00139 $m^3/s/m^3$) defined in Section 2209.5.6. The ventilation system serving the dispensing area shall be directed to the outside in accordance with Section 501.3 of the *International Mechanical Code*.

2209.5.3.2 Operation. Room ventilation shall be provided by a continuous mechanical ventilation system or by a mechanical ventilation system activated by a continuously monitoring hydrogen gas detection system set to activate when a gas concentration exceeds 25 percent of the lower flammable limit (LFL). In either case, the system shall shut down the fueling system in the event of failure of the ventilation system.

The dedicated mechanical ventilation system serving the dispensing area shall operate continuously for not less than ten (10) seconds prior to dispenser operation, during fueling, and for not less than one minute after fueling has been completed. Failure of either the room ventilation system or the dedicated dispensing area ventilation system shall shut down the dispenser.

2209.5.4 Gas detection system. Indoor ~~attended~~ fast-fill hydrogen fuel- dispensing areas shall be provided with an approved flammable hydrogen gas detection system. The system shall be tested and maintained in accordance with Section 2703.2.9.

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 hydrogen 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 of the following:

1. Initiation of distinct audible and visual alarm signals throughout the ~~building~~ fire area in which indoor fast fuel-dispensing occurs.
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~~ shall be shut down and the flow of hydrogen fuel into the building ~~is~~ shall be stopped.

2209.5.4.3 Failure of the gas detection system. Failure of the gas detection system shall result in the following:

1. Deactivation of the heating system,
2. Shut down of the fuel-dispensing system,
3. Activation of the mechanical ventilation system, and
4. Where the mechanical ventilation system is interlocked with gas detection, failure of the gas detection system shall cause a trouble signal to sound in an approved location.

2209.5.4.4 Reactivation. Reactivation of ~~de~~fueling 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~~ control 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.~~ provide a means to prevent over pressurization of the on-board storage container and in accordance with the following:

1. The maximum pressure of the vehicle fuel storage system shall not exceed 125% of the on-board storage container service pressure.
2. The on-board storage container and its integral appurtenances shall not exceed 185 ^{o}F (85 ^{o}C) during the fueling operation.
3. The hydrogen content of the on-board storage container shall not exceed the gas density of hydrogen at the service pressure and 59 oF (15 oC).
4. Over-pressure relief device [Pressure Relief Valve (PRV)] for the dispenser set no greater than 140% of the service pressure of the on-board storage container.

2209.5.5.1 Fueling system integrity. The dispensing device shall include provisions to check that there are no leaks in the fueling system including the connecting hose and nozzle used to connect the vehicle to the dispenser prior to fueling.

2209.5.5.1.1 Loss of fueling system integrity. The following actions shall occur automatically in the event that a system leak is detected:

1. ~~Activation of the system shall shut down~~ The dispenser shall be shut down,
2. ~~and stop~~ The flow of gas into the room shall be stopped, and
3. Where mechanical ventilation is provided, ~~activate~~ room ventilation and dedicated dispensing area ventilation systems shall both be activated.

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 *International Code Council Electrical Code – Administrative Provisions*.

Exceptions:

1. Vehicles located within the refueling area ~~and having no open flames~~.
2. Vehicles containing fuel-fired auxiliary equipment where such equipment is shut off completely before entering an area in which ignition sources are not permitted.

2209.5.7 ~~Fire-resistance-rated construction~~ Types I and II 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*.~~ Buildings in which indoor fast fuel-dispensing operations take place shall be of Type I or Type II construction. Building construction within 15 feet of the point of transfer to the onboard fuel storage system during filling shall have a fire-resistance rating of not less than 2 hours. Such construction shall be assembled as fire barriers in accordance with Chapter 7 of the *International Building Code*.

2209.5.8 Fire extinguishing systems. Indoor attended fast-fill fuel-dispensing areas designed for maximum fuel delivery masses per refueling event which exceed 2 kg, shall be equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1. The design of the sprinkler system shall not be less than that required for Ordinary Hazard Group 2 with a minimum design area of 3,000 square feet (279 m^2).

Where proximate materials or storage arrangements are regulated by other provisions of this code such that a higher level of sprinkler system protection is required, the higher level of sprinkler system protection shall be provided.

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 hydrogen~~, 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.~~

HYDROGEN FUEL-DISPENSING AREA. A Class 1, Division 2 area defined within 15 feet of the point of transfer to the onboard hydrogen fuel storage system during filling, and extending outward in the shape of a cylinder from the point of transfer and from floor to ceiling in accordance with the ICC *Electrical Code*.

TIME-FILL FUEL-DISPENSING SYSTEM. A storage and dispensing system designed to fill motor vehicle fuel tanks with compressed hydrogen~~, 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~~ of ~~below~~ 12 Standard Cubic Feet per Minute (SCFM) or less. ~~The main valve can also be placed in the fast fill position to allow for filling at rates greater than 12 SCFM.~~

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~~ ~~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.

907.2.24 Indoor ~~attended~~ fast-fill hydrogen fuel-dispensing areas. An approved manual and automatic fire alarm system shall be installed in fire areas in which indoor fast-fill fuel-dispensing occurs. Manual fire alarm boxes shall be installed in accordance with 907.4.1 in the ~~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 shall initiate ~~a local alarm which will sound~~ an audible and visual signal at a constantly attended on site location.

2. Modify current text as follows:

IFC 2703.2.9.1 Equipment, devices and systems requiring testing. The following equipment, systems and devices shall be tested in accordance with Sections 2703.2.9 and 2703.2.9.2.

1. through 5. (No change to current text)
6. Gas detection systems, alarms and automatic emergency shutoff valves required by Section 2209 for hydrogen motor fuel dispensing and generation facilities.

IFGC [F] 706.2 Indoor gaseous hydrogen systems. Gaseous hydrogen systems shall be located in indoor rooms or areas in accordance with one of the following:

1. and 2. (No change to current text)
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 and Section 2209 of the *International Fire Code*.
4. Inside a building in dedicated fast-fill hydrogen fuel-dispensing area designed and constructed in accordance with Section 2209.5 of the International Fire Code.

Commenter's Reason: Section *2209.5:* The term "attended" has been replaced with "qualified operator." ICC identifies the term "attended" with the type of fuelling that is done in NJ and OR where a paid attendant is present and others are not permitted to fuel a vehicle. Fuelling operations should be performed by a **"qualified operator"** (that has been qualified through appropriate training) to ensure that proper safeguards are followed. The term "attended" has also been stricken throughout the document for consistency.

Section 2209.5.1: The term "listed" equipment should only be used 1) when there is in fact a listing standard, and 2) when listed equipment is available. Unless these conditions are met the requirements for items of equipment should either be 1) not specified, 2) "approved," or 3) "listed or approved."

Section *2209.5.2:* The change is editorial in nature. The section on indoor fast fueling is not intended to replace Section 2209.5.

Section *2209.5.2.1:* *Fire alarm boxes (pull stations or alarm initiating devices) should be installed in the area in which fueling occurs. The term INDOOR FAST-FILL HYDROGEN FUEL-DISPENSING AREA is defined by this proposal. The term limits applicability of the requirements to the fueling area.*

Section **2209.5.3:** This change proposes relocation of the Exception to NEW Section 2209.5.3.1.1, Room ventilation rate. The IFGC should be referenced as it sets the fundamental requirements for indoor operations.

Section 2209.5.3.1: The IFGC allows ventilation to be by natural or mechanical means. Provisions are made for the use of "specially engineered installations." The requirements for indoor fast fueling should be correlated with the IFGC. If specially engineered installations are to be prohibited then a statement along with justification is needed to prohibit them, otherwise they are needed for correlation purposes.

Section 2209.5.3.1.1: The proposed change is to establish and clarify two distinct ventilation rates for these operations, a general room ventilation rate, and a dedicated, localized dispensing area ventilation rate. Ventilation rates to be consistent with industry practice by reference to the IFGC.

Section 2209.5.3.1.2: The proposed change is to establish and clarify two distinct ventilation rates for these operations, a general room ventilation rate, and a dedicated, localized dispensing area ventilation rate. Ventilation rates to be consistent with industry practice by reference to the IFGC.

Section 2209.5.3.2: This change proposes hydrogen gas monitoring as a safety measure which is consistent with industry practice.

Section 2209.5.4: Detection (and alarm) systems are to be tested and maintained such that they operate as intended when required. Section 2703.2.9 provides the means to address requirements for testing and maintenance for a wide array of alarm and detection systems. The use of Section 2703.2.9 will provide a consistent approach in control. A modification to Section 2703.2.9 has also been proposed.

Section 2209.5.4.1: Gas detection systems, when provided to monitor hydrogen fueling systems, should be hydrogen specific. Alternatively a flammable gas detector could be used in circumstances where hydrogen is blended with other fuel gases. Specifying the use of a natural gas detection system is not appropriate for hydrogen based fuels.

Section 2209.5.4.2: With the exception of item 1 all other changes are editorial in nature. The audible and visual alarm signals should be limited to the fire area in which fueling occurs.

Section 2209.5.4.3: When any other control system is dependent on the operation of the gas detection system, failure of the gas detection system should prevent dispensing from occurring.

Section 2209.5.4.4: Editorial. Defueling is not the subject of this code section.

Section 2209.5.5: The required controls for dispensing systems should prevent the on-board storage container from being overfilled (or over-pressurization).

Section 2209.5.5.1: A means shall be provided to detect a leak should a leak occur. When leaks are detected fueling should be prevented until leaks are repaired.

Section 2209.5.5.1.1: Editorial clarity.

Section 2209.5.6: Ignition source control is required by IFC Sections 2209.3.2.3.3, 2703.7, and 3503.1.4. Coverage is added for food wagons and campers with auxiliary heating equipment and/or cooking appliances.

Section 2209.5.7: The construction of buildings used for indoor fast-fueling of hydrogen should limit the effects of fire and its spread through the use of one or more of the following: 1) Non-combustible construction, 2) a means to provided the spread of a fire by passive measures such as fire-resistive construction, or 3) the use of an automatic fire sprinkler system in the hydrogen fuel-dispensing area in which the fueling occurs. Being that construction as a fire barrier is specified, any proposed openings therein are inherently subject to the provisions of IBC Section 706.7.

Section 2209.5.8: This provision is designed to address the targeted fleet of indoor fast fill operations such as small lift truck applications.

Section 2202.1 (Fast-Fill Fuel-Dispensing System: The term “gasified fuels” includes CNG and LNG as well as hydrogen. Section 2209 is specific to hydrogen. Fast fill systems include any system that is designed to flow gas at a rate exceeding 12 scfm. The filling rate of a fuel dispensing system need not exceed the 12 scfm. However if the system affords the capability of providing a fuel fill rate greater than or equal to 12, the system is deemed fast-fill by definition.

Section 2202.1 (Time-Fill Fuel-Dispensing System) The term “gasified fuels” includes CNG and LNG as well as hydrogen. Section 2209 is specific to hydrogen. To be qualified as a time-fill system it should not be necessary to fill the vehicle overnight or while parked in a fleet yard. The code permits filling at rates less than 12 scfm in indoor locations.

Section 2209.3.2.3: To correlate with the requirements of (NEW) Section 2209.5.

Section 907.2.24: Fire alarm boxes (pull stations or alarm initiating devices) should be installed in the area in which fueling occurs. Fire areas are bounded by fire-resistive construction. If, for example, a large warehouse is involved and the fueling area is not isolated, audible and visible alarms will be required throughout the building. A “fire area” is the aggregate floor area enclosed and bounded by fire walls, fire barriers, exterior walls or fire-resistance-rated horizontal assemblies of a building. The term fire area confines the requirements to the fueling area.

IFC Section 2703.2.9.1: To correlate with the requirements of Section 2209.5.4.

IFGC [F] Section 706.2: To correlate with the requirements of (NEW) IFC Section 2209.5 and corresponding revisions to IFC Section 2209.3.2.3.

Final Action: AS AM AMPC____ D

F156-06/07, Part I

2209.5.1.1(New), Chapter 45

Proposed Change as Submitted:

Proponent: Thomas Joseph, Chair, Hydrogen Industry Panel on Codes

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

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.

Note: The following analysis was not in the Code Change Proposal book but was published in the "Errata to the 2006/2007 Proposed Changes to the International Codes and Analysis of Proposed Referenced Standards" provided at the code development hearings:

Analysis: Review of the proposed new standard indicated that, in the opinion of ICC staff, the standard did not comply with ICC standards criteria, Sections 3.6.2.11 and 3.6.3.2.

Committee Action: **Disapproved**

Committee Reason: In was unclear how the proposed standard for resilient floor coverings would apply to non-coated concrete.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Thomas Joseph, Chair, Hydrogen Industry Panel on Codes, requests Approval as Modified by this public comment for Part I.

Replace proposal with the following:

2209.5.1.1 Vehicle fueling pad. The vehicle fueling pad shall be of concrete or a material having a resistivity not exceeding 1 megohm as determined by an approved method.

Commenter's Reason: The current language does not address safety issues associated with electrostatic discharges (ESD). The Public Comment addresses IFC and IBC Committee concerns in that the proposal specifies plain concrete as the transfer surface material of choice, while clearly stating the antistatic performance of alternative materials.

Motor vehicles can acquire an electrostatic charge while traveling. The resistance offered by the tires through an un-coated concrete surface is low enough that this charge dissipates to ground very quickly (seconds or less). However, under dry conditions, an asphalt surface may offer sufficient resistance that the charge will not dissipate in a timely manner. A small number of incidents have occurred in Europe where a non-absorbent polymer, having unusually high resistance, was used at service stations to prevent soil contamination from gasoline spills. Therefore, paved surfaces that result in a resistance greater than one megohm should not be used.

Transfer surface materials meeting the criteria specified will provide for the dissipation of static charge built up on the vehicle before the driver opens the door initiate refueling.

The 1 megohm criteria is cited from the *American Petroleum Institute (API) 2003 Recommended Practices (RP)*. This language has also been proposed by the State of Michigan, Department of Environmental Quality – Waste and Hazardous Materials Division for Michigan's *Hydrogen Storage and Dispensing Rules*, and is consistent with changes proposed under the current cycle to NFPA 55-2005, *Standard for the Storage, Use, and Handling of Compressed Gasses and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks*. Addition of this language will provide the IFC with electrostatic discharge requirements for hydrogen refueling stations that are as protective as those for petroleum refueling stations with language aligned with modifications proposed to NFPA 55. Measurement of the resistivity of the vehicle fueling pad can be conducted using the *European Standard EN 1081 : 1998 Determination of Electrical Resistance – Resilient Floor Coverings.*

Cost Impact: The code change proposal will increase the cost of construction at service stations where materials other than plain concrete are proposed.

Final Action: AS AM AMPC____ D

F156-06/07, Part II
IBC 406.5.2 (New), Chapter 35

Proposed Change as Submitted:

Proponent: Thomas Joseph, Chair, Hydrogen Industry Panel on Codes

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.

Note: The following analysis was not in the Code Change Proposal book but was published in the "Errata to the 2006/2007 Proposed Changes to the International Codes and Analysis of Proposed Referenced Standards" provided at the code development hearings:

Analysis: Review of the proposed new standard indicated that, in the opinion of ICC staff, the standard did not comply with ICC standards criteria, Sections 3.6.2.11 and 3.6.3.2.

Committee Action: **Disapproved**

Committee Reason: The standard proposed for inclusion had not been provided for review by the committee.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Thomas Joseph, Chair, Hydrogen Industry Panel on Codes, requests Approval as Modified by this public comment for Part II.

Replace proposal with the following:

406.5.2 Vehicle fueling pad. The vehicle fueling pad shall be of concrete or a material having a resistivity not exceeding 1 megohm as determined by an approved method.

Commenter's Reason: The current language does not address safety issues associated with electrostatic discharges (ESD). The Public Comment addresses IFC and IBC Committee concerns in that the proposal specifies plain concrete as the transfer surface material of choice, while clearly stating the antistatic performance of alternative materials.

Motor vehicles can acquire an electrostatic charge while traveling. The resistance offered by the tires through an un-coated concrete surface is low enough that this charge dissipates to ground very quickly (seconds or less). However, under dry conditions, an asphalt surface may offer sufficient resistance that the charge will not dissipate in a timely manner. A small number of incidents have occurred in Europe where a non-absorbent polymer, having unusually high resistance, was used at service stations to prevent soil contamination from gasoline spills. Therefore, paved surfaces that result in a resistance greater than one megohm should not be used.

Transfer surface materials meeting the criteria specified will provide for the dissipation of static charge built up on the vehicle before the driver opens the door initiate refueling.

The 1 megohm criteria is cited from the *American Petroleum Institute (API) 2003 Recommended Practices (RP)*. This language has also been proposed by the State of Michigan, Department of Environmental Quality – Waste and Hazardous Materials Division for Michigan's *Hydrogen Storage and Dispensing Rules*, and is consistent with changes proposed under the current cycle to NFPA 55-2005, *Standard for the Storage, Use, and Handling of Compressed Gasses and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks*. Addition of this language will provide the IFC with electrostatic discharge requirements for hydrogen refueling stations that are as protective as those for petroleum refueling stations with language aligned with modifications proposed to NFPA 55. Measurement of the resistivity of the vehicle fueling pad can be conducted using the *European Standard EN 1081 : 1998 Determination of Electrical Resistance – Resilient Floor Coverings.*

Cost Impact: The code change proposal will increase the cost of construction at service stations where materials other than plain concrete are proposed.

Final Action: AS AM AMPC____ D

F158-06/07
Table 2306.2, 2306.7

Proposed Change as Submitted:

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 remain unchanged)

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" <u>required</u> 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.

Committee Action: Disapproved

Committee Reason: For consistency with the action on F124- and F125-06/07.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Richard Schulte, Schulte & Associates, requests Approval as Submitted.

Commenter's Reason: The stated reasons for disapproval of the code change are not consistent with the published rationale for this proposal, nor the testimony heard by the committee. The published rationale provided in support of the code change proposal included passages from the NFPA Fire Protection Handbook, NFPA 13 and NFPA 204/204M over a 20 year period cited in previous proposals to delete the requirements for roof vents, as well as new information included in NIOSH 2005-132. Hence, a disapproval recommendation based upon the fact that no new information was presented to the committee is in error.

While there is still considerable debate over whether open vents will have a negligible or significant impact upon the operation of standard sprinklers, there are numerous other reason why these provisions should be deleted.

A review of the roof vent provisions presently included in the IBC/IFC indicates that draft curtains are not required in storage buildings which contain high-piled storage and that the area of curtained areas is permitted to be up to 50,000 square feet in industrial and storage buildings which do not contain high-piled storage. (The requirements for draft curtains were removed because of the detrimental effect of draft curtains on the operation of standard sprinklers.) Roof vents and draft curtains are a team. The effectiveness of roof vents is compromised when draft curtains are not provided in combination with roof vents. In other words, many of the benefits of the use of roof vents claimed by proponents of vents do not occur unless roof vents are used in combination with draft curtains.

Tests and research on the interaction of standard sprinklers, roof vents and draft curtains sponsored by the National Fire Protection Research Foundation (NFPRF) and conducted by Underwriters Laboratories in 1997/1998 conclusively demonstrated that roof vents will not automatically open in buildings which are protected by standard sprinklers where the sprinkler system is adequate (or slightly inadequate) for the hazard being protected.

This finding of the NFPRF research was confirmed in a major fire which occurred at a bulk retail facility in Tempe, Arizona on March 19, 1998. In this fire, only three of 29 automatic roof vents operated despite the fact that the sprinkler system was failing to control the fire and the fact that the temperature rating of the fusible links of the roof vents was as 165oF, while the temperature rating of the sprinklers was 286oF. The NFPA fire investigation report on this fire indicates that when the fire department arrived at the building, the 100,000 square foot building (with a ceiling height which varied from 24 to 29 feet) was filled with smoke from floor to ceiling. The reason that automatic roof vents do not operate in sprinklered buildings is that sprinkler water spray efficiently cools the ceiling and limits the temperature at the ceiling to less than the operating temperature of the vents and also that water droplets from the sprinkler spray form on the vent activating mechanism.

The NFPRF research also confirmed a previous finding by Factory Mutual Research Corporation (FMRC) in 1994 that draft curtains significantly impact the operation of sprinklers. By limiting the spread of heat under the ceiling, draft curtains may cause a significantly

larger number of sprinklers to operate and also cause a distortion of the sprinklers which actually do operate. In addition, the NFPRF research also determined that draft curtains may prevent sprinklers which would normally operate from operating, thus interfering with the "pre-wetting" mechanism necessary for standard sprinklers to control a fire in storage occupancies.

The fire in the Tempe bulk retail building also confirmed the NFPRF research finding that draft curtains interfered with "pre-wetting". The NFPA investigation report indicates that fire was able to spread across an aisle which was 10 feet in width. A draft curtain (6 feet, 6 inches in depth) was located in the aisle (as recommended by NFPA 204). The draft curtain prevented sprinklers on the side of the draft curtain opposite the fire from operating, thus preventing "pre-wetting" from occurring and allowing the fire to spread across the aisle.

The committee's rationale for disapproving the code change proposal includes the statement that "*the discussions have focused on everything but the safety of the occupants, including firefighters.*" This statement is also not consistent with the testimony. The testimony offered in support of this code change specifically focused on the issue of firefighter safety. The proponent read excerpts from NIOSH 2005-132, "*Preventing Injuries and Deaths of Firefighters Due to Truss System Failures*". The testimony included the following four excerpts from NIOSH 2005-132:

> "Fire fighters should be discouraged from risking their lives solely for property protection activities."
>
> ". . . however, under uncontrolled fire conditions, the time to truss failure is unpredictable."
>
> "Lives will continue to be lost unless fire departments make appropriate fundamental changes in fire-fighting tactics involving trusses."
>
> "Use defensive strategies whenever trusses have been exposed to fire or structural integrity cannot be verified."

The NIOSH recommendations clearly indicate that the use of interior manual firefighting is to be discouraged in large buildings where the sprinkler system has failed to control the fire. (One story industrial and storage buildings are typically constructed using non-rated roof construction supported on non-rated steel bar joists and steel trusses.) The issue of firefighter safety is also addressed by the NFPA statistic that no firefighter fatalities occurred in any building protected by a sprinkler system in 2005.

Regarding the issue of the safety to occupants, neither sprinklered or unsprinklered singlestory industrial or storage buildings present a major fire safety hazard to building occupants. The occupant fire safety risk of both sprinklered and unsprinklered single-story industrial or storage buildings is extremely low. (NFPA statistics for 2005 indicate that a total of 50 civilian fire deaths occurred in all of the commercial (non-residential) buildings in the United States. Commercial buildings include buildings which contain assembly, educational, health care, mercantile occupancies, as well as industrial and storage buildings.)

While the committee's stated rationale for disapproving this code change proposal indicates that the change as presented does not have merit, the ICC Code Technology Committee (CTC) conducted a public hearing on whether or not to form a study group on the issue of roof vents in sprinklered buildings on October 20, 2006, approximately 3-1/2 weeks after the code hearings in Orlando. After hearing representatives for the roof vent manufacturers (opponents of the code change proposal) make an extended presentation on roof vents, the CTC voted to form a study group based upon the same rationale as was presented to the code change committee.

There has been more than sufficient documentation submitted to demonstrate that the provisions for roof vents and draft curtains contained in the IBC and IFC are archaic. In fact, the manufacturers of roof vents admitted as much when the American Architectural Metals Association (AAMA) announced a new research project on the interaction of sprinklers and roof vents in September 1999 in response to the publication of the results of the NFPRF research in September 1998. AAMA's plans to conduct new research were dropped after the code change committee voted to disapprove code changes to delete the requirements for roof vents in the 2000 and 2001 editions of the IBC and IFC. In the summer of 2006, the AAMA once again announced a new research project on the interaction of sprinklers and vents. This time the AAMA is reacting to discussions of the topic by the CTC.

Given the above, it is requested that the membership overturn the committee's recommendation and approve code change F158-06/07 as submitted (AS).

Final Action: AS AM AMPC____ D

F165-06/07

2605.2.1 (New)

Proposed Change as Submitted:

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.

Committee Action: **Approved as Submitted**

Committee Reason: Based on the proponent's reason statement. The proposal provides reasonable storage requirements for cylinders connected for use, as on welding carts.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Larry Fluer, Fluer, Inc., representing Compressed Gas Association, requests Approval as Modified by this public comment.

Modify proposal as follows:

2605.2.1.1 Individual cart separation. Individual carts in accordance with 2605.2.1 shall be separated from each other in accordance with Section 2703.9.8.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: During the public testimony one of the committee members raised a question regarding the separation of multiple carts. The code change was focused on single cylinders on individual carts, and multiple carts were not considered. If the number of carts were to grow, the quantity controls imposed by the Maximum Allowable Quantities (MAQ) would trigger the use of an H Occupancy when the MAQ of 1,000 cubic feet of flammable gas was exceeded (three or four carts depending on the fuel gas). However, using MAQ as a control was not the intent of the code change.

The addition of a new subsection to require that individual carts be separated in accordance with Section 2703.9.8 solves the problem raised in committee discussion by recognizing the allowance created to allow a single cylinder of oxidizing gas and single cylinder of fuel gas to be located on an individual cart while addressing the concern expressed with multiple carts while maintaining the intent of the code change.

Final Action: AS AM AMPC____ D

F173-06/07
3006.2

Proposed Change as Submitted:

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.

Committee Action: **Approved as Modified**

Modify the proposal 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. Rooms or areas where ~~Storage of~~ hazardous medical gases are stored or used in quantities 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~~ the *International Building Code* for high hazard Group H occupancies.

Committee Reason: Based on the proponent's reason statement. The proposal clarifies that when the maximum allowable quantity of hazardous medical gases is reached, all provisions of the code for Group H apply. The modification further clarifies the code by indicating that it is the application of the IBC that determines Group H construction requirements.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

John Williams, Washington State Department of Health – Construction Review Service, requests Approval as Modified by this public comment.

Further modify proposal 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. Rooms or areas where ~~hazardous~~ medical gases are stored or used in quantities exceeding the maximum allowable quantity per control area as set forth in Section 2703.1 shall be in accordance with the *International Building Code* for high hazard Group H occupancies.

Commenter's Reason: Having the word "hazardous" in front of "medical gases" creates an undefined term that will cause confusion. This introduces a concept of classification that does not exist. Throughout this section medical gases are referred to as simply "medical gases." This term should remain consistent.

Final Action: AS AM AMPC____ D

F175-06/07
3204.3.1.3

Proposed Change as Submitted:

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.

Committee Action: **Disapproved**

Committee Reason: The scope of the proposal exceeds the nature of the LH_2 hazard since it would take an extremely large and rapid leak to get a pool of LH_2 large enough to warrant such site work.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

John Dean, National Association of Fire Marshals (NASFM), requests Approval as Modified by this public comment.

Modify proposal 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 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 and/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, it is preferable to divert the liquid some distance 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.

Commenter's Reason: This is not a proposal to require diking. 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 retention of LH2. 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.

Final Action: AS AM AMPC____ D

F177-06/07
3301.1.3

Proposed Change as Submitted:

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.

Committee Action: **Approved as Submitted**

Committee Reason: Based on the proponent's reason statement. The proposal provides sounder wording that should cover all variations of other applicable laws.

Assembly Action: **Disapproved**

Individual Consideration Agenda

This item is on the agenda for individual consideration because an assembly action was successful.

Final Action: AS AM AMPC____ D

F188-06/07
3402.9.1 (New)

Proposed Change as Submitted:

Proponent: Michael G. Kraft, Division of State Fire Marshal, State of Ohio

Add new text as follows:

3404.2.9.1 Existing installations. Existing aboveground tank installations, even if previously approved, that are determined to constitute a hazard by the fire code official, shall not be continued in service. Unsafe tanks shall be removed where required by the fire code official and in accordance with Sections 3404.2.14 through 3404.2.14.2.

Reason: For AST's that constitute a hazard, such as an underground tank being used above ground, a clear-cut authorization to remove is needed. These situations are different from an abandoned out of service tank, yet require similar mitigation, such that the removal of such an unsafe tank needs to be in accordance with the safeguards otherwise required.

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

Committee Action: **Disapproved**

Committee Reason: The proponent requested disapproval to revise the proposal.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Michael G. Kraft, Ohio Division of State Fire Marshal, request Approval as Modified by this public comment.

Modify proposal as follows:

3404.2.9.1 Existing noncompliant installations. Existing aboveground tanks shall be maintained in accordance with the code requirements that were applicable at the time of installation. Aboveground tanks that were installed in violation of code requirements applicable at the time of installation shall be made code compliant or shall be removed in accordance with Section 3402.14, regardless of whether such tank has been previously inspected. See Section 106.4. ~~installations, even if previously approved, that are determined to constitute a hazard by the fire code official, shall not be continued in service. Unsafe tanks shall be removed where required by the fire code official and in accordance with Sections 3404.2.14 through 3404.2.14.2.~~

Commenter's Reason: This public comment fixes flaws in the original proposal that caused the proponent to request disapproval at the Orlando hearing. The revisions provided in this comment give straightforward guidance on how fire officials should handle existing non-compliant aboveground tanks. The reference to Section 106.4 addresses the issue of previous approvals that were mistakenly given by an inspector when a violation may have gone unnoticed.

Final Action: AS AM AMPC____ D

F190-06/07
3405.5.1

Proposed Change as Submitted:

Proponent: Patrick A. McLaughlin, McLaughlin & Associates, representing Consumer Specialty Products Association

Revise as follows:

3405.5.1 Corridor installations. Where wall-mounted dispensers containing alcohol-based hand rubs are installed in corridors, they shall be in accordance with all of the following:

1. Level 2 and Level 3 aerosols containers shall not be allowed in corridors.
2. The maximum capacity of each Class I or II liquids dispenser shall be 41 ounces and the maximum capacity of each Level 1 aerosol dispenser shall be 18 ounces (.51 kg).
3. The maximum quantity allowed in a corridor within a control area shall be 10 gallons (37.85 L).
4. The minimum corridor width shall be 72 inches (1829 mm).
5. Projections into a corridor shall be in accordance with Section 1003.3.3.

Reason: The original proposal to allow limited quantities of Class I and II liquid alcohol rubs in corridors did not include aerosols because they were not addressed in the supporting documentation. This exclusion is appropriate for Level 2 and Level 3 aerosols but not Level 1. Level 1 aerosols are treated as ordinary combustibles by the Fire Code. The alcohol component is no different than that considered in the original approval. The concern of bursting is not relevant because the temperatures in the corridor that would result in a can burst would be so high that the corridor would already be untenable.

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

Committee Action: **Disapproved**

Committee Reason: The committee did not feel that aerosols of any level should be installed in corridors without more history in the successful application of current Section 3405.5. Since the corridor is an egress element, a quantity limit for aerosols should be included since there is none in Chapter 28

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Patrick A. McLaughlin, McLaughlin & Associates, representing Consumer Specialty Products Association, requests Approval as Modified by this public comment.

Modify proposal as follows:

3405.5.1 Corridor installations. Where wall-mounted dispensers containing alcohol-based hand rubs are installed in corridors, they shall be in accordance with all of the following:

1. Level 2 and Level 3 aerosols containers shall not be allowed in corridors.
2. The maximum capacity of each Class I or II liquids dispenser shall be 41 ounces and the maximum capacity of each Level 1 aerosol dispenser shall be 18 ounces (.51 kg).
3. The maximum quantity allowed in a corridor within a control area shall be 10 gallons (37.85 L) of Class I or II liquids or 1135 ounces (32.2 kg) of Level 1 aerosols, or a combination of Class I or II liquids and Level 1 aerosols not to exceed, in total, the equivalent of 10 gallons (37.85 L) or 1135 oz (32.2 kg).
4. The minimum corridor width shall be 72 inches (1829 mm).
5. Projections into a corridor shall be in accordance with Section 1003.3.3.

Commenter's Reason: The International Fire Code, 2006 Edition, was amended, as a result of the ICC Ad Hoc Committee on the Use of Alcohol Hand Disinfectants in Health Care Occupancies project, to allow limited quantities of Class I and II liquid alcohol hand sanitizers in corridors but did not include aerosol alcohol hand sanitizers because aerosols were not addressed in the supporting documentation (aerosol products make up approximately 33% of the use of alcohol based hand sanitizers). The aerosol industry was asked to conduct their own study and testing to show that aerosols could also be allowed in the same application. This was done and only Level 1 aerosols were proposed for inclusion in the code. The study is attached. Level 1 aerosols are treated as ordinary combustibles by the Fire Code. The alcohol content is equal to that currently permitted in Class I and II liquid or gel hand sanitizers. Testing of the aerosol configuration was done and the results showed that the hazard of level 1 aerosols was less than that of the allowed hand sanitizers and that the aerosol can would not release its contents before the temperatures in the corridor would be untenable.

The benefit of alcohol hand sanitizers as a means to minimize healthcare acquired infections was well documented in the Ad Hoc Committee work. "In response to this health care crisis, the CDC issued the Guidelines for Hand Hygiene in Health-Care Settings in October 2002. These guideline urge health care organizations to utilize alcohol hand rub solutions (found to be more effective than antimicrobial soap) to prevent the spread of dangerous germs via healthcare worker hands, leading to significant reduction in Healthcare Associated Infections and saving lives. Clinical studies have shown that the frequency of handwashing is affected by the accessibility of hand-hygiene facilities and that the placement of alcohol-based hand-rub solution dispensers in convenient locations is a key to success. By permitting the installation of hand-rub dispensers immediately outside the patient/residence bedroom or within suites of rooms the overall efficacy of staff use have been shown in case studies to increase by over 20%. This means that this code change has the potential to reduce the life loss related to these infections by some 18,000 per year."

At the Code Development Hearing in September 2006, comments regarding the fire history of all alcohol hand sanitizers were introduced as evidence that aerosols should not be allowed. Also, as stated in the reason for disapproval, the Committee felt that there needed to be more experience before aerosols were included. Aerosol alcohol hand sanitizers were first introduced into the hospital market in the early 1970s and have been marketed widely in that market for over 30 years. We have reviewed the fire history of all alcohol hand sanitizers (gel and aerosol) and found that there have been only **3** incidents reported in the public domain in the last 7 years. These were all associated with alcohol based hand rubs in a gel formulation. In addition, the quality tracking system of one of the major manufacturers of alcohol based hand antiseptic products (estimated to provide 30 % of the product used in the US) recorded an additional 5 incidents. None of which involved aerosols and all were minor (confined to the product user, resulting in minor burns to the hands) with the cause of the fires being attributed either to electrostatic discharge, or improper use of the product (user lighting cigarette before hands were dry (3 cases), contact with electrical equipment or gas stove before hands were dry (2 cases)) Based on the limited number of incidents compared to the level of use, the safety profile of these aerosol products has been excellent. It is estimated that 95% or 4,465 out of 4,700 hospitals greater than 100 beds are now using alcohol based hand sanitizers. Aerosol alcohol hand rubs make up approximately 33% of the overall healthcare market, with over 3 million units of this product type used annually. The aerosol alcohol form of these products has shown no greater safety risk than gel based formulations. Furthermore, quoting from the Ad-Hoc Committee's reason statement; "Alcohol Hand Rub Solutions have been used, without incident of fire, for over 20 years in hospitals throughout Great Britain, Germany, Switzerland, Austria and Australia. In March 2003, the Infectious Disease Society of America (SHEA) conducted a study of 840 U.S. hospitals with over 95% indicating the ongoing use of alcohol hand rubs with dispensers in rooms and/or corridors …None of the respondents reported having a fire attributed to (or involving) an alcohol-based rub dispenser had occurred in his or her facility." (from Infection Control and Hospital Epidemiology, August 2003, pp. 618-619.) Testing and experience has shown that all alcohol based hand sanitizers, including aerosol alcohol hand sanitizers can safely be used in hospital corridors.

Lastly, the Code Development Committee requested that there be a maximum quantity limit and that has been provided in this pubic comment. It is proposed that the limit be the same as is presently allowed for Class I and II liquids.

Final Action: AS AM AMPC____ D

F200-06/07
3705.1

Proposed Change as Submitted:

Proponent: Kent Miller, representing City of Stockton, CA Fire Department; Paul Inouye, representing City of Milpitas, CA Fire Department; Ron Keefer, City of Menlo Park, CA Fire Department

Revise as follows:

3705.1 Scope. Ozone gas generators having a maximum ozone-generating capacity of 0.5 pound (0.23 kg) or more over a 24-hour period shall be in accordance with this section.

Exceptions~~:~~ ~~1.~~ Ozone-generating equipment used in Group R-3 occupancies.
~~2. Ozone-generating equipment used in Group H-5 occupancies.~~

Reason: This proposal will delete exception #2 that exempts H-5 Occupancies from the safeguards required by this Section for Ozone Gas generating equipment. Since the semiconductor industry uses Ozone Gas generators, which is a Fire Code defined Highly Toxic Gas, they should be included in the safeguards provided by this Section of the Code. It simply retains the Standard of Care that now exists. The specific requirements for ozone will require additional safeguards that would not otherwise be in H-5 occupancy.

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

Committee Action: **Disapproved**

Committee Reason: The proposal would nullify previously added safeguards. The proponent requested disapproval in order to resolve that issue and others brought up to him by the semiconductor industry.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Ron Keefer, Menlo Park Fire Protection District, representing California Fire Chiefs Association, requests Approval as Modified by this public comment.

Modify proposal as follows:

3705.1 Scope. Ozone gas generators having a maximum ozone-generating capacity of 0.5 pound (0.23 kg) or more over a 24-hour period shall be in accordance with this section.

Exceptions:

1. Ozone-generating equipment used in Group R-3 occupancies.
2. Ozone generating equipment when used in Group H-5 occupancies when in compliance with Chapters 18 and 27 and the other provisions in Chapter 37 for Highly Toxic Gases.

Commenter's Reason: This proposal ensures that the necessary safety provisions for the highly toxic ozone gas produced in an ozone generator will be maintained when used in a semiconductor facility.

Final Action: AS AM AMPC____ D

F205-06/07
4006 (New), 4002.1, 3001.1

Proposed Change as Submitted:

Proponent: John Anicello, Airgas, Inc.; Greg Rogers, South Kitsap Fire & Rescue, representing ICC Joint Fire Service Review Committee

1. Add new text as follows:

SECTION 4006
LIQUID OXYGEN IN HOME HEALTH CARE

4006.1 General. The storage and use of liquid oxygen (LOX) in home health care shall comply with Sections 4006.2 through 4006.10.3.

4006.2 Information and instructions to be provided. The supplier of liquid oxygen shall provide the user with the following information in written form:

1. Manufacturer's instructions for operation of the containers used and labeling.
2. Locating containers away from ignition sources, exits, electrical hazards and high temperature devices.
3. Restraint of containers to prevent falling.
4. Requirements for transporting containers.
5. Safeguards to be followed when containers are refilled.

4006.3 Liquid oxygen home care containers. Liquid oxygen home care and ambulatory containers in Groups I-1, I-4, R-3 Residential Care/Assisted Living Facilities and R-4 occupancies shall be stored, used and filled in accordance with Sections 4006, 3203.1 and 3203.2.

4006.4 Manufacturer's instructions and labeling. Containers shall be stored, used and operated in accordance with the manufacturer's instructions and labeling.

4006.5 Locating containers. Containers shall not be located in areas:

1. Where they can be overturned due to operation of a door,
2. Where they are in the direct path of egress,
3. Subject to falling objects,
4. Where they may become part of an electrical circuit, or
5. Where open flames and high temperature devices can cause a hazard.

4006.6 No smoking. Smoking shall be prohibited in rooms or areas where liquid oxygen is in use.

4006.7 Signs. A sign stating "OXYGEN NO SMOKING" shall be posted in the room or area where the liquid oxygen home care container(s) is stored or used and liquid oxygen ambulatory containers are filled.

4006.8 Restraining containers. Containers shall be restrained while in storage or use to prevent falling caused by contact, vibration or seismic activity. Containers shall be restrained by one of the following methods:

1. Restraining containers to a fixed object with one or more restraints.
2. Restraining containers within a framework, stand or assembly designed to secure the container.
3. Restraining containers by locating a container against two points of contact like the walls of a corner of a room or a wall and a secure furnishing or object like a desk.

4006.9 Container movement. Containers shall be transported by use of a cart or hand truck designed for such use.

Exceptions:

1. Liquid oxygen home care containers equipped with a roller base.
2. Liquid oxygen ambulatory containers are allowed to be hand carried.

4006.10 Filling of containers. The filling of containers shall be in accordance with Sections 4006.10 through 4006.10.3.

4006.10.1 Filling of home care containers. Liquid oxygen home care containers shall be filled outdoors.

4006.10.1.1 Incompatible surfaces. A liquid oxygen compatible drip pan shall be provided under home care container fill connections during the filling process in order to protect against liquid oxygen spillage from coming into contact with combustible surfaces, including asphalt.

4006.10.2 Filling of ambulatory care containers. The filling of liquid oxygen ambulatory containers is allowed indoors where the supply container is designed to fill them and written instructions are provided by the container manufacturer.

4006.10.3 Open flames and high temperature devices. The use of open flames and high temperature devices shall be in accordance with Section 2703.7.2.

2. Add new definitions as follows:

4002.1 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.

LIQUID OXYGEN HOME CARE CONTAINER. A container used for liquid oxygen not exceeding 15.8 gallons (60 liters) specifically designed for use as a medical device as defined by 21 USC Chapter 9, the United States Food, Drug and Cosmetic Act that is intended to deliver gaseous oxygen for therapeutic use in a home environment.

LIQUID OXYGEN AMBULATORY CONTAINER. A container used for liquid oxygen not exceeding 0.396 gallons (1.5 liters) specifically designed for use as a medical device as defined by 21 USC Chapter 9, the United States Food, Drug and Cosmetic Act that is intended for portable therapeutic use and to be filled from its companion base unit (a liquid oxygen home care container).

OXIDIZING CRYOGENIC FLUID. An oxidizing gas in the cryogenic state.

3. Revise as follows:

3001.1 Scope. Storage, use and handling of compressed gases in compressed gas containers, cylinders, tanks and systems shall comply with this chapter, including those gases regulated elsewhere in this code. Partially full compressed gas containers, cylinders or tanks containing residual gases shall be considered as full for the purposes of the controls required.

Exceptions:

1. Gases used as refrigerants in refrigeration systems (see Section 606).
2. Compressed natural gas (CNG) for use as a vehicular fuel shall comply with Chapter 22, NFPA 52 and the *International Fuel Gas Code*.

Cutting and welding gases shall also comply with Chapter 26.

Cryogenic fluids shall ~~also~~ comply with Chapter 32. Liquefied natural gas for use as a vehicular fuel shall also comply with NFPA 57 and NFPA 59A.

Compressed gases classified as hazardous materials shall also comply with Chapter 27 for general requirements and chapters addressing specific hazards, including Chapters 35 (Flammable Gases), 37 (Highly Toxic and Toxic Materials), 40 (Oxidizers) and 41 (Pyrophoric).

LP-gas shall also comply with Chapter 38 and the *International Fuel Gas Code*.

Reason:
1. Chapter 40: A typical liquid oxygen home care container holds up to 15.8 gallons of liquid oxygen (LOX). The ambulatory containers are typically limited to 1.5 gallons or less. These containers include in their design all appurtenances such as regulators, gauges, piping and controls and require no external piping other than the application of disposable breathing apparatus.

A code change (F215-04/05) was initially submitted by Mr. Hal Key, City of Mesa, AZ to address the subject. This code change was not approved, however, a substantial public comment was issued by Mr. John Anicello, Airgas, Inc. for consideration at the annual meeting. The public comment was disapproved at the request of the proponent to allow for further study and consideration. The code change has now been further revised based on input from the ICC/IAFC Western/Canadian Code Action Committee and discussion with other liquid oxygen suppliers.

This proposal is designed to establish controls for LOX into a section of Chapter 40 instead of Chapter 32, Cryogenic Fluids because Chapter 32 is a generic chapter that provides general provisions for all cryogens and has only limited application to liquid oxygen in homecare. Liquid oxygen is regulated by Chapters 32 and 40. As a cryogen LOX is not regulated by Chapter 30. Part 1 of the proposal is designed to resolve what might be a conflict by referring the user to Chapter 32 when cryogens are involved.

2. Chapter 40 definitions: Part 2 of the proposal provides the general provisions for storage and use of liquid oxygen home care and ambulatory containers as defined in two new definitions to be added to Chapter 40. A key aspect in the definitions are the containers are medical devices as classified by the Federal Food and Drug Administration and always intended for therapeutic use.

Use in all occupancies requires that the supplier furnish written information to the user under the requirements of Section 4006.1. Specific provisions applicable to I-1, I-4, R-3 Residential Care/Assisted Living facilities and R-4 occupancies are addressed in Section 4006.2 and the sections that follow. The requirements establish general safeguards including but not limited to locating containers, restraining containers, distance to exposures such as ignition sources, and high temperature devices, container movement and filling. The permit quantity of 10 gallons is unchanged.

The definitions and Part 4 of the proposal provide a reference to the US Code, Title 21 – Federal Food, Drug and Cosmetic Act that defines medical devices. LOX containers used as medical devices are unique in that they are intended for therapeutic use only, and not intended for use in industrial applications.

As the population ages the use of LOX is expected to increase. Approval of this code change will enhance public safety by establishing minimum requirements surrounding its use in the occupancies where the material is most frequently encountered. In addition it requires that the suppliers provide a reasonable level of information containing safeguards to be applied by the users. The code change fills a void in the code which has been characterized by a growing concern and “need to know” emanating from the code enforcement community.

3. 3001.1: Compressed gases in the cryogenic state are regulated under Chapter 32

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

Committee Action: Approved as Modified

Modify the proposal as follows:

SECTION 4006
LIQUID OXYGEN IN HOME HEALTH CARE

4006.1 General. The storage and use of liquid oxygen (LOX) in home health care shall comply with Sections 4006.2 through ~~4006.10.3~~ 4006.3.7, as applicable.

4006.2 Information and instructions to be provided. (Proposed text is unchanged)

4006.3 Liquid oxygen home care containers. (Proposed text is unchanged)

~~**4006.4**~~ **4006.3.1 Manufacturer’s instructions and labeling.** (Proposed text is unchanged)

~~**4006.5**~~ **4006.3.2 Locating containers.** (Proposed text is unchanged)

~~4006.6~~ **4006.3.3 No smoking.** (Proposed text is unchanged)

~~4006.7~~ **4006.3.4 Signs.** (Proposed text is unchanged)

~~4006.8~~ **4006.3.5 Restraining containers.** Liquid oxygen home care containers shall be restrained while in storage or use to prevent falling caused by contact, vibration or seismic activity. Containers shall be restrained by one of the following methods:

1. Restraining containers to a fixed object with one or more restraints.
2. Restraining containers within a framework, stand or assembly designed to secure the container.
3. Restraining containers by locating a container against two points of contact like the walls of a corner of a room or a wall and a secure furnishing or object like a desk.

~~4006.9~~ **4006.3.6 Container movement.** (Proposed text is unchanged)

~~4006.10~~ **4006.3.7 Filling of containers.** The filling of containers shall be in accordance with Sections ~~4006.10~~ 4006.3.7.1 through ~~4006.10.3~~ 4006.3.7.3.

~~4006.10.1~~ **4006.3.7.1 Filling of home care containers.** (Proposed text is unchanged)

~~4006.10.1.1~~ **4006.3.7.1.1 Incompatible surfaces.** (Proposed text is unchanged)

~~4006.10.2~~ **4006.3.7.2 Filling of ambulatory care containers.** (Proposed text is unchanged)

~~4006.10.3~~ **4006.3.7.3 Open flames and high temperature devices.** (Proposed text is unchanged)

(Portions of proposal not shown remain unchanged)

Committee Reason: The proposal responds to guidance given by the committee in the 2004/2005 cycle in disapproving code change F215-04/05 and represents a consensus among gas purveyors and fire code officials. It provides needed and reasonable regulation of the hazards associated with the storage and use of liquid oxygen in home health care scenarios. The modification clarifies that Sections 4006.1 and 4006.2 apply to all occupancies and that Sections 4006.3.1 through 4006.3.7.3 apply to Groups I-1, I-4, R-3 Residential Care/Assisted Living and R-4 occupancies.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Modify proposal as follows:

A. Hal Key, Fire Department, Mesa, Arizona, requests Approval as Modified by this public comment.

4001.1 Scope. The storage and use of oxidizers shall be in accordance with this chapter and Chapter 27. Compressed gases shall also comply with Chapter 30.

Exceptions:

1. Display and storage in Group M and storage in Group S occupancies complying with Section 2703.11.
2. Bulk oxygen systems at industrial and institutional consumer sites shall be in accordance withNFPA55.
3. Liquid oxygen in I-1, I-4 and R occupancies for home health care shall comply with Section 4006.

4006.1 General. The storage and use of liquid oxygen (LOX) in Group I-1, I-4 and R occupancies for home health care shall comply with Sections 4006.2 through 4006.3.~~7.3~~9, as applicable.

4006.2 Information and instructions to be provided. The supplier of liquid oxygen shall provide the user with the following information in written form:

1. Manufacturer's instructions for operation of the containers used and labeling.
2. Locating containers away from ignition sources, exits, electrical hazards and high temperature devices.
3. Restraint of containers to prevent falling.
4. Requirements for transporting containers.
5. Safeguards to be followed when containers are refilled.
6. Signage as required by Section 4006.3.4.

4006.3 Liquid oxygen home care containers. Only liquid oxygen home care ~~and ambulatory~~ containers no larger than 15.8 gal (60 liters) and liquid oxygen ambulatory containers are allowed in Groups I-1, I-4~~, R-2, R-3 Residential Care/Assisted Living Facilities, and R-4~~ and R occupancies. These containers shall be stored, used and filled in accordance with Sections 4006, 3203.1 and 3203.2.

4006.3.4 Signs. Warning signs for occupancies using oxygen in home health care shall be in accordance with Sections 4006.3.4.1 and 4006.3.4.2.

4006.3.4.1 No Smoking. A sign stating "OXYGEN NO SMOKING" shall be posted in the room or area where the liquid oxygen home care container(s) is stored or used and liquid oxygen ambulatory containers are filled.

4006.3.4.2 Premise. When required by the fire code official, each dwelling unit or sleeping unit shall have an approved sign indicating that the unit contains liquid oxygen home care container(s).

4006.3.8 Maximum allowable quantity. The maximum allowable quantity of liquid oxygen in each dwelling unit or sleeping unit shall be 31.6 gallons (120 L) with not more than 15.8 gallons (60 L) in storage.

4006.3.9 Fire department notification. When required by the fire code official, the liquid oxygen supplier shall notify the fire department of the locations of liquid oxygen home care containers.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: There was concern expressed that the provisions of the approved proposal still tied this new section to Chapter 27 and the requirements of Chapter 27 would still apply making the original proposal ineffectual. The revision to the scope of Chapter 40 in this comment exempts the new section for "Liquid Oxygen in Home Care" from Chapter 27. In addition, the added section for Maximum Allowable Quantity in the new section limits the quantity that a single dwelling unit can contain.

Another concern was the notification for the firefighters that LOX is contained within a dwelling unit. The comment expands the section on signage adding a section on premise signs. It is worded to allow the Fire Code Official to approve the signage thus giving the AHJ the option of requiring signs or not and the type of sign.

The last concern I attempted to address with this comment is: The original proposal seems to limit LOX to "Home Health Care" only. The comment broadens the scope to include all residential occupancies along with the I-1 and I-4.

Final Action: AS AM AMPC____ D

F210-06/07
Chapter XX (New)

Proposed Change as Submitted:

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

Add new chapter as follows:

CHAPTER XX
MARINAS

SECTION XX01
SCOPE

XX01.1 Scope. Marina facilities shall be in accordance with this chapter.

XX01.1.1 Plans and approvals. Plans for marina fire-protection facilities shall be approved prior to installation. The work shall be subject to final inspection and approval after installation.

SECTION XX02
DEFINITIONS

XX02.1 Definitions. The following words and terms shall, for the purpose of this chapter and as used elsewhere in this code, have the meanings shown herein.

FLOAT. A floating structure normally used as a point of transfer for passengers and goods, or both, for mooring purposes.

MARINA. Any portion of the ocean or inland water, either naturally or artificially protected, for the mooring, servicing or safety of vessels and shall include artificially protected works, the public or private lands ashore, and structures or facilities provided within the enclosed body of water and ashore for the mooring or servicing of vessels or the servicing of their crews or passengers.

PIER. A structure built over the water, supported by pillars or piles, and used as a landing place, pleasure pavilion or similar purpose.

VESSEL. Watercraft of any type, other than seaplanes on the water, used or capable of being used as a means of transportation. Included in this definition are non transportation vessels such as houseboats and boathouses.

WHARF. A structure or bulkhead constructed of wood, stone, concrete or similar material built at the shore of a harbor, lake or river for vessels to lie alongside of, and piers or floats to be anchored to.

SECTION XX03
GENERAL PRECAUTIONS

XX03.1 Combustible debris. Combustible debris and rubbish shall not be deposited or accumulated on land beneath marina structures, piers or wharves.

XX03.2 Sources of ignition. Open-flame devices used for lighting or decoration on the exterior of a vessel, float, pier or wharf shall be approved.

XX03.3 Flammable or combustible liquid spills. Spills of flammable or combustible liquids at or upon the water shall be reported immediately to the fire department or jurisdictional authorities.

XX03.4 Rubbish containers. Containers with tight fitting or self closing lids shall be provided for the temporary storage of combustible trash or rubbish.

XX03.5 Electrical equipment. Electrical equipment shall be installed and used in accordance with its listing and Section 605 and NFPA 303, Chapter 3 as required for wet, damp and hazardous locations.

XX03.6 Berthing and storage. Berthing and storage shall be in accordance with NFPA 303, Chapter 5.

SECTION XX04
FIRE-PROTECTION EQUIPEMENT

XX04.1 General. Piers, wharves with facilities for mooring or servicing five or more vessels, and marine motor vehicle fuel-dispensing stations shall be equipped with fire-protection equipment in accordance with Section XX04.

XX04.2 Standpipes. Marinas and boatyards shall be equipped throughout with standpipe systems in accordance with NFPA 303.

XX04.3 Access and water supply. Piers and wharves shall be provided with fire apparatus access roads and water-supply systems with on-site fire hydrants when required by the fire code official. Such roads and water systems shall be provided and maintained in accordance with Sections 503.2 and 508.

XX04.4 Portable fire extinguishers. One fire extinguisher for ordinary (moderate) hazard type, shall be provided at each required hose station. Additional fire extinguishers, suitable for the hazards involved, shall be provided and maintained in accordance with Section 906.

XX04.5 Communications. A telephone not requiring a coin to operate or other approved, clearly identified means to notify the fire department shall be provided on the site in a location approved by the code official.

SECTION XX05
MARINE MOTOR VEHICLE FUEL-DISPENSING STATIONS

XX05.1 Fuel- Dispensing. Marine motor vehicle fuel-dispensing stations shall be in accordance with Chapter 22.

Reason: It has been identified the IFC currently has no requirements for the general fire safety precautions or protection equipment for marinas. Because of the different environment that a marina presents in fighting fires, than a normal business, these facilities need to be specifically addressed in the IFC.

In the last three years the largest marina fires in the US caused over 67 million dollars in damage with the complete loss of 272 boats and houseboats. A perfect example of the need to address marinas in the IFC is the following incident:

$10 MILLION MARINA FIRE
Bohemia Bay, Maryland

FIRE PROTECTION CODES AND EQUIPMENT
There was no fire detection or sprinkler systems at Bohemia Bay. The marina structure was completed in October 1986. It was built under a Maryland code that did not require fire detection, fire sprinkler, or standpipe systems. In addition, there was no requirement for providing readily accessible areas for fire department drafting operations.

Portable fire extinguishers located on finger piers were the main fire protection equipment provided in the entire marina. As a result of persuasion by the local fire department, a two inch dry standpipe line running the length of docks 'D' and 'E' had been installed. (The adequacy of such standpipe lines should be questioned because of their small size and the location of hose outlets.) There was no standpipe on the pier with the fire. A new Maryland code was adopted, which incorporated the B.O.C.A. code. The B.O.C.A. code adopts NFPA Standard #303, Protection to Marinas, and will require all future structures of this type and use to be equipped with fire protection, fire suppression, and standpipe systems. They must also provide reliable and accessible sources of water for fire fighting.

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

Committee Action: Disapproved

Committee Reason: The proposal treats the subject matter in too broad a fashion and would have a negative impact upon small marinas that have not been shown to be a problem. For example, a wilderness outpost that rents out six kyaks or a youth camp that owns and docks 5 sailboats should not have to comply with all the requirements simply because they fit the definition. Also, the provisions would be applicable to any type of watercraft by definition in Section XX02. The threshold for fire protection equipment at 5 vessels is too low. There is no guidance regarding reportable quantities for fuel spills in Section XX03.3. The subject matter would be more appropriate as an appendix to the code, as it was in the legacy Uniform Fire Code/97, since not all jurisdictions would have use for it.

Assembly Action: Approved as Submitted

Individual Consideration Agenda

This item is on the agenda for individual consideration because an assembly action was successful and a public comment was submitted.

Public Comment:

Greg Rogers, representing Washington State Association of Fire Marshals, requests Approval as Modified by this public comment.

Modify proposal as follows:

Chapter XX
MARINAS

Section XX02
DEFINITIONS

XX02.1 Definitions. The following words and terms shall, for the purpose of this chapter and as used elsewhere in this code, have the meanings shown herein.

VESSEL is a motorized watercraft ~~of any type~~, other than seaplanes on the water, used or capable of being used as a means of transportation. Included in this definition are non transportation vessels such as houseboats and boathouses.

XX03.4 Rubbish containers. Metal containers with tight-fitting or self-closing metal lids shall be provided for the temporary storage of combustible trash or rubbish.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: To address the concern from the committee based on the published written comments in the 2006 Report of the Public Hearing. We have changed the definition of vessel to eliminate these requirements for small marinas with kayaks and small non-motorized sailboats.

One of the other areas mention was the negative impact on small marinas and the threshold of 5 vessels for fire protection equipment was too small. Current, the IFC requires standpipe systems for all marinas and boatyards with no limit under section 905.3.7. This would require a marina with one boat/vessel/kayak/sailboat/jet-ski to have standpipe system installed. This proposal actually increases the current IFC required threshold from zero to five.

To address the comments of making “this proposal an appendix, since not all jurisdictions would have to use it.” If this is the direction the IFC is going, then ICC and members should look at making Chapter 16 Fruit and Crop Ripening, Chapter 17 Fumigation and Thermal Insecticidal Fogging, Chapter 18 Semiconductor Fabrication Facilities and other areas not used by every jurisdiction an appendix. Marina’s are no different than any other item listed in the Fire Code. Because of the different environment that marinas present to firefighters while fighting fires, unlike a normal business, these facilities need to be specifically addressed in the IFC and not in an appendix.

Every year during the code hearings, the code development committee wants technical justification, below is justification to better understand the marina problem. In the last three years the largest marina fires in the US caused over 67 million dollars in damage with the complete loss of 272 boats and houseboats. A perfect example of the need to address marinas in the IFC is the following incident:

$10 MILLION MARINA FIRE
Bohemia Bay, Maryland

FIRE PROTECTION CODES AND EQUIPMENT

There was no fire detection or sprinkler systems at Bohemia Bay. The marina structure was completed in October 1986. It was built under a Maryland code that did not require fire detection, fire sprinkler, or standpipe systems. In addition, there was no requirement for providing readily accessible areas for fire department drafting operations.

Portable fire extinguishers located on finger piers were the main fire protection equipment provided in the entire marina. As a result of persuasion by the local fire department, a two inch dry standpipe line running the length of docks 'D' and 'E' had been installed. (The adequacy of such standpipe lines should be questioned because of their small size and the location of hose outlets.) There was no standpipe on the pier with the fire. A new Maryland code was adopted, which incorporated the B.O.C.A. code. The B.O.C.A. code adopts NFPA Standard #303, Protection to Marinas, and will require all future structures of this type and use to be equipped with fire protection, fire suppression, and standpipe systems. They must also provide reliable and accessible sources of water for fire fighting.

Final Action: AS AM AMPC____ D

F218-06/07
IBC [F] 307.1

Proposed Change as Submitted:

Proponent: Gregory R. Keith, Professional heuristic Development, representing the Boeing Company

Revise as follows:

[F] 307.1 High-hazard Group H. High-hazard Group H occupancy includes, among others the use of a building or structure, or a portion thereof, that involves the manufacturing, processing, generation or storage of materials that constitute a physical or health hazard in quantities in excess of those allowed in Tables 307.1(1) and 307.1(2) per control ~~area~~s as constructed and located as required in Section 414. Hazardous occupancies ~~uses~~ are classified in Groups H-1, H-2, H-3, H-4 and H-5 and shall be in accordance with this section, the requirements of Section 415 and the *International Fire Code*.

Exceptions: The following shall not be classified as ~~in~~ Group H, but shall be classified as ~~in~~ the occupancy that they most nearly resemble.

~~1. Buildings and structures that contain not more than the maximum allowable quantities per control area of hazardous materials as shown in Tables 307.1(1) and 307.1(2), provided that such buildings are maintained in accordance with the *International Fire Code*.~~

~~2. Buildings utilizing control areas in accordance with Section 414.2 that contain not more than the maximum allowable quantities per control area of hazardous materials as shown in Tables 307.1(1) and 307.1(2).~~

~~3.~~ 1. Buildings and structures occupied for the application of flammable finishes, provided that such buildings or areas conform to the requirements of Section 416 and the *International Fire Code*.

~~4.~~ 2. Wholesale and retail sales and storage of flammable and combustible liquids in mercantile occupancies conforming to the *International Fire Code*.

~~5.~~ 3. Closed piping containing flammable or combustible liquids or gases utilized for the operation of Machinery or equipment.

~~6.~~ 4. Cleaning establishments that utilize combustible liquid solvents having a flash point of 140° (60°C) or higher In closed systems employing equipment listed by an approved testing agency, provided that this occupancy is separated from all other areas of the building by 1-hour fire barriers or 1-hour horizontal assemblies or both.

~~7.~~ 5. Cleaning establishments that utilize a liquid solvent having a flash point at or above 200°F (93°C).

~~8.~~ 6. Liquor stores and distributors without bulk storage.

~~9.~~ 7. Refrigeration systems.

~~10.~~ 8. The storage or utilization of materials for agricultural purposes on the premises.

~~11.~~ 9. Stationary batteries utilized for facility emergency power, uninterrupted power supply or Telecommunication facilities, provided that the batteries are provided with safety venting caps and ventilation is provided in accordance with the *International Mechanical Code*.

~~12.~~ 10. Corrosives shall not include personal or household products in their original packaging used in retail display or commonly used building materials.

~~13.~~ 11. Buildings and structures occupied for aerosol storage shall be classified as Group S-1, provided that such buildings conform to the requirements of the *International Fire Code*.

~~14.~~ 12. Display and storage of nonflammable solid and nonflammable or noncombustible liquid hazardous Materials in quantities not exceeding the maximum allowable quantity per control area in Group M or S occupancies complying with Section 414.2.5.

~~15.~~ 13. The storage of black powder, smokeless propellant and small arms primers in Groups M and R-3 and special industrial explosive devices in Groups B, F, M and S, provided such storage conforms to the quantity limits and requirements prescribed in the *International Fire Code*.

Reason: Section 307.1 was modified in the 2006 Edition of the International Building Code. In an attempt to clarify the provisions of the code, one key point was missed. The appropriate and necessary reference to Tables 307.1(1) and 307.1(2) was removed from the enabling text. It is generally expected that one would find the technical charging requirement for Tables 307.1 in Section 307.1. The concept of maximum allowable quantities of hazardous materials based on Tables 307.1(1) and 307.1(2) is absolutely fundamental to the proper classification of Group H occupancies. This proper legal reference should be established in the charging text. It is noted that the reference to the tables first occurs in Exception 1. Exceptions represent exceptions to the rule. What now occurs in Exception 1, is the rule. Accordingly, it is proposed to reintroduce the proper cross reference to Tables 307.1(1) and 307.1(2) into Section 307.1. Having done this, it renders Exception 1 as redundant and moot. Also, Exception 1 contains an IFC maintenance provision as a condition of classification as a non-Group H occupancy. Is this to say that buildings not maintained in accordance with the *International Fire Code* must be classified as Group H occupancies? This represents a potentially unenforceable provision. Additionally, Exception 2 is redundant as the control area concept is already addressed in Section 307.1. Approval of this proposal will clarify the code and increase uniformity in the proper classification of Group H occupancies.

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

Committee Action: **Approved as Submitted**

Committee Reason: Based on the proponent's reason statement. The proposal adds a needed reference to restore clarity to the text in referencing the appropriate tables and deletes redundant text.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeffrey Shapiro, PE, FSFPE, International Code Consultants, representing The Chlorine Institute, requests Approval as Modified by this public comment.

Modify proposal as follows:

[F] 307.1 High-hazard Group H. High-hazard Group H occupancy includes, among others the use of a building or structure, or a portion thereof, that involves the manufacturing, processing, generation or storage of materials that constitute a physical or health hazard in quantities in excess of those allowed in ~~Tables 307.1(1) and 307.1(2) per~~ control areas complying with Section 414, ~~as~~ based on the maximum allowable quantity limits for control areas set forth in Tables 307.1(1) and 307.1(2) ~~constructed and located as required in Section 414~~. Hazardous occupancies are classified in Groups H-1, H-2, H-3, H-4 and H-5 and shall be in accordance with this section, the requirements of Section 415 and the *International Fire Code*.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This public comment provides an editorial clean-up of the change made by this proposal to ensure that the section cannot be read to suggest that only a single control area is permitted, which was possible with the original wording.

Final Action: AS AM AMPC____ D

F219-06/07

IBC [F] 307.4, IBC [F] 307.5 (IFC 202), IBC [F] 415.2, [F] 415.6.2.11 through [F] 415.6.2.13 (New), [F] 415.7, [F] 415.7.2, [F] 415.7.4 through [F] 415.7.6 (New), [F] 415.8.5.2.2; IFC 3402.1

Proposed Change as Submitted:

Proponent: Philip Brazil, P.E., Reid Middleton, Inc., representing Washington Association of Building Officials (WABO)

1. Revise as follows:

IBC [F] 307.4 (IFC 202) High-hazard Group H-2. Buildings and structures containing materials that pose a deflagration hazard or a hazard from accelerated burning shall be classified as Group H-2. Such materials shall include, but not be limited to, the following:

Class I, II or IIIA flammable or combustible liquids which are used, dispensed, mixed or stored in normally open containers or systems, or in closed containers or systems pressurized at more than a gage pressure of 15 psi (103.4 kPa) ~~gage~~
Combustible dusts
Cryogenic fluids, flammable
Flammable gases
Organic peroxides, Class I
Oxidizers,Class 3, that are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than a gage pressure 15 psi (103 kPa) ~~gage~~
Pyrophoric liquids, solids and gases, nondetonable
Unstable (reactive) materials, Class 3, nondetonable
Water-reactive materials, Class 3

IBC [F] 307.5 (IFC 202) High-hazard Group H-3. Buildings and structures containing materials that readily support combustion or that pose a physical hazard shall be classified as Group H-3. Such materials shall include, but not be limited to, the following:

Class I, II or IIIA flammable or combustible liquids that are used, mixed or stored in normally closed containers or systems pressurized at a gauge pressure of 15 pounds per square inch ~~gauge~~ (103.4 kPa) or less
Combustible fibers, other than densely packed baled cotton
Consumer fireworks, 1.4G (Class C, Common)
Cryogenic fluids, oxidizing
Flammable solids
Organic peroxides, Class II and III
Oxidizers, Class 2
Oxidizers, Class 3, that are used or stored in normally closed containers or systems pressurized at a gauge pressure of 15 pounds per square inch ~~gauge~~ (103 kPa) or less
Oxidizing gases
Unstable (reactive) materials, Class 2
Water-reactive materials, Class 2

2. (IFC) Revise as follows:

3402.1 Definitions. The following term shall, for the purposes of this chapter and as used elsewhere in the code, have the following meaning:

LIQUID STORAGE ROOM. A room classified as a Group H-2 or H-3 occupancy used for the storage of flammable or combustible liquids in a closed condition.

LIQUID USE, DISPENSING AND MIXING ROOM. A room in which Class I, Class II and Class IIIA flammable or combustible liquids are used, dispensed or mixed in open containers.

LIQUID STORAGE WAREHOUSE. A building classified as a Group H-2 or H-3 occupancy used for the storage of flammable or combustible liquids in a closed condition.

3. Revise as follows:

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

[F] LIQUID STORAGE ROOM. A room classified as a Group H-2 or H-3 occupancy used for the storage of flammable or combustible liquids in a closed condition.

[F] LIQUID USE, DISPENSING AND MIXING ROOMS. A room ~~rooms~~ in which Class I, II and IIIA flammable or combustible liquids are used, dispensed or mixed in open containers.

LIQUID STORAGE WAREHOUSE. A building classified as a Group H-2 or H-3 occupancy used for the storage of flammable or combustible liquids in a closed condition.

[F] 415.6 Group H-2. Occupancies in Group H-2 shall be constructed in accordance with Sections 415.6.1 through 415.6.4 and the *International Fire Code*.

[F] IBC 415.6.2.11 Liquid storage rooms. Liquid storage rooms shall be constructed in accordance with the following:

1. Rooms shall be separated from other areas of the building by fire barriers constructed in accordance with Section 706 or horizontal assemblies constructed in accordance with Section 711, or both. The fire-resistance rating shall be not less than 1 hour for rooms no greater than 150 square feet (13.9 m^2) in area and not less than 2 hours for rooms more than 150 square feet (13.9 m^2) in area.
2. Rooms greater than 500 square feet (46.5 m^2) in area shall have at least one exterior door approved for fire department access.
3. Shelving, racks, wainscoting, dunnage, scuffboards, floor overlay and similar installations shall be of noncombustible construction or wood of at least 1 inch (25.4 mm) nominal thickness.
4. Rooms used for the storage of Class I flammable liquids shall not be located in a basement.

[F] IBC 415.6.2.12 Liquid use, dispensing and mixing rooms. Liquid use, dispensing and mixing rooms shall be constructed in accordance with the following:

1. Rooms shall be separated from other areas of the building by fire barriers constructed in accordance with Section 706 or horizontal assemblies constructed in accordance with Section 711, or both. The fire-resistance rating shall be not less than 1 hour for rooms no greater than 150 square feet (13.9 m^2) in area and not less than 2 hours for rooms more than 150 square feet (13.9 m^2) in area.
2. Rooms greater than 500 square feet (46.5 m^2) in area shall have at least one exterior door approved for fire department access.
3. Rooms shall not be located in a basement.

[F] IBC 415.6.2.13 Liquid storage warehouses. Liquid storage warehouses shall be constructed in accordance with the following:

1. Warehouses shall be separated from other areas of the building by a fire wall constructed in accordance with Section 705 with a fire-resistance rating of not less than 3 hours.
2. Shelving, racks, wainscoting, dunnage, scuffboards, floor overlay and similar installations shall be of noncombustible construction or wood of at least 1 inch (25.4 mm) nominal thickness.
3. Rooms used for the storage of Class I flammable liquids shall not be located in a basement.

[F] 415.7 Groups H-3 and H-4. Groups H-3 and H-4 shall be constructed in accordance with ~~the applicable provisions of this code~~ Sections 415.7.1 through 415.7.6 and the *International Fire Code*.

[F] 415.7.2 Floors in storage rooms. Floors in liquid storage rooms and in storage areas for corrosive liquids and highly toxic or toxic materials shall be of liquid-tight, noncombustible construction.

[F] IBC 415.7.4 Liquid storage rooms. Liquid storage rooms shall be constructed in accordance with Section 415.6.2.11.

[F] IBC 415.7.5 Liquid use, dispensing and mixing rooms. Liquid use, dispensing and mixing rooms shall be constructed in accordance with Section 415.6.2.12.

[F] IBC 415.7.6 Liquid storage warehouses. Liquid storage warehouses shall be constructed in accordance with the Section 415.6.2.13.

[F] 415.8.5.2.2 Liquid storage rooms. Liquid storage rooms shall be constructed in accordance with the following requirements:

~~2.~~ 1. Rooms shall be separated from other areas of the building by fire barriers having a fire-resistance rating of not less than 1-hour for rooms up to 150 square feet (13.9 m^2) in area and not less than 2 hours ~~where the room is~~ for rooms more than 150 square feet (13.9 m^2) in area.

~~1.~~ 2. Rooms ~~in excess of~~ greater than 500 square feet (46.5 m^2) in area shall have at least one exterior door approved for fire department access.

3. Shelving, racks, ~~and~~ wainscoting, dunnage, scuffboards, floor overlay and similar installations ~~in such areas~~ shall be of noncombustible construction or wood of not less than 1inch (25 mm) nominal thickness.

4. Rooms used for the storage of Class I flammable liquids shall not be located in a basement.

Reason: The purpose for this proposal is to establish requirements in the IBC for construction of liquid storage rooms and liquid use, dispensing and mixing rooms, which are referenced in the IFC, and to better align the IFC and IBC provisions on storage and use of flammable and combustible liquids.

There are technical provisions for liquid storage rooms in IBC Sections 415.8.5.2.2 and 415.8.5.2.3 for Group H-5, but not in IBC Sections 415.6 and 415.7 for Groups H-2 and H-3, respectively.

Aircraft paint hangars are classified as Group H-2 per IBC Section 412.4.1. Spray equipment cleaning operations and flammable liquid storage are required to be conducted in liquid use, dispensing and mixing rooms and liquid storage rooms, per IBC Sections 412.4.3 and 412.4.4, respectively. There is no mention in the IBC of where the technical provisions for the construction of these rooms are located.

For Groups H-2 and H-3, Exceptions 1 and 2 to IBC Section 415.3 exempt liquid use, dispensing and mixing rooms not more than 500 square feet in floor area and liquid storage rooms not more than 1,000 square feet in floor area from being located on the outer perimeter of the building. There is no mention in the IBC of where the technical provisions for the construction of these rooms are located.

IBC Section 415.2 contains a definition for "liquid use, dispensing and mixing room," but the IFC does not (see Section 3402.1). Although "liquid use, dispensing and mixing room" is defined in IBC Section 415.2, it does not appear anywhere else in the IBC. However, it does appear in several code sections of the IFC (i.e., Sec. 3405.3.5.3 and 3405.3.7.1)

IFC Section 3404.3.7.1 for liquid storage rooms specifies that they shall be constructed and separated as required by the IBC. However, the IBC does not contain any such provisions, except for Group H-5 in Section 415.8.5.2.2. IFC Section 1803.3.3 for semiconductor fabrication facilities specifies that liquid storage rooms shall comply with the IBC. The requirements are found in IBC Section 415.8.5.2.2.

IFC Section 3405.3.5.3 for use, dispensing and mixing inside of buildings specifies that quantities exceeding control area limits shall be within a room or building complying with the IBC. There is no mention in the IBC of where the technical provisions for the construction of these rooms are located.

IFC Section 3405.3.7.1 specifies that rooms or buildings classified by the IBC as Group H-2 or H-3 based on use, dispensing or mixing of flammable or combustible liquids shall be constructed in accordance with the IBC. IBC Sections 307.4 and 307.5 include use and storage depending on whether the container is open or closed and level of pressurization in closed containers for Groups H-2 and H-3. Dispensing and mixing are not mentioned. There is no mention in the IBC of where the technical provisions for the construction of these rooms or buildings are located.

The IBC does not have a definition for "liquid storage warehouse." and never mentions the term. The IFC does have a definition in Section 3402.1. IFC Section 3404.3.8 for liquid storage warehouses specifies that they shall be constructed and separated as required by the IBC. There is no mention in the IBC of where the technical provisions for the construction of these warehouses are located.

The definition of liquid storage warehouse in Section 3402.1 of the IFC was added during the 2004/2005 code development cycle. Before that, it was not clear what occupancy a liquid storage warehouse would be classified as. The definition of liquid use, dispensing and mixing room in Section 415.2 of the IBC does not specify an occupancy classification but the use (but not dispensing or mixing) of Class I, II or IIIA flammable or combustible liquids is listed for Group H-2 and H-3 occupancies in IFC Section 202 (IBC Sections 307.4 and 307.5, respectively). The determination of the occupancy classification in closed (i.e., not open) containers is dependent on whether the flammable or combustible liquids are kept at gauge pressures of more than (Group H-2) or less than (Group H-3) 15 psi. This is also the case for a liquid storage warehouse since its definition classifies it as Group H-2 or H-3.

What is missing from this is the same treatment for a liquid storage room. In IFC Section 3402.1 and IBC Section 415.2, the definition of liquid storage room specifies a Group H-3 classification. As noted above, the storage of Class I, II or IIIA flammable or combustible liquids is listed for Group H-2 and H-3 occupancies in IFC Section 202 (IBC Sections 307.4 and 307.5, respectively). This proposal changes the definition of liquid storage room to specify its occupancy classification as Group H-2 or H-3, which will be determined on the basis of whether the flammable or combustible liquids are stored at gauge pressures of more than (Group H-2) or less than (Group H-3) 15 psi. If this revision is approved, it will make the listing of occupancies in the definitions of liquid storage room and liquid storage warehouse superfluous.

The purpose of this proposal is to add technical provisions to the IBC for the construction of liquid storage rooms; liquid use, dispensing and mixing rooms; and liquid storage warehouses that are compatible with the scoping provisions for them currently found in the IBC and IFC. In the case of liquid storage rooms in Groups H-2 and H-3, it will also add technical provisions that are consistent with those for liquid storage rooms in Groups H-5.

The proposed change from "15 psi (103.4 kPa) gauge" to a "gauge pressure of 15 psi (103 kPa)" in IFC Section 202 (IBC Sections 307.4 and 307.5) is intended to make the language consistent with the protocol established in the IEEE/ASTM SI 10 "Use of the International System of Units (SI): The Modern Metric System" (see Section 3.5.5, 2002 edition). Note that gauge pressure is measured with zero equal to atmospheric pressure, which is in contrast with absolute pressure that is measured with zero equal to a perfect vacuum.

The proposed changes in IFC Section 202 from "used or stored" to "used, dispensed, mixed or stored" at Group H-2 (IBC Section 307.4) and from "used or stored" to "used, mixed or stored" at Group H-3 (IBC Section 307.5) is for compatibility with similar language in the IFC (e.g., Sections 3405.3, 3405.3.5.1, 3405.3.5.3, 3405.3.7, 3405.3.7.1, 3405.3.7.5, etc.) and IBC Sections 412.4.3, 415.2 ("liquid use, dispensing and mixing room") and 415.3 (Exception 1). Dispensing is added to Group H-2, but not Group H-3, because a classification of Group H-3 is limited to closed containers and dispensing is not possible unless is occurs from open containers. Mixing is added to Groups H-2 and H-3 because it is possible in a closed container (i.e., internal mechanism with remote operation).

Liquid storage rooms are added to storage areas for corrosive, toxic and highly toxic materials at IBC Section 415.7.2 on Group H-3 and H-4 occupancies for consistency with IBC Section 415.8.5.2.3 for HPM rooms and liquid storage rooms in Group H-5 occupancies.

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

Analysis: In Section 3402.1, the definition of "Liquid Use, Dispensing and Mixing Rooms" that currently exists in IBC Section [F] 415.2 is being editorially duplicated in the IFC. Likewise, in IBC Section [F] 415.2, the definition of "Liquid Storage Warehouse" that currently exists in the IFC is being editorially duplicated in the IBC. No technical changes are being proposed to these two definitions. They are being shown for the clarity of the code change.

Committee Action: **Disapproved**

Committee Reason: The proposal is taking the code in a direction opposite of where it had begun to go. The liquid storage room provisions were previously taken out of the code in favor of a Group H-3 occupancy which is what the IBC requirements for separation, etc. are based on. Even NFPA 30 is moving away from the approach contained in the proposal in favor of the current IBC approach.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

William Winslow, Washington State Association of Fire Marshals, requests Approval as Submitted.

Commenter's Reason: IFC Section 3404.3.8 currently sends the reader to the IBC for construction and separation requirements for a liquid storage warehouse. However, liquid storage warehouse is not mentioned in the IBC. As a result, there is no difference between a liquid storage room and a liquid storage warehouse with respect to construction or separation requirements in the IBC. A liquid storage room is limited to 15,000 gallons of IB flammable liquids in containers (IFC Table 3404.3.6.3(1)). There is no limit to the quantity in a liquid storage warehouse (IFC 3404.3.8.1). Because there is no limit, the liquid storage warehouse poses a greater hazard than the liquid storage room, and specific construction and separation requirements for the warehouse should be provided in the IBC.

Final Action: AS AM AMPC____ D

F220-06/07

IBC 403.1.1, [F] 403.10.3 through [F] 403.11.2, [F] 403.15 through [F] 403.15.3 (All New)

Proposed Change as Submitted:

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

1. Revise as follows:

403.1 Applicability. The provisions of this section shall apply to buildings with an occupied floor located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access.

Exception: The provisions of this section shall not apply to the following buildings and structures:

1. Airport traffic control towers in accordance with Section 412.
2. Open parking garages in accordance with Section 406.3.
3. Buildings with an occupancy in Group A-5 in accordance with Section 303.1.
4. Low-hazard special industrial occupancies in accordance with Section 503.1.1.
5. Buildings with an occupancy in Group H-1, H-2 or H-3 in accordance with Section 415.

403.1.1 Fuel oil for standby power. Portions of high-rise construction that contain an occupancy in Group H-3 for storage of fuel oil for standby power, emergency power, or an elective, redundant power system shall be constructed in accordance with Section 403.15.

2. Add new text as follows:

[F] 403.10.3 Fuel oil (Class II and Class III combustible liquids) storage. Fuel oil (Class II and Class III combustible liquids) used in conjunction with the standby power system shall be stored in accordance with 403.15.

[F] 403.11.2 Fuel oil (Class II and Class III combustible liquids) storage. Fuel oil (Class II and Class III combustible liquids) used in conjunction with the emergency power system shall be stored in accordance with 403.15.

[F] 403.15 Fuel oil (Class II and Class III combustible liquids) storage. Fuel oil (Class II and Class III combustible liquid) storage inside buildings used in conjunction with the emergency power system, the standby power system or an elective, redundant power supply system shall be permitted to exceed the maximum allowable quantity as per Table 307.1(1) provided the storage is in compliance with 403.15.1.

[F] 403.15.1 Fuel oil (Class II and Class III combustible liquids) storage systems. Fuel oil (Class II and Class III combustible liquid) storage systems shall comply with the requirements of this section and NFPA 31.

[F] 403.15.1.1 Control areas. All storage tanks installed above the lowest level of the building shall comply with Table 307.1(1) and Section 414.2.

[F] 403.15.1.2 Inside storage. Inside storage shall be permitted to be increased to 36,000 gal provided all of the following conditions are met:

1. The tank is located on the lowest floor level of the building.
2. The capacity of any one tank does not exceed 12,000 gallons
3. Each tank is located in a vault listed in accordance with UL 2245 having walls, floor, and top having a fire resistance rating of not less than 3 hours. The walls shall be bonded to the floor. The top and walls of the vault shall be independent of the building structure. An exterior building wall having a fire resistance rating of not less than 3 hours shall be permitted to serve as a wall of the vault; and
4. The vault is located in a room or area of the building that is cut off vertically and horizontally from other areas and floors of the building by assemblies having a fire resistance rating of not less than 2 hours.

[F] 403.15.1.3 Secondary containment. Fuel oil (Class II and Class III combustible liquid) tanks having a capacity of more than 660 gallons storage at the lowest level of a building shall have secondary containment equal to two times the tank capacity.

[F] 403.15.1.4 Float switch. A float switch shall be provided with the curb or pan around the storage tank or utilization equipment and shall be arranged so as to sound an alarm and stop the transfer pump in case of failure of the tank or the control in the tank. An alarm bell shall be located in the same room with the tank and a visual and audible alarm shall be located in a fire command center.

[F] 403.15.2 Method of transfer. Storage tanks and utilization equipment installed above the lowest level of a building shall be filled by means of a transfer pump supplied from a primary storage tank located and installed in accordance with 403.15.1.2. All storage tanks installed above the lowest level of the building shall comply with Table 307.1(1) and Section 414.2. A separate transfer pump and piping circuit shall be provided for each storage tank or equipment installed above the lowest floor. Appropriate devices shall be provided for the automatic and manual starting and stopping of the transfer pumps so as to prevent the overflow of liquid from these storage tanks. Fuel transfer piping shall not be used for storage and the size of the pipe shall not exceed the minimum needed for hydraulic performance.

[F] 403.15.3 Excess flow. Every pump contained within the system shall be capable of identifying excess flow due to a breach in the piping and shall automatically interrupt the flow from the tank. A check valve for the piping system shall be provided at every third story at a minimum.

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

The Code has long prohibited uses of Group H-3 in high rise buildings except when quantities involved fall below very restrictive thresholds. The purpose of this change is to establish controls on the storage and distribution of Class II and III liquids in high rise buildings.

Electricity has become the life blood of the modern information management workplace. Continuous and uninterrupted power is essential to the business continuity and even the survival of many enterprises. These elective redundant power systems are typically driven by Class III combustible liquids. The absolute necessity for elective redundant power has led to the illicit storage of these materials in high rise buildings or systems designed to pump the material throughout the building.

The National Institute of Standards and Technology's (NIST) report on the World Trade Center (WTC) tragedy did not deal with this issue because it covered only WTC 1 and WTC 2. The proponents believe that a Class III combustible liquid distribution system was implicated in the WTC 7 collapse and that the soon to be released WTC 7 report will so find.

This proposal recognizes the necessity for elective redundant power and seeks to regulate storage and distribution of Class II and Class III combustible liquids in high rise and other buildings while protecting against the risks associated with such use.

Ideally, the storage of Class II or Class III combustible liquids (exceeding the exempt quantities established by the Code) should not be permitted inside of high rise buildings. There are, however, sites in highly dense urban locations where there is no place for outside storage. The proposed new Subsection 403.15.1 allows storage beneath a high rise building but subjects that storage to a number of requirements which will ensure safety.

Distribution of Class II and Class III combustible liquids poses an even greater hazard. The proposed new Subsection 403.15.2 establishes requirements intended to ensure the safety of such distribution systems.

Cost Impact: The proposal will not increase the cost of construction, per se, because the storage of large quantities of Class II and Class III combustible liquids is not now permitted. There will be some increase in the cost of distribution systems.

Committee Action: **Disapproved**

Committee Reason: The intent of the proposal is to not classify inside generator fuel oil storage areas in Group H, however it is unclear what effects that would have on public safety. The reference to NFPA 31 is incorrect. It is also unclear as to why the proposal is limited only to high-rise buildings. An extensive modification was submitted by the proponent that would have allowed 36,000 gallons of inside storage on the lowest floor level of the building without the protection of a vault as originally proposed and would have deleted most of proposed Section 403.15.1.2, all of Section 403.15.1.3, most of Section 403.15.2 and all of Section 403.15.3. The modification would have corrected the referenced standard to be NFPA 37 but would have retained the requirement for a float switch and alarm as overfill protection, which is considered outdated technology. Overall, the committee felt that, while it appeared to speak to some of the issues of concern, the modification was too complex and extensive to consider at this time.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

William M. Connolly, Chair, ICC Ad Hoc Committee on Terrorism Resistant Buildings, requests Approval as Modified by this public comment.

Modify proposal as follows:

403.10.3 Fuel oil ~~(Class II and Class III combustible liquids)~~ storage. Fuel oil ~~(Class II and Class III combustible liquids)~~ used in conjunction with the standby power system shall be stored in accordance with Section 403.15.

403.11.2Fuel oil ~~(Class II and Class III combustible liquids)~~ storage. Fuel oil ~~(Class II and Class III combustible liquids)~~ used in conjunction with the emergency power system shall be stored in accordance with Section 403.15.

403.15 Fuel oil ~~(Class II and Class III combustible liquids)~~ storage. Fuel oil ~~(Class II and Class III combustible liquid)~~ storage inside buildings used in conjunction with the emergency power system, the standby power system or an elective, redundant power supply system shall be permitted to exceed the maximum allowable quantity as per Table 307.1(1) provided the storage is in compliance with Sections 403.15.1 and 415.6.2.

403.15.1 Fuel oil ~~(Class II and Class III combustible liquids)~~ storage systems. Fuel oil ~~(Class II and Class III combustible liquid)~~ storage systems shall comply with the requirements of this section, *the International Fire Code* and NFPA ~~31~~ 37.

403.15.1.2 Inside storage. Inside storage shall be permitted to be increased to 36,000 gal provided ~~all of the following conditions are met:~~

~~1.~~ 1. the tank is located on the lowest floor level of the building.
~~2.~~ 2. ~~The capacity of any one tank does not exceed 12,000 gallons~~
~~3.~~ 3. ~~Each tank is located in a vault listed in accordance with UL 2245 having walls, floor, and top having a fire resistance rating of not less than 3 hours. The walls shall be bonded to the floor. The top and walls of the vault shall be independent of the building structure. An exterior building wall having a fire resistance rating of not less than 3 hours shall be permitted to serve as a wall of the vault; and~~
~~4.~~ 4. ~~The vault is located in a room or area of the building that is cut off vertically and horizontally from other areas and floors of the building by assemblies having a fire resistance rating of not less than 2 hours.~~

~~**403.15.1.3 Secondary Containment.** Fuel oil (Class II and Class III combustible liquid) tanks having a capacity of more than 660 gallons storage at the lowest level of a building shall have secondary containment equal to two times the tank capacity.~~

~~**403.15.1.4 Float switch.** A float switch shall be provided with the curb or pan around the storage tank or utilization equipment and shall be arranged so as to sound an alarm and stop the transfer pump in case of failure of the tank or the control in the tank. An alarm bell shall be located in the same room with the tank and a visual and audible alarm shall be located in a fire command center.~~

403.15.2 Method of transfer. Storage tanks and utilization equipment installed above the lowest level of a building shall be filled by means of a transfer pump supplied from a primary storage tank located and installed in accordance with Section 403.15.1.2. ~~All storage tanks installed above the lowest level of the building shall comply with Table 307.1(1) and Section 414.2. A separate transfer pump and piping circuit shall be provided for each storage tank or equipment installed above the lowest floor. Appropriate devices shall be provided for the automatic and manual starting and stopping of the transfer pumps so as to prevent the overflow of liquid from these storage tanks.~~ Fuel transfer piping shall not be used for storage and the size of the pipe shall not exceed the minimum needed for hydraulic performance.

~~**403.15.3 Excess flow.** Every pump contained within the system shall be capable of identifying excess flow due to a breach in the piping and shall automatically interrupt the flow from the tank. A check valve for the piping system shall be provided at every third story at a minimum.~~

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The public comment addresses the concerns of the Code Development Committee. Most of what is included in this public comment was included in a floor modification in Orlando. The Committee felt that the floor modification was too extensive to be addressed in that forum and suggested that the proponent submit this public comment. The committee was also confused regarding the limitation of the change to high-rise buildings. This is due to the prohibition of Group H in high-rise buildings. The storage of fuel oil is currently permitted in all other types of buildings. Lastly, the committee was unclear on the impact of this proposal on Group H. The impact is minimal. This change does not change the occupancy classification of the space; it merely allows the Group H to exist in a high-rise building provided it complies with the very specific requirements of this new section. The following amendments to the original change are as follows:

Sections 403.10.3, 403.11.2, 403.15 and 403.15.1 have been simplified to address all fuel oil classes.

Section 403.15 is clarified to include a cross reference to section 415.6.2 for the appropriate installation requirements for such fuel oil tanks in a multi-story building. Please note that the maximum number of control area(s)/floor and the maximum allowable quantity (gallons) of fuel oil that would be permitted in any control area would be limited by reference to Table 307.1(1) and Table 414.2.2 by way of proposed Section 403.15.1.1. However, for operational and practical purposes up to 36,000 gallons of fuel oil shall be permitted in the control area only at the lowest level of the building in accordance with proposed Section 403.15.1.1.

Section 403.15.1 is clarified to require compliance also with the IFC and replaces the reference to NFPA 31("Standard for the Installation of Oil-Burning Equipment") with the correct reference to NFPA Standard 37 ("Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines").

Section 403.15.1.2, 403.15.1.3, 403.15.1.4, 403.15.2 and 403.15.3 are all clarified to delete provisions that are contained within the appropriately referenced NFPA Standard 37 ("Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines"), and IBC Section 415.6.2 (and its subsections).

With these modifications, F220-06/07 is an all encompassing code change that will provide requirements for the safe handling, storage and use of fuel oil in high-rise buildings.

Final Action: AS AM AMPC____ D

F221-06/07

IBC [F] 403.2.1 through [F] 403.2.1.2 (New), [F] 403.2.2 (New) [IFC 914.3.1.1 through 914.3.1.1.2, 914.3.1.2 (New)] IBC [F] 911.1 (IFC 509.1)

Proposed Change as Submitted:

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

1. Add new text as follows:

[F] 403.2.1 (IFC 914.3.1.1) Sprinkler riser redundancy and isolation. All buildings that are more than 420 feet (128 m) in height shall have all risers supplying automatic sprinkler systems interconnected to each other at the top and bottom most floor of each vertical riser zone. The interconnections shall be at least as large as the largest riser supplied.

[F] 403.2.1.1 (IFC 914.3.1.1.1) Number of risers and separation. A minimum of two sprinkler water supply risers must be provided in each vertical riser zone of the building. Sprinkler water supply risers shall be placed a distance apart equal to not less than one-half of the length of the maximum overall diagonal dimension of the building or area to be served measured in a straight line between the nearest portion of the sprinkler water supply risers.

[F] 403.2.1.1.1 (IFC 914.3.1.1.1.1) Hydraulic design evaluations. Independent hydraulic design evaluations shall be completed utilizing individual water supply risers for each vertical riser zone. System hydraulic design shall not be based upon redundancy of water supply risers for each vertical riser zone.

[F] 403.2.1.2 (IFC 914.3.1.1.2) Control valves. Manual or remote control valves shall be provided on all riser piping supplying automatic sprinkler systems at every third floor of the building. This requirement is independent of sprinkler floor control valves required by Section 903.4.3.

[F] 403.2.2 (IFC 914.3.1.2) Water supply to required fire pumps. Required fire pumps shall draw from a minimum of two independent street level water mains located in different streets.

2. Revise as follows:

[F] 911.1 (IFC 509.1) Features. Where required by other sections of this code, a fire command center for fire department operations shall be provided. The location and accessibility of the fire command center shall be approved by the fire department. The fire command center shall be separated from the remainder of the

building by not less than a 1-hour fire barrier constructed in accordance with Section 706 or horizontal assembly constructed in accordance with Section 711, or both. The room shall be a minimum of 96 square feet (9 m^2) with a minimum dimension of 8 feet (2438 mm). A layout of the fire command center and all features required by the section to be contained therein shall be submitted for approval prior to installation. The fire command center shall comply with NFPA72 and shall contain the following features:

1. The emergency voice/alarm communication system unit.
2. The fire department communications unit.
3. Fire detection and alarm system annunciator unit.
4. Annunciator unit visually indicating the location of the elevators and whether they are operational.
5. Status indicators and controls for air-handling systems.
6. The fire-fighter's control panel required by Section 909.16 for smoke control systems installed in the building.
7. Controls for unlocking stairway doors simultaneously.
8. Sprinkler valve and water-flow detector display panels.
9. Emergency and standby power status indicators.
10. A telephone for fire department use with controlled access to the public telephone system.
11. Fire pump status indicators.
12. Schematic building plans indicating the typical floor plan and detailing the building core, means of egress, fire protection systems, fire-fighting equipment and fire department access.
13. Worktable.
14. Generator supervision devices, manual start and transfer features.
15. Public address system, where specifically required by other sections of this code.
16. Controls and status indicators for remote control valves on vertical sprinkler/standpipe risers.

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

The purpose of this proposed change is to increase the reliability of fire suppression systems in very tall buildings, those that exceed 420 feet in height, by requiring looping of sprinkler uses and independent street-level water feeds.

The difficulty of fighting fires in very tall buildings ranges from hard to virtually impossible. Accordingly, the reliable functioning of required sprinkler systems is critically important. The National Institute of Standards and Technology (NIST) World Trade Center (WTC) Report documented that the proximate cause of the collapse was a building contents fire that raged out of control, in part at least, because the building's fire sprinkler systems were non-functional due to the initial aircraft attack. Events far less dramatic could knock out or make a sprinkler riser inoperative, thereby leaving the structure very vulnerable to fire.

Recommendation 12 of the NIST WTC report calls for the redundancy of active fire suppression systems to be increased to accommodate the greater risks associated with increasing building height and population. This proposal seeks to do that by providing two water feeds to each floor designed such that the system will function as intended if one of those feeds is damaged or otherwise interrupted.

It is interesting to note that existing standards for water mains in residential subdivisions call for looping and valving to ensure that no more than 20 homes could be cut off by a water main break. Such a break would create a fire suppression risk for 4 people (the average occupancy of one home) or no more than 80 people (assuming all 20 homes catch fire). In contrast, we do not require looping and valving to isolate failure in buildings that might contain 10,000 occupants. This proposal seeks to correct that problem.

Substantiation: Proposed new Subsection 403.2.1 requires the interconnection (looping) of sprinkler risers in each vertical zone.

Proposed new Subsection 403.2.1.1 requires two risers for every zone and specifies a separation distance to reduce the possibility that one incident could incapacitate both risers.

Proposed new Subsection 403.2.1.1.1 ensures that the sprinkler system will be designed to function as intended and required from either riser. This is consistent with the goal of providing redundancy.

Proposed new Subsection 403.2.1.2 requires riser control valves at every third floor of the building. This provision supports the stated intent of this code change by ensuring that a riser break (or other problem eliminating the riser's functionality) will not leave more then two floors without the required sprinkler protection. These new valves raise the possibility that someone will inadvertently close one or more. Accordingly, a proposed amendment to Section 911.1 of the Code requires that these automatic valves be able to be monitored from the fire command center by the use of status indicators. This will make it possible to monitor continuously all riser valves from one location and correct any problem from that location.

New Subsection 403.2.2 requires fire pumps to be fed from two independent water mains in separate streets. This will greatly reduce the possibility of the loss of water due to a main break, given the valving which is a feature of public water systems.

Bibliography:

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.

Cost Impact: The code change proposal will increase the cost of construction for very tall buildings, but the additional cost is warranted by the additional risk inherent in such buildings.

Committee Action: **Disapproved**

Committee Reason: Standpipe control valves are already required to be monitored and NFPA 14 already requires redundancy. The increased number of control valves could increase the possibility of inadvertent valve closures, especially in multi-story express risers. The proposal is unclear as to how continuous riser feed would be provided if one riser failed. Better correlation with NFPA 14 is needed.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

William M. Connolly, Chair, ICC Ad Hoc Committee on Terrorism Resistant Buildings, requests Approval as Modified by this public comment.

Modify proposal as follows:

[F] 403.2.1.2 (IFC 914.3.1.1.2) Control valves. Manual ~~or~~ and remote control valves shall be provided on all riser piping supplying automatic sprinkler systems at every third floor of the building served. This requirement is independent of sprinkler floor control valves required by Section 903.4.3.

[F] 403.2.2 (IFC 914.3.1.2) Water supply to required fire pumps. Required fire pumps shall draw from a minimum of two independent street level water mains located in different streets.

> **Exception:** When the street level water main is a looped or gridded system, two taps may by drawn from the same main provided the main is part of a system which is looped or gridded and valved such that an interruption on one side of the loop or grid can be isolated so that the water supply will continue without interruption through at least one of the taps. Each tap shall be sized to supply the required flow. The taps shall be located as remote from one another as is practicable given the site conditions.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The committee disapproved this code change for several reasons. One reason was that standpipe control valves are already required to be monitored and NFPA 14 requires redundancy. This is true; however, the control valves required by new section 403.2.1.2 are in addition to the control valves required by NFPA 14. Along with the redundant sprinkler riser that is required by section 403.2.1, the valves required by this new section will assure that any riser break will not leave more than two floors without the required sprinkler protection. The committee was also concerned with the valving requirement as it would be applied to express risers serving upper floors. This public comment resolves that concern by the amendment to section 403.2.1.2. This amendment would now require the automatic and remote control valves installed only on floors serviced by the riser, thus exempting express risers from the requirement on floors not served by said riser. Additionally, the committee was concerned with the lack of correlation with NFPA 14. Whereas NFPA 14 requires redundant water supplies in certain scenarios (NFPA 14, Section 7.9.4), this code change establishes requirements for the redundant water supplies. This public comment resolves any confusion that there may have been with the requirement for two independent water supplies by providing an exception for a looped or gridded street level water main system.

Final Action: AS AM AMPC____ D

F222-06/07
IBC [F] 412.4.3

Proposed Change as Submitted:

Proponent: Carroll Lee Pruitt, FAIA, Pruitt Consulting, Inc.

Revise as follows:

[F] 412.4.3 Operations. ~~Only those flammable liquids necessary for painting operations shall be permitted in quantities less than the maximum allowable quantities per control area in Table 307.7(1).~~ The quantities of flammable materials in use at any given time within each separate and distinct control area within a aircraft paint hangar shall not exceed the maximum allowable quantities per control area permitted in Table 307.7(1). The quantities of flammable materials in storage and not in use shall be allowed to exceed the quantities in Table 307.7.1 provided they are not within the control area in use for painting operations. Spray equipment cleaning operations shall be conducted in a liquid use, dispensing and mixing room.

Reason: The purpose of the code change is to provide clearer information as to the intent of the code. The language as written seems to imply that even though the paint hanger is classified as a Group H occupancy, the quantities of flammable liquids are limited and may not exceed the exempt amount in Table 307.7.1. If the quantities do not exceed the amount in the Table, the use would not appear to be a Group H. This code change clarifies that it is important to limit the quantities of flammable materials in actual use at any given time within a control area, but to not limit the amount that might be stored in other areas of the building outside of the control area where the materials are actually in use.

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

Committee Action: **Disapproved**

Committee Reason: The committee agreed that there is a problem but did not feel that the proposal addressed it. An extensive modification was submitted to replace the proposal but it, too, failed to resolve the issue of whether Section 412.4 (quantities in excess of the MAQ) of Section 412.4.3 (quantities less than the MAQ). The last added sentence in the original proposal should be located in Section [F]412.4.4 since it deals with storage, not operations.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Carroll Lee Pruitt, FAIA, NCARB, Pruitt Consulting, Inc., requests Approval as Modified by this public comment.

Replace proposal with the following modification to current text:

[F] 412.4.3 Operations. ~~Only those flammable liquids necessary for painting operations shall be permitted in quantities less than the maximum allowable quantities per control area in Table 307.7(1).~~ The quantities of flammable liquids in use for aircraft painting operations within a aircraft paint hangar shall not exceed the maximum allowable quantities per control area permitted in Table 307.7(1). Spray equipment cleaning operations shall be conducted in a liquid use, dispensing and mixing room.

Commenter's Reason: The change makes the proposed deleted language clearer by precisely defining the amount of hazardous materials that may be in use in an aircraft paint hangar.

Final Action: AS AM AMPC____ D

F223-06/07
IBC [F] 414.1.3

Proposed Change as Submitted:

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

Revise as follows:

[F] 414.1.3 Information required. The hazardous material(s) to be used or stored shall be submitted with the maximum amount expected to be present for each classification of physical or health hazard as indicated in Tables 307.1(1) and 307.1(2). The submittal shall include a description of how the material will be used or stored. ~~Separate floor plans shall be submitted f~~ For buildings and structures with an occupancy in Group H ~~,~~ separate floor plans shall be submitted identifying the locations of anticipated contents and processes so as to reflect the nature of each occupied portion of every building and structure. A report identifying hazardous materials including, but not limited to, materials representing hazards that are classified in Group H to be stored or used, shall be submitted and the methods of protection from such hazards shall be indicated on the construction documents. The opinion and report shall be prepared by a qualified person, firm or corporation approved by the building official and shall be provided without charge to the enforcing agency.

Reason: Applying Section 307.1 requires that the code official know what classes and total amounts of hazardous materials in each class are to be present at any one time. Sections 307.1.1, 414.1.1 and 414.1.2 make it clear that hazardous materials in any quantity must comply with Section 414 and the *International Fire Code*. This language would indicate that the intent of the code is that the code official is entitled to have a listing of materials supplied for review against code requirements. However, the existing language found at [F] 414.1.3 limits the submission of additional information concerning the hazardous materials to Group H occupancies only.

The first problem with the existing language is that the code official needs information on the hazardous materials submitted to make a determination of the H Group, not after the determination is made. The second problem is that regardless of the Group H designation the code official needs to know what materials are to be present to apply Section 414 of the IBC and the appropriate chapters of the International Fire Code.

This proposal clarifies the need for a submittal of information concerning what hazardous materials will be present including maximum amounts to be provided for each hazard classification as referenced in Tables 307.1(1) and 307.1(2). It includes that a description of how the materials will be used or stored to be submitted to assist in identifying what hazards may be created by the handling or use of the

material. This will assist the code official in making a proper determination of whether or not an H Group is involved and will provide needed information for applying Section 414 and appropriate Chapters of the International Fire Code whenever hazardous materials are present. It also clarifies that the submitter shall do the analysis necessary to provide a classification breakdown with total amounts in each class as compared to just submitting a listing of materials and leaving the code official the job of totaling up the amount in each class.

If the determination of a Group H is made the more extensive requirements for separate floor plans and a report prepared by a qualified person, firm or corporation would continue to apply unchanged other than an editorial revision to the language.

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

Committee Action: **Approved as Submitted**

Committee Reason: Based on the proponent's reason statement. The proposal provides clarification regarding the submittal of hazardous material information.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeffrey Shapiro, PE, FSFPE, International Code Consultants, representing the Chlorine Institute, requests Approval as Modified by this public comment.

Modify proposal as follows:

[F] 414.1.3 Information required. ~~The hazardous material(s) to be used or stored shall be submitted with the maximum amount expected to be present for each classification of physical or health hazard as indicated in Tables 307.1(1) and 307.1(2). The submittal shall include a description of how the material will be used or stored.~~ For buildings and structures with an occupancy in Group H , separate floor plans shall be submitted identifying the locations of anticipated contents and processes so as to reflect the nature of each occupied portion of every building and structure. A report shall be submitted to the code official identifying the maximum expected quantities of hazardous materials to be stored, used in a closed system and used in an open system, and subdivided to separately address hazardous materials classification categories based on Tables 307.1(1) and 307.1(2). ~~including, but not limited to, materials representing hazards that are classified in Group H to be stored or used, shall be submitted and~~ The methods of protection from such hazards, including but not limited to control areas, fire protection systems and Group H occupancies shall be indicated in the report and on the construction documents. The opinion and report shall be prepared by a qualified person, firm or corporation approved by the building official and shall be provided without charge to the enforcing agency.

Commenter's Reason: The approved change, which involved adding a new first sentence to this section, created overlap and inconsistency between the beginning and the end of the paragraph. The revisions maintain and better execute the intent of the proponent, while eliminating inconsistencies.

Final Action: AS AM AMPC____ D

F224-06/07

IBC [F] 415.3.2, [F] 415.2, [F] 307.2

Proposed Change as Submitted:

Proponent: Gregory R. Keith, Professional heuristic Development, representing the Boeing Company

1. Revise as follows:

[F] 415.3.2 Group H-1 and H-2 or H-3 detached buildings. The storage of hazardous materials in excess of those amounts listed in Table 415.3.2 shall be in accordance with the provisions of Section 415.5. Where a detached building is required by Table 415.3.2, there are no requirements for wall and opening protection based on fire separation distance.

2. Delete without substitution:

[F] 307.2 Definitions. The following words and terms shall, for the purposes of this section and as used elsewhere in this code, have the meanings shown herein.

~~**DETACHED BUILDING.** A separate single-story building, without a basement or crawl space, used for the storage or use of hazardous materials and located an approved distance from all structures.~~

3. Add new text as follows:

F] 415.2 Definitions. The following words and terms shall, for the purposes of this chapter and as used elsewhere in the code, have the meanings shown herein.

DETACHED BUILDING. A separate single-story building, without a basement or crawl space, used for the storage or use of hazardous materials and located an approved distance from all structures.

Reason: Table 415.3.2 currently is not formally enabled by the text in Section 415.3.2. This proposal corrects this circumstance. Technical requirements in tables are generally legally established by proper charging language in the corresponding text sections in order to assist users in the proper determination of such requirements. Editorial convention, however, is to title a table based on that section where the term first appears in the code. In this instance, Section 415.5 provides the root requirement for detached buildings and enables Table 415.3.2. The proposed included cross reference will assist users in ascertaining those additional schematic requirements located in Section 415.5. Additionally, the definition of "detached building" has been relocated from Chapter 3 to Chapter 4. In this proper location, it can support applicable technical requirements. Approval of this proposal will clarify the code and increase uniformity in the proper determination of detached building requirements.

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

Committee Action: **Disapproved**

Committee Reason: The proposal does not include a reference to Section [F]415.4, which also applies to Group H-1.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Gregory R. Keith, Professional heuristic Development, representing the Boeing Company, requests Approval as Modified by this public comment.

Modify proposal as follows:

[F] 415.3.2 Group H-1 and H-2 or H-3 detached buildings. The storage of hazardous materials in excess of those amounts listed in Table 415.3.2 shall be in accordance with the applicable provisions of Sections 415.4 and 415.5. Where a detached building is required by Table 415.3.2, there are no requirements for wall and opening protection based on fire separation distance.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: Table 415.3.2 currently is not formally enabled by the text in Section 415.3.2. This proposal corrects this oversight. It was pointed out during committee discussion in Orlando, that as written, one could interpret the provision as neglecting certain Group H-1 requirements. The proposal has been modified to address that concern.

Technical requirements in tables should be legally established by proper charging language in the text sections. Additionally, the definition of "detached building" has been relocated from Chapter 3 to Chapter 4. In this proper location, it can support applicable technical requirements. Approval of this proposal will clarify the code and increase uniformity in the proper determination of detached building requirements.

Final Action: AS AM AMPC____ D

F229-06/07
IFGC [F] 706.4 (New)

Proposed Change as Submitted:

Proponent: John C. Dean, The National Association of State Fire Marshals

Add new text as follows:

[F] 706.4 Indoor storage of hydrogen. Storage of hydrogen in quantities not exceeding 3,500 scf at 10,000 psig shall be permitted in systems compliant with ASME boiler and pressure vessel code and listed by a nationally recognized testing Lab. The residential fueling facility shall be allowed to store hydrogen either indoors or outdoors. Indoor storage of hydrogen shall be in a Class 1, Division 2 room and not exceed 3,500 scf at 7,700 psig provided that indoor storage is ventilated in accordance with Section 706.4.1, or storage shall be in a separate sealed enclosure ventilated directly to outdoors.

[F] 706.4.1 Room ventilation. The ventilation shall be at least 1 cfm per square foot of room area, but not less than 1 1 cfm per 6 cubic foot of room volume. Ventilation shall include spaces above suspended ceilings.

[F] 706.4.1.1 Mechanical ventilation. Ventilation shall be by a continuous mechanical ventilation system or by a mechanical ventilation system activated by a continuously monitoring hydrogen detection system where a gas concentration of not more than 25% of the lower flammable limit is present.

[F] 706.4.1.2 Gas detection. Where installed, a gas detection system shall be equipped to sound an alarm and visually indicate when a maximum of 25% of the lower flammable limit (LFL) is reached. The gas detection system shall function during ventilation system maintenance operations. The LFL of hydrogen shall be defined as 4% hydrogen in air.

[F] 706.4.1.3 System failure. Any failure of the ventilation system shall immediately shut down the fueling system. Reactivation of the fueling system shall be by manual restart and shall be conducted by trained personnel.

[F] 706.4.1.4 Adjacent ventilation systems. A ventilation system for a room within or attached to another building shall be designed such that all areas served by the ventilation system comply with this section during the normal operating conditions and during alarm conditions.

Reason: This differs from anything in existing code in that it stipulates pressure limits, not just quantities of hydrogen gas. Ventilation and alarms are required so that should there be a gas leak, it is detected and there is no chance of asphyxiation. The IEC and NFPA 55 have established 25% of the LFL as the alarm point, and this seems to be consistent with good engineering practice.[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 residential and consumer hydrogen facilities.

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

Committee Action: **Disapproved**

Committee Reason: Should be a subsection in IFGC Section 706.2.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

John C. Dean, National Association of State Fire Marshals (NASFM), requests Approval as Modified by this public comment.

IFGC [F] ~~706.4~~ 706.2.1 Indoor storage ~~of hydrogen~~ quantities. Storage of hydrogen in quantities not exceeding 3,500 scf at 10,000 psig shall be permitted in systems compliant with ASME boiler and pressure vessel code and listed by a nationally recognized testing lab. The residential fueling facility may store hydrogen indoors or outdoors. Indoor storage of hydrogen shall be in a Class 1 Div. 2 room and not exceed 3,500 scf at 7,700 psig provided that indoor storage is ventilated in accordance with Section ~~706.4.1~~ 706.2.2, or storage shall be in a separate sealed enclosure ventilated directly to outdoors.

IFGC [F] ~~706.4.1~~ 706.2.2 Room ventilation. The ventilation shall be at least 1 cubic foot per minute per square foot of room area, but not less than 1cubic foot per minute per 6 cubic feet of room volume. Ventilation shall include spaces above suspended ceilings.

IFGC [F] ~~706.4.1.1~~ 706.2.2.1 Mechanical ventilation. Ventilation shall be by a continuous mechanical ventilation system or by a mechanical ventilation system activated by a continuously monitoring hydrogen detection system where a gas concentration of not more than 25% of the lower flammable limit is present.
IFGC [F] ~~706.4.1.2~~ 706.2.2.2 Gas detection. Where installed, a gas detection system shall be equipped to sound an alarm and visually indicate when a maximum of 25% of the lower flammable limit (LFL) is reached. The gas detection system shall function during ventilation system maintenance operations. LFL of hydrogen shall be defined as 4%.

IFGC [F] ~~706.4.1.3~~ 706.2.2.3 System failure. Any failure of the ventilation system shall immediately shut down the fueling system. Reactivation of the fueling system shall be by manual restart and shall be conducted by trained personnel.

IFGC [F] ~~706.4.1.4~~ 706.2.2.4 Adjacent ventilation systems. A ventilation system for a room within or attached to another building shall be designed such that all areas served by the ventilation system comply with this section during the normal operating conditions and during alarm conditions.

Commenter's Reason: Proposal F229-06/07 was disapproved by the International Fire Code Committee who felt the proposal should have been a subsection of IFGC Section 706.2. Upon review of the proposal, and the committee's reason for disapproval, NASFM has addressed this issue and relocated the text of the proposal and renumbered the subsections to conform to the committee's recommendation.

Final Action: AS AM AMPC____ D

F231-06/07
2705.5.1.11

Proposed Change as Submitted:

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

Revise as follows:

~~2705.2.2.1~~ 2705.1.11 Design. Systems shall be suitable for the use intended and shall be designed by persons competent in such design. Controls shall be designed to prevent materials from entering or leaving the process or reaction system at other than the intended time, rate, or path. Where automatic controls are provided, they shall be designed to be fail safe.

Reason: This section currently applies only to closed hazardous materials systems. Open systems should also meet the requirements of being suitable for the intended use and being designed by competent persons to prevent the unintended release of hazardous materials. No cost increase is expected, because hazardous materials systems should already meet this standard, as they are required to be approved in section 2703.2.3.

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

Committee Action: **Approved as Submitted**

Committee Reason: Based on the proponent's reason statement. The proposal properly relocates system design requirements so as to apply to both open and closed systems.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeffrey Shapiro, PE, FSFPE, International Code Consultants, representing The Chlorine Institute, requests Approval as Modified by this public comment.

Modify proposal as follows:

2705.1.11 Design. Systems shall be suitable for the use intended and shall be designed by persons competent in such design. Controls shall be designed to prevent materials from entering or leaving the process or reaction system at other than the intended time, rate, or path. Where automatic safety controls are ~~provided~~ used to prevent a dangerous condition or reaction, they shall be designed to be fail safe.

Commenter's Reason: This is a simple clarification. There is no need for all automatic controls to be fail safe because many such controls have nothing to do with and no impact on safety. Only those controls that are intended to be part of the safety system were intended to be encompassed by this requirement.

Final Action: AS AM AMPC____ D