

**FINAL STATEMENT OF REASONS  
FOR  
PROPOSED BUILDING STANDARDS  
OF THE  
OFFICE OF THE STATE FIRE MARSHAL  
REGARDING THE 2010 CALIFORNIA BUILDING CODE  
CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 2  
2010 INTERIM RULEMAKING CYCLE**

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The Administrative Procedure Act requires that every agency shall maintain a file of each rulemaking that shall be deemed to be the record for that rulemaking proceeding. The rulemaking file shall include a final statement of reasons. The Final Statement of Reasons shall be available to the public upon request when rulemaking action is being undertaken. The following are the reasons for proposing this particular rulemaking action:

**UPDATES TO THE INITIAL STATEMENT OF REASONS**

(Government Code Section 11346.9(a)(1))

The Office of the State Fire Marshal has not added any additional data or any technical, theoretical or empirical studies, reports or similar documents on which the SFM relied on in proposing these amendments to Title 24, Part 2 into this Final Statement of Reason unless noted otherwise in the comments or response to comments.

Proposed regulations relating to antifreeze solutions in fire sprinkler systems and proposed regulations relating to smoke alarms in existing building have been completed as part of separate emergency rulemaking submittals (BSC File No. SFM EF 01-10 and BSC File No. SFM EF 01-11) and are addressed in the Final Statement of Reason for each of the final emergency rulemaking packages therein.

**MANDATE ON LOCAL AGENCIES OR SCHOOL DISTRICTS**

(Pursuant to Government Code Section 11346.9(a)(2))

The SFM has determined that the proposed regulatory action would not impose a mandate on local agencies or school districts.

**OBJECTIONS OR RECOMMENDATIONS MADE REGARDING THE PROPOSED REGULATION(S)**

(Government Code Section 11346.9(a)(3)) [List a summary of EACH objection or recommendation regarding the specific adoption, amendment, or repeal proposed, and explanation of how the proposed action was changed to accommodate each objection or recommendation, or the reasons for making no change. This requirement applies only to objections or recommendations specifically directed at the agency's proposed action or to the procedures followed by the agency in proposing or adopting the actions or reasons for making no change. Irrelevant or repetitive comments may be aggregated and summarized as a group]

The following is the Office of the State Fire Marshal's summary of and response to comments specifically directed at the agency's proposed action or to the procedures followed by the agency in proposing or adopting the actions or reasons for making no change:

**COMMENTS RECEIVED DURING THE 45-DAY COMMENT PERIOD.**

Pursuant to the requirements of Government Code Section 11346.8 (c), and Section 44 of Title 1 of the California Code of Regulations, the Office of the State Fire Marshal proposed modifications to the California Code of Regulations, Title 24, Part 2 were the subject of a Notice of Proposed Action (Register 2011, Volume No. 16-Z, notice File No. Z-2011-0412-07). The text with the modifications clearly indicated, were made available to the public for a 45-day written public comment period April 22, 2011 through June 6, 2011.

The following is the Office of the State Fire Marshal's summary of and response to comments specifically directed at the agency's proposed action or to the procedures followed by the agency in proposing or adopting the actions or reasons for making no change:

[Section 705.2.3]

**Name/Organization:** Stephan Kiefer, Chair, CALBO State Code Committee

As with the Building Standards Commission Code Advisory Committee, we believe the proposal is unjustified and unnecessary.

We recommend the proposal be amended to return the exception to its original model code language. We believe the original model code language provides the best clarity, and accomplishes the SFM desire to eliminate the unintended "2 feet" reference.

**Response:**

The SFM is removing the proposed modifications and those existing modifications to the above section to return the text back to the original model code text. This action is in part as a result of comments made during the March 24, 2011 CBSC Code Advisory Committee which recommended disapproval. Additionally, the SFM received comments during the initial 45-day comment period requesting a similar action with additional modification to revert back to the base model code provisions, which the SFM agrees with.

**SFM change to accommodate as follows:**

**705.2.3 Combustible projections.** Combustible projections located where openings are not permitted, or where protection of openings is required ~~or where a combination of protected and unprotected openings are permitted~~ shall be of at least 1-hour fire-resistance-rated construction, Type IV construction, *fire-retardant-treated wood* or as required by Section 1406.3.

**Exceptions:**

- ~~1. Type VB construction shall be allowed for combustible projections in Group R-3 and U occupancies with a fire separation distance greater than or equal to 25 feet.~~
- ~~2. Type V construction shall be allowed for combustible projections in group R-3 and U occupancies equipped throughout with an automatic fire sprinkler system installed in accordance with 903.3.1.3 with a fire separation distance greater than or equal to 3 feet.~~

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[Sections 910.1, 910.2, 910.4, 910.4.1, 910.4.2]

**Name/Organization: Carl F. Baldassarra, P.E., Executive Vice President, The RJA Group**

We have reviewed the proposed amendments to Chapter 9 and Chapter 10 of the 2010 California Fire Code (CFC) intended to address limitations and/or inadequacies of the adopted reference model code and SFM regulations relating to exit access travel distance and fire fighter operations in Group F-1 and S-1 occupancies. We agree that a modification is needed to allow exit access travel distances up to 400 feet in these occupancies. However, we have a number of concerns with the current proposal and wish to offer further modifications. Concerns with the current proposal are summarized as follows:

**1. Allowing the increased travel distance should be based on other mitigating factors rather than smoke/heat vents.** Experience and full-scale tests show that fusible link-operated vents in a sprinklered building will not likely operate. Furthermore, in the event that the vents operate either automatically or manually, the efficacy of the vents in moving cold smoke out of the building is highly questionable.

The report prepared by Aon Fire Protection Engineering and included in the "Report to the California State Fire marshal on Exit Access Travel Distance of 400 Feet," by Task Group 400, December 20, 2010, shows that a 400-foot exit access travel distance in large Group F-1 and S-1 occupancies provides a reasonable level of safety for the occupants without other special provisions.

**2. For firefighting purposes, mechanical smoke exhaust should be recognized as an acceptable, if not superior, method of exhausting smoke in lieu of smoke and heat vents.** The referenced standards allow the design of a mechanical system in lieu of providing smoke and heat vents. However, the current language puts this superior method of exhausting smoke at a major disadvantage of being utilized.

Furthermore, the use of smoke and heat vents with sprinkler systems, especially those employing ESFR sprinklers, is questionable and may lead to excessive damage and a risk to life safety. Allowing the use of mechanical systems gives designers an option to meet the goal of the exhausting smoke in these large buildings while not mixing the use of vents and sprinklers.

**3. The mechanical smoke exhaust system only needs to replace the smoke/heat vents, therefore, the ventilation rate specified in the code is excessive.** The ventilation rate included in the current edition of the CFC, 300 cfm for every square foot of vent area, is based upon calculations derived for uncontrolled fires in unsprinklered buildings. The physics are much different when compared to that associated with fires in sprinklered buildings and are not appropriate to be used.

Attached to this letter are: (1) proposed revisions to Section 910 of the CFC/CBC which address the above concerns, and (2) typical smoke production and exhaust rate calculations approved for use on actual projects in the State of California where mechanical exhaust systems have been used in lieu of smoke and heat vents. The second attachment provides the technical substantiation for the recommended exhaust rate to be used with the mechanical exhaust option.

## **ATTACHMENT 1 – PROPOSED REVISIONS**

### **1. Amend Section 910.1 of the proposed revision to 2010 CFC/CBC as follows:**

**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. *Automatic smoke and heat vents or mechanical smoke exhaust systems are not required within areas of buildings equipped with early suppression fast-response (ESFR) sprinklers unless any of the following conditions exist:*
  - 2.1. *The building is a state institution,*
  - 2.2. *The building is a state-owned or state-occupied building,*
  - 2.3. *The building is any of the applications listed in Section 1.11 regulated by the Office of the State Fire Marshal, or*
  - 2.4. *The area of a Group F-1 or S-1 occupancy protected with the ESFR sprinklers has an exit access travel distance of more than 250 feet (76 200 mm).*

**2. Amend Section 910.2 of the 2010 CFC/CBC as follows:**

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

**3. Amend Section 910.4 of the 2010 CFC/CBC as follows:**

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

**4. Amend Section 910.4.1 of the 2010 CFC/CBC as follows:**

**910.4.1 Location.** Exhaust fans shall be uniformly spaced within ~~each draft-protected area~~ and the maximum distance between fans shall not be greater than 100 feet (30480 mm).

**5. Amend Section 910.4.2 of the 2010 CFC/CBC as follows:**

**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 provide a minimum of ~~be determined by the equation:~~

$$C = A \times 300 \quad \text{(Equation 9-4)}$$

where:

~~C = Capacity of mechanical ventilation required, in cubic feet per minute (ft3/min).~~

~~A = Area of roof vents provided in square feet (m2) in accordance with Table 910.3, two complete air changes per hour based on the volume of the building or portions thereof without deduction for any commodity storage.~~

**Response:**

The SFM is proposing modification as a result of comments made during the 45-day comment period. These modifications provide for an alternative to smoke and heat vents with a mechanical smoke exhaust system. The SFM agrees in part with comments made, and agrees that the inclusion of mechanical smoke exhaust systems provide a viable alternative for the fire service operations of controlling and suppressing a fire event. The ventilation rate for a mechanical smoke exhaust system is revised since the calculation method currently in the code is based on a non-sprinklered building, as confirmed in the following data.

**Introduction**

This paper provides an example of the calculation of the capacity of a mechanical smoke exhaust system proposed in lieu of smoke and heat vents for a hypothetical facility. This analysis is based upon an actual project completed by Schirmer (Aon Fire Protection) Engineering. The mechanical exhaust system eliminates the need to have fire fighters going on the roof or entering the building to release smoke and heat vents. In addition, the proposed mechanical smoke removal system provides an effective method of removing products of combustion without compromising the superior performance of the sprinkler system.

**Mechanical Smoke Removal System Capacity Requirements**

The current design criterion for mechanical smoke removal systems of 300 cfm per square foot of vent area, which first appeared in the 1985 Uniform Fire Code, is believed to have originated from the 1982 edition of NFPA 204M, *Guide for Smoke and Heat Venting*, the current edition at that time. This standard was intended to offer guidance in the design of facilities for the emergency venting of combustion products from *uncontrolled fires in non-sprinklered* single story buildings.

Much of the theory for the smoke venting requirements in the 1982 edition of NFPA 204M is based on the work by Dr. Gunnar Heskestad. The recommended mechanical exhaust capacity per square foot of vent area prescribed in NFPA 204M is 354 scfm per square foot for curtained compartments up to 6 feet in depth. The recommended mechanical smoke exhaust rate increases for corresponding increases in curtain depth. It is important to note that the calculations used to derive this relationship were based upon uncontrolled fires in unsprinklered buildings with the resulting temperatures and buoyancy needed to drive smoke and heat out of the vents.

The 2010 California Fire Code (CFC) and California Building Code (CBC) include the ratio of 300 cfm per square foot of vent area in Section 910.4.2. In addition, the CFC requires that individual fans shall not exceed a capacity of 30,000 cfm and shall be uniformly spaced with not more than 100 feet between fans. For 20 foot high storage of high-hazard commodities (Group A plastics), the required ratio of smoke/heat vents to floor area is 1 square foot of vent area per 50 square feet of floor area (1:50). For the 104,279 square foot floor area of a hypothetical facility, the

required smoke/heat vent area is 2,086 square feet. Applying the design of 300 cfm per square foot of venting area results in a total required exhaust capacity of 625,800 cfm, requiring a minimum of 21 exhaust fans. For this 25.5 foot high building, this ventilation rate would exceed an incredible *14 air changes* per hour.

As was previously discussed, the calculation of the mechanical ventilation rate prescribed by the CFC is for the removal of combustion products from uncontrolled fires in large industrial and storage facilities. This design has merit when applied to such cases. However, Section 910 is applicable to storage areas of facilities protected with automatic sprinklers. The proposed smoke removal system will be used for overhaul of the building after the fire has been suppressed, rather than removal of combustion products from an uncontrolled fire. As such, the smoke and heat removal requirements of 300 cfm per square foot of venting area are considered to be inappropriate for the intended application to facilities which are sprinklered.

### Design Justification

The conditions that could occur within a building during a fire situation can be simulated by conducting appropriate fire testing. A series of nine large scale fire tests were conducted at the Underwriter's Laboratories Fire Test Center in Northbrook, Illinois, between June and August, 1998. The purpose of these tests was to investigate the performance of the Grinnell Corporation's Model ESFR-25 pendent sprinkler which has a nominal discharge coefficient (K factor) of 25. Test No. 6 consisted of Group A unexpanded plastic stored to a maximum height of 20 feet, protected with ESFR K-25 sprinklers with a design pressure of 15 psi.

Only one ESFR sprinkler was needed to suppress the fire. The gas temperature above the ignition source peaked at 203°F and returned to ambient temperature approximately two minutes after operation of the sprinkler. The peak steel temperature was measured at 102°F. Steel temperatures returned to ambient levels approximately fifteen minutes after operation of the sprinklers. These steel temperatures are well below the critical temperature of 1,000°F.

### Smoke Production Calculations

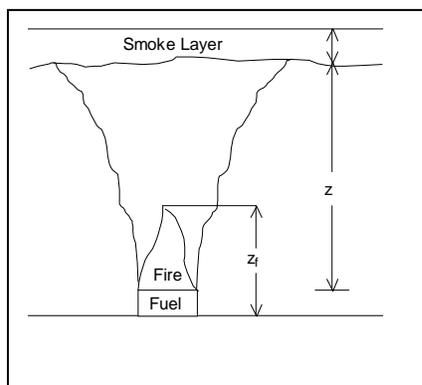
The mass rate of smoke production can be estimated as the mass rate of air entrained along the height of the smoke plume up to the lower boundary of the smoke layer. Correlations have been developed to calculate the mass rate of smoke production based upon the heat release rate of the fire and height of the fuel surface to the lower boundary of the smoke layer<sup>1</sup>. Utilizing these correlations, the amount of smoke produced by the selected fire scenario will be calculated. An axisymmetric plume was assumed as a worst case situation. The amount of smoke produced will be compared to the capacity of the smoke removal system to determine if the design objective has been met.

Work by Heskestad (1989)<sup>2</sup> has developed the following equation for the calculation of smoke production:

$$\dot{m} = 0.022 (Ec)^{1/3} z^{5/3} + 0.0042 (Ec)$$

WHERE:

- $\dot{m}$  = mass rate of smoke production, lb/sec
- $Ec$  = convection heat release rate of the fire, btu/sec
- $Z$  = height from top of the fuel surface to the bottom of the smoke layer, feet



The above equation is appropriate for clear heights,  $z$ , that are greater than the limiting height,  $z_f$ , where  $z_f = 0.533 Ec^{2/5}$ . A discussion of the input data used in the calculation follows.

<sup>1</sup> Design of Smoke Management Systems, John Klote and James A. Milke

<sup>2</sup> Design of Smoke Management Systems, John Klote and James A. Milke.

## Heat Release Rate

The type and form of the commodity are the most influential factors in determining the heat release rate of a storage fire<sup>3</sup>. The heat content of the material, the burning rate, the exposed surface area, and how the commodity reacts to the application of water determine the protection requirements. Rack storage fires are generally more severe than solid-piled storage because of better air access and stability of the burning product. Storage height is a key determinant of heat release rate. As more material is exposed vertically, the burning rate increases with increasing storage height.

For this analysis, assume a storage commodity consisting of a mixture of products, ranging from Class I commodities to Group A plastic. As a conservative approach, Factory Mutual Research Corporation (FMRC) Standard Plastic Commodity (polystyrene cups in compartmented cartons) was selected. This commodity is recognized to represent the most severe fire hazard of the high density plastics tested<sup>4</sup>.

Heat release rate data for unsprinklered rack storage fires are almost non-existent due to the obvious hazard of conducting such tests. However, convective heat release data were documented for 20 foot rack storage of FMRC Standard Plastic Commodity by Yu<sup>5</sup>. The storage array used to develop the data consisted of two-pallet loads wide and two-pallet loads deep of FMRC Standard Plastic Commodity in rack storage array. Test Nos. 5 and 6 utilized four tiers of storage stacked in such an array. Total storage height was approximately 20 feet. Heat release data from Test No. 6 was selected as the data is somewhat higher. This testing data is considered a conservative representation of the predicted fire scenario as the amount of product consumed in the ESFR fire testing was much less, the storage array is similar, and the commodity utilized is the same.

The convective heat release rate reaches 5,000 kw (4,742 btu/sec) at approximately one minute, six seconds, which is very conservative since the first ESFR sprinkler activated at 50 seconds. The convective heat release rate will then decrease as fire suppression is achieved. Suppression is achieved not later than two minutes as shown by air temperatures above ignition.

For calculation purposes, the convective heat release rate is assumed to be a constant 4,742 btu/sec from ignition to two minutes after ignition. This is very conservative as the convective heat release rate increases to a peak of 4,742 btu/sec at one minute, and then rapidly decreases until fire suppression is achieved at two minutes. The convective heat release rate is approximately 70 percent of the total heat release, thus it is noted the total heat release rate is 7,150 kw.

Heat release rate data for the rack storage of aerosols, flammable liquids, and combustible liquids are non-existent. The use of a constant convective heat release rate for Group A plastic is very conservative and the best available data. The axisymmetric plume equation is primarily dependent on the variable clear height. Moderate increases in the convective heat release rate will not significantly affect the smoke production rate or the overall results.

## Clear Height

To determine the clear height (z), the height of the top of the fuel surface and the depth of the smoke layer must be determined. The height of the proposed storage array is 20 feet. As shown in the fire test data, the fire actually consumed product to an elevation of 5 feet. As a conservative approach (the greater the clear height the greater the smoke production rate), the top of the fuel surface will be considered at the floor.

The depth of the upper layer is dependent upon the ceiling to fire source height. The upper layer thickness can be estimated as 5 to 12 percent of the ceiling to fire source height<sup>6</sup>. An upper layer thickness of 3 feet (25.5 foot ceiling height - 0 foot fire source height x 12 percent) was utilized.

## Calculation Results

As shown in the attached calculation (Appendix A), a maximum of 68,960 cfm of smoke will be generated by the design fire. Based upon an empty building volume of 2.659 million cubic feet, the exhaust rate required to achieve two air changes per hour is 88,637 cfm. Because no single fan can exceed 30,000 cfm and fans cannot be spaced more than 100 feet apart, this project required five fans, each exhausting 25,570 cfm for a total of 127,850 cfm. This exceeds the minimum two air changes per hour by more than 40 percent. Even at the minimum required rate of two air changes per hour, the calculation results show that the mechanical smoke removal system proposed will be capable of removing the smoke from the building faster than it will be generated, ultimately removing smoke from the

<sup>3</sup> Factory Mutual Loss Prevention Data Sheet 8-9R "Storage of Class I, 2, 3, 4 and Plastic Commodities".

<sup>4</sup> An Engineering Approach to Industrial Fire Protection, Robert Zalosh, January 1994.

<sup>5</sup> Yu, H-Z, *The Transient Ceiling Flows of Growing Rack Storage Fires*, FMRC JION1JO.RA(3).

building once the fire is extinguished. A degree of conservatism is added to this by the calculation using an empty building volume.

### Discussion

The design goal of the smoke removal system is to remove smoke from the building without compromising the performance of the sprinkler system and to facilitate firefighting operations. An ESFR sprinkler system will activate very quickly, at approximately one minute, and suppress the fire, thereby minimizing smoke production. The smoke that is produced will be exhausted from the building by fire department activation of the smoke removal system, thus making it unnecessary for fire department personnel to access the roof. At the time the fire department begins manual overhaul, the visibility should be improved, facilitating operations. A superior level of performance is likely when compared to that expected from the performance of the building having heat-activated smoke and heat vents which rely upon the natural buoyancy of cold smoke. The design goal has therefore been achieved.

### APPENDIX A – SMOKE PRODUCTION CALCULATIONS

$$\dot{m} = 0.022 (Ec)^{1/3} z^{5/3} + 0.0042 (Ec)^7$$

$$z = (25.5 \text{ ft} - 3 \text{ ft}) - 0 \text{ ft} = 22.5 \text{ ft}$$

$$Ec = 5000 \text{ KW} \times \frac{56.90 \text{ BTU} / \text{min}}{1 \text{ KW}} \times \frac{1 \text{ min}}{60 \text{ sec}}$$

$$= 4742 \text{ BTU} / \text{sec}$$

$$z_f = 0.533 (4742 \text{ BTU} / \text{sec})^{2/5} = 15.7 \text{ ft}$$

$z > z_f$ , therefore the equation is valid

$$\dot{m} = 0.022 (4742 \text{ BTU} / \text{sec})^{1/3} 22.5 \text{ ft}^{5/3} + 0.0042 (4742 \text{ BTU} / \text{sec})$$

$$= 86.2 \text{ lb} / \text{sec}$$

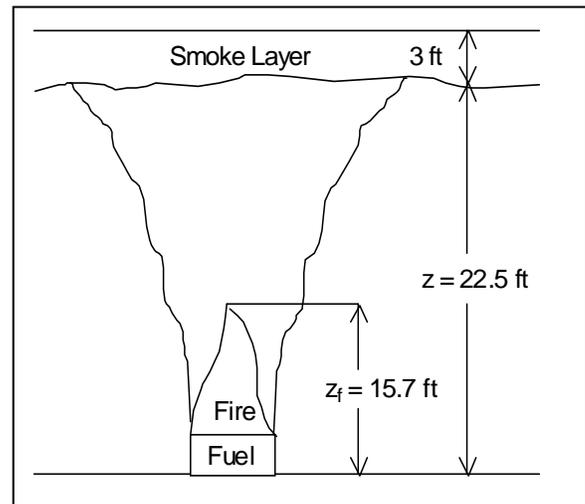
$$Q = C \frac{\dot{m}^8}{p}$$

$Q$  = volumetric smoke production rate, cfm

$$C = 60 \text{ (constant)}$$

$$p = \text{density of plume gases, lb/ft}^3 = 0.075 \text{ lb/ft}^3 \text{ (at } 68^\circ \text{ F and one atmosphere)}$$

$$Q = 60 \frac{86.2 \text{ lb} / \text{sec}}{0.075 \text{ lb} / \text{ft}^3} = 68,960 \text{ cfm}$$



### Approximate Building Dimensions:

104,279 ft<sup>2</sup> x 25.5 ft high

Building volume = 2.659 million ft<sup>3</sup>

<sup>7</sup> Design of Smoke Management Systems, John Klote and James A. Milke, Equation 10.8

<sup>8</sup> Design of Smoke Management Systems, John Klote and James A. Milke, Equation 10.12

**SFM change to accommodate as follows:**

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**Exceptions:**

1. Frozen food warehouses used solely for storage of Class I and II commodities where protected by an approved automatic sprinkler system.
2. Automatic smoke and heat vents or mechanical smoke exhaust systems are not required within areas of buildings equipped with early suppression fast-response (ESFR) sprinklers unless any of the following conditions exist:
  - 2.1. *The building is a state institution,*
  - 2.2. *The building is a state-owned or state-occupied building,*
  - 2.3. *The building is any of the applications listed in Section 1.11 regulated by the Office of the State Fire Marshal, or*
  - 2.4. *The area of a Group F-1 or S-1 occupancy protected with the early suppression fast-response (ESFR) sprinklers has an exit access travel distance of more than 250 feet (76 200 mm).*

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

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

**910.4.1 Location.** Exhaust fans shall be uniformly spaced ~~within each draft-protected area~~ and the maximum distance between fans shall not be greater than 100 feet (30480 mm).

**910.4.2 Size.** Fans shall have a maximum individual capacity of 30,000 cfm (14.2 m<sup>3</sup>/s). The aggregate capacity of smoke exhaust fans shall ~~be determined by the equation:~~

~~$C = A \times 300$~~  ~~(Equation 9-4)~~

~~where:~~

~~C = Capacity of mechanical ventilation required, in cubic foot per minute (ft<sup>3</sup>/min).~~

~~A = Area of roof vents provided in square foot (m<sup>2</sup>) in accordance with Table 910.3. provide a minimum of two complete air changes per hour based on the volume of the building or portions thereof without deduction for any commodity storage.~~

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[910.1, 910.2.1, 910.3.2.2, 910.3.2.2.1, 910.3.2.2.2, 910.3.2.2.3, Table 1016.1, 1016.3]

**Name/Organization:** Richard C. Schulte. Schulte & Associates

**Comment 1. Committee Composition** – “The fact that neither Mr. Thornberry, nor Ms. Ruth are listed as representing the Smoke Vent Task Group is rather interesting.”

**Response:** Task Group 400 was created to address the travel distance issue in California. The fact that there may be activity occurring under the International Code Council umbrella does not negate the process occurring in California. Mr. Thornberry and Ms. Ruth are both identified as Industry Consultants. The members of Task Group 400 were intentionally selected to include all potential stakeholders in the process. Industry is represented along with other groups.

**Comment 2. CTC Study Group Resources** – “It does not appear that the Task Group availed itself to this resource [ICC Code Technology Resources]....”

**Response:** Task Group 400 was created to address the travel distance issue in California. The fact that there may be activity occurring under the International Code Council umbrella does not impact the process occurring in California. Additionally, Mr. Schulte indicates in his letter that the ICC Code Technology Committee has been considering this issue of over 4 years. Task Group 400 was established and the report was developed to resolve the issue and develop a proposal with the input of affected California stakeholders.

**Comment 3. NIOSH 2005-132/NIOSH 2010-153** – “The report of Task Group 400 contains no mention of either of these two NIOSH Alerts.”

**Response:** Neither SFM, Task Group 400 nor the *California Fire Code/California Building Code* regulate or stipulate firefighting operations during an emergency. Those fireground decisions are left to the Incident Commander at each incident. It is impossible for the codes to regulate firefighting operations because every building and every fire incident has its own characteristics and circumstances. Firefighting decisions are made at the incident and those decisions should follow the NIOSH alerts.

**Comment 4. Sofa Super Store Fire, Charleston, South Carolina** – “Several reports regarding fire fighting operations at the Sofa Super Store fire which occurred in Charleston, South Carolina on June 18, 2007 have been released. These reports document the risk of conducting interior manual fire fighting operations in a building which was only 15,000 square feet in floor area.”

**Response:** Oftentimes, code revision occurs as the result of actual fire experience. As a result of the Sofa Super Store fire, the code now requires an automatic fire sprinkler system in Group F and M occupancies containing upholstered furniture. However, the code does not mandate firefighting operations nor make fireground decisions to enter a building, or not enter a building. Those decisions are made by the Incident Commander based on the fire and rescue situations.

**Comment 5. Note h, Table 2306.2, International Fire Code** – “The report issued by Task Group 400 does not include a discussion of Note h.”

**Response:** A building size was chosen to address the typical size building constructed in California and demonstrate buildings which necessitate the exit access travel distance increase to 400 feet. The level of hazard was selected as the most severe with regard to fire spread and smoke development. Group A plastics are classified as a high-hazard commodity and are used as the standard baseline for many “high challenge” fire tests and fire modeling. It is correct that Table 2306.2, Footnote h limits the fire area for High Hazard Commodities to 500,000 square feet.

As indicated on Page 17 of the *Report to the California State Fire Marshal on Exit Access Travel Distance of 400 Feet*,

“This fire was selected with the expectation that if this design was successful, all lesser hazards would also be successful. The Aon FPE report states “As a conservative approach, high-pile rack storage of Group A plastics was selected as the primary fuel. This commodity is recognized to represent the most severe fire hazard of the high density plastics tested.””

**Comment 6. High Hazard Commodity Classification** – “Hence, Note h to Table 2306.2 would be applicable to a building containing storage classified as Group A plastics.”

**Response:** See response to Comment 5.

**Comment 7. Aon FPE Analysis/Report** – “Since Note h limits the maximum area of a building containing highpiled storage classified as a high hazard commodity to a maximum of 500,000 square feet, the building used in Aon FPE’s analysis does not comply with code requirements applicable to buildings containing high hazard commodities.”

**Response:** See response to Comment 5.

**Comment 8. SFPE Guidelines for Substantiating the Use of a Fire Model** – “This document addresses how fire models are to be utilized. In particular, this document addresses the issue of the “validation” of fire models for the purpose for which a model is being utilized.”

**Response:** The SFM disagrees with Mr. Schulte’s claim that the fire modeling is invalid. There is no requirement in the SFPE Guide, California Law, or CBCS procedures that mandate the use of the *SFPE Guide for Substantiating a Fire Model for a Given Application*. It is simply a recommended guide.

Even if compliance with the *SFPE Guide for Substantiating a Fire Model for a Given Application* was determined to be appropriate, the document was only available as a Draft for Comment, dated September 2009. The document was not finalized until December 2010, and not publicly available before the *Report to the California State Fire Marshal on Exit Access Travel Distance of 400 Feet* was received.

**Comment 9. The Concept of “Ganged” Operation of Smoke/Heat Vents** – *“None of the above information has been mentioned in the portion of the report addressing the concept of the “ganged” operation of smoke/heat vents. It is unclear why a discredited concept was discussed by the Task Group.”*

**Response:** The concept of ganged release was considered during the Task Group 400 project. Task Group 400 intentionally evaluated and reviewed all options and concepts which may have been viable to justify the increased exit access travel distance. Task Group 400 evaluated twelve different options, and the concept of “ganged release” is listed as Option #2 on Page 9 of the Task Group 400 Report. The fact that the ICC Code Development Process and the NFPA 204 committee both disapproved the concept does not eliminate it as a concept. Task Group 400 conducted their own evaluation and due to a number of reasons, this concept was determined not to be the most viable method to allow an increased exit access travel distance.

**Comment 10. Code Change Proposal E113-07/08** – *“Given the information included in this letter, it seems obvious, at least to me, that proposal E113-07/08 was, and is, the correct solution to the issue being addressed by Task Group 400.”*

**Response:** The SFM and Task Group 400 disagree with Mr. Schulte’s claim that his proposed code change is the “correct solution”. Code Change E113-07/08 would have allowed any Group F or S building with a fire sprinkler system to have an increased exit access travel distance of 400 feet. This item which was submitted to the ICC Code Change Process was disapproved, and Task Group 400 also did not agree with this code change. The SFM proposal allows for the same increased exit access travel distance, but also requires a minimum ceiling height of 24 feet. E113-07/08 provides no criteria on ceiling height and therefore could be applied to a building storing Group A plastics to 6 feet in height with a ceiling height of 9 feet.

The SFM proposal requires a minimum ceiling height of 24 feet which allows for the smoke generated from the fire to be collected before it impacts exiting occupants. With a ceiling height of 9 feet, the capability to store the smoke is inadequate to allow for a travel distance of 400 feet.

**Comment 11. NFPA 13 Roof Vent Provision Substantiation** – *“Both the substantiation for the NFPA 13 provisions addressing the installation of roof vents and the comment above make it clear that automatic smoke/heat vents should not be provided in storage buildings protected by a sprinkler system, regardless of whether standard spray sprinklers or ESFR sprinklers are used. The substantiation statement and comment couldn’t be any clearer.”*

**Response:** This comment from Mr. Schulte deserves no response. The text Mr. Schulte claims is from NFPA 13 Section 12.1.1 and Annex A Section A12.1.1 does not exist in the NFPA 13.

**Comment 12. Seismic Activity** – *“Smoke/heat vent systems in buildings are intended to facilitate manual interior fire fighting operations. Without a water supply at a building, manual interior fire fighting operations cannot be initiated. Hence, the reasoning that smoke/heat vents should be provided as a back-up for sprinkler protection in case the water supply fails is a flawed rationale.”*

**Response:** The SFM disagrees with Mr. Schulte’s statement. Mr. Schulte may be unaware of the fact that California fire apparatus typically carry water in a water tank on the vehicle. So, when the fire sprinkler system is ineffective as a result of a damaged water supply, the smoke/heat vents will open allowing smoke and heat to escape so firefighters can enter the building with hoselines supplied from the tank water. While it is likely that the entire fire could not be extinguished with tank water, rescue of occupants could be performed with the safety of hoselines in the firefighters’ hands.

**Comment 13. Draft Curtains** – *“Given that the performance of smoke/heat vents without draft curtains is degraded, and given that the performance of the sprinkler system may be degraded by the installation of draft curtains, the only logical approach is to eliminate smoke/heat vents if draft curtains are not provided.”*

**Response:** The SFM disagrees with Mr. Schulte’s assertion that since draft curtains are not required then the smoke/heat vents should also be eliminated. While a portion of Mr. Schulte’s comment may be factual that the performance of smoke/heat vents is “degraded” without draft curtains, it is not correct to assume that smoke/heat vents are useless. The draft curtains are intended to reduce the time to operation of smoke/heat vents by collecting the heat and smoke within an under-roof area. But once the smoke/heat vent opens, the heat will rise on its own without the need for draft curtains. So, the lack of draft curtains may delay operation, but the smoke/heat vent will perform as expected once it opens.

**Comment 14. McFrugal's Warehouse Fire-New Orleans, Louisiana** – “No mention was made that the Task Group either reviewed or studied the McFrugal's Warehouse fire in detail.”

**Response:** The fire at McFrugal Warehouse is one of hundred's that have occurred in warehouses. Mr. Schulte's comments with regard to this fire appear to contradict his previous comments in two issues:

1. Mr. Schulte's Comments #10 and #11 indicate his opposition to the use of smoke/heat vents, however in Comment #14 he refers to the advantage of smoke/heat vents given that the roof had opened like smoke/heat vents.
2. Mr. Schulte's Comments #3 and #4 indicate his concern with interior firefighting operations, however in Comment #14 he states that the fire was fought with firefighters inside the building for over five hours.

Specifically, Mr. Shulte's comments are as follows:

“The McFrugal's Warehouse was not provided with either smoke/heat vents or draft curtains, yet the New Orleans Fire Department conducted interior manual firefighting operations in the building for over 5 hours due to the fact that the fire burned through a portion of the steel roof deck. In effect, the steel roof deck acted as an automatic smoke/heat vent in this fire.”

**Comment 15. Home Depot Fire-Tempe, Arizona** – “The fire at the Home Depot store in Tempe is an excellent example of the failure of smoke/heat vents to perform their intended function in a building protected by a sprinkler system.”

**Response:** The SFM agrees with many of Mr. Schulte's statements regarding the performance of the fire sprinkler system and smoke/heat vents in this fire. It appears that Mr. Schulte understands the concern of the SFM in his comments in the following issues:

1. Mr. Schulte states: “It appears that the failure was, in part, caused by the draft curtains.” As was stated in our response to Comment #5, codes change as a result of fire experience. The CBC and CFC no longer require draft curtains in sprinklered buildings.
2. Mr. Schulte states: “...only a few smoke/heat vents opened...” This is factual, and this is expressed in the Task Group 400 Report on Pages 7-8. This is the reason that an increase in exit access travel distance is no longer allowed under the current code when smoke/heat vents are installed. This is the very reason why the SFM has proposed the code change. However, the fact that the smoke/heat vents will not automatically open does not mean that the exit access travel distance of 400 feet must also be eliminated. The increase in travel distance does not rely on the functioning of the smoke/heat vents as discussed in Aon's Fire Protection Engineering Report (Appendix A of the Task Group 400 Report) on Pages 30-31. One of the facts that Mr. Schulte does not include from this particular fire is that there were no lives lost, even though the smoke/heat vents did open. The entire purpose of this SFM proposal is to establish other criteria which allow for the safe increase in exit access travel distance to 400 feet.

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[Section 1011.3]

**Name/Organization: Stephan Kiefer, Chair, CALBO State Code Committee**

As with the Building Standards Commission Code Advisory Committee, we recommend the proposed amendment be studied further. The SFM reason statement suggests that this is simply an editorial modification. While changes to visually sighted signs may be considered editorial, similar changes to tactile signage have potentially substantive impact. We therefore, believe this proposal be both reviewed and if deemed appropriate, brought forward by DSA-AC. If not correlated with DSA-AC, the proposed language may create confusion and potentially, a safety hazard for a non- or partially-sighted person. In order to ensure consistency with state accessibility standards, we therefore, recommend that this and similar accessibility related code amendments be brought forward by DSA.

**Response:**

The SFM is removing proposed modifications that would have made a significant change to the current 2010 CBC provisions for further study. The additional text to add combined signage of “EXIT RAMP/STAIR DOWN” or “EXIT RAMP/STAIR UP” will be readdressed in a future rulemaking cycle. Additionally the SFM is reverting the signage to

that of "TO EXIT" in item 5 to maintain the current code provisions, this item will also be readdressed in a future rulemaking cycle which is This action is in part as a result of comments made during the March 24, 2011 CBSC Code Advisory Committee which recommended further study. Additionally the SFM received comments during the initial 45-day comment period requesting a similar action and agrees in part with the comments.

**SFM change to accommodate as follows:**

**1011.3 Tactile exit signage.** *Tactile exit signs shall be required at the following locations:*

1. *Each grade-level exterior exit door that is required to comply with Section 1011.1, shall be identified by a tactile exit sign with the word, "EXIT."*
2. *Each exit door that is required to comply with Section 1011.1, and that leads directly to a grade-level exterior exit by means of a stairway or ramp shall be identified by a tactile exit sign with the following words as appropriate:*
  - 2.1. "EXIT STAIR DOWN"
  - 2.2. "EXIT RAMP DOWN"
  - 2.3. "EXIT STAIR UP"
  - 2.4. "EXIT RAMP UP"

~~Where the exit door leads both to a ramp and a stairway, the tactile sign shall read "EXIT RAMP/STAIR DOWN" or "EXIT RAMP/STAIR UP."~~

*exit by means of an exit enclosure or an exit passageway shall be identified by a tactile exit sign with the words, "EXIT ROUTE."*

4. *Each exit access door from an interior room or area to a corridor or hallway that is required to comply with Section 1011.1, shall be identified by a tactile exit sign with the words "EXIT ROUTE."*
5. *Each exit door through a horizontal exit that is required to comply with Section 1011.1, shall be identified by a sign with the words, ~~"EXIT ROUTE."~~ "TO EXIT."*

*For the purposes of this Section "tactile exit signs" shall comply with Section 1117B.5.1 Item 1.*

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[3006.4.1, 903.3.1.1.1, Chapter 35 Referenced Standards NFPA 13 - 8.15.5.6 and NFPA 72 – 21.3.6 ]

**Name/Organization:** **Brian Black, NEII Code & Safety Consultant, National Elevator Industry Inc. comments:**

The National Elevator Industry Inc. (NEII) is a national trade association representing the interest of firms that install, maintain and/or manufacture elevators, escalators, moving walks and other building transportation products. NEII appreciates the opportunity to comment on the California State Fire Marshal (SFM) Express Terms for proposed Building Standards of the State Fire Marshal Regarding the 2010 California Building Code, California Code of Regulations Title 24, Part 2 2010 Annual Rulemaking cycle, dated April 12, 2011.

Our review of those portions of the proposal that affect elevators has revealed a number of areas of major concern. If adopted, the proposed modifications will significantly deharmonize California's regulations with national requirements based on the ICC *International Building Code* and the ASME A17.1/CSA B44 *Safety Code for Elevators and Escalators*. This will likely result in significant delays in elevator availability and will likely not achieve the stated reason "...to save thousands of dollars in elevator installation..." On the contrary, the effect will likely be the opposite and will make California less competitive *vis-à-vis* other states in the US and provinces of Canada. Most importantly, the proposed changes will not enhance safety.

NEII's specific concerns and comments are as follows:

1. Proposed Sections 3001.6 and 3001.7 require that elevator cables and belts, as well as equipment within and exposed to elevator hoistways "shall be noncombustible or limited-combustible (Material) as defined in accordance with NFPA 13."
  - (a) The requirements listed in the note (NFPA 3.3.13) are for typical building materials, not elevator system components.
  - (b) There is no requirement in ASME A17.1/CSA B44 requiring equipment in hoistways other than car enclosures to have flame spread ratings.

(c) Elements of controllers, motors, drives, rollers, isolation pads, buffer strike pads, non-metallic sheave parts, car enclosure, etc. would be affected by this rule. This will result in significant redesign and qualification testing. It will not enhance safety, and would likely cost the state and its stakeholders many thousands of dollars extra per elevator.

NEII recommends the removal of sections 3001.6 and 3001.7 and the note regarding the definition of limited combustible material in NFPA 13, Section 3.3.13.

2. Proposed requirement 3006.4.1 states:

**“3006.4.1 Automatic sprinkler system. Automatic sprinklers shall not be required to be installed in elevator machine rooms and machinery spaces where all the following are met:**

1. Approved smoke detectors shall be installed in elevator machine rooms and machinery spaces and connected to the building fire alarm system in accordance with Section 907.
2. Activation of the smoke detectors located in the elevator machine room or machinery space shall cause the actuation of the building fire alarm notification appliances in accordance with 907.
3. Activation of any smoke detectors located in the elevator machine room or machinery space shall cause all elevators having any equipment located in that machine room to recall nonstop to the appropriate designated floor in accordance with CCR Title 8, Division 1, Chapter 4, Subchapter 6, Elevator Safety Orders.
4. Elevator machine rooms and machinery spaces shall be enclosed with fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. The fire-resistance rating shall not be less than the required rating of the hoistway enclosure served by the machinery. Openings in the fire barriers shall be protected with assemblies having a fire protection rating not less than that required for the hoistway enclosure doors. The exceptions to Section 3006.4 shall not apply.
5. The building fire alarm system shall be monitored by an approved supervising station in accordance with 907.
6. An approved sign shall be permanently displayed in elevator machine rooms and machinery spaces in a conspicuous location with a minimum of 1½ inch letters on a contrasting background, stating:

**NO COMBUSTIBLE STORAGE  
PERMITTED IN THIS ROOM**  
**By Order of the Fire Marshal [or name of fire authority]”**

There is an inconsistency in approach with reference to requirement 3006.4.1 *vis-à-vis* the proposed requirements 3001.6 and 3001.7. Requirement 3006.4.1 exempts machine rooms and machinery spaces from the need for permanently installed automatic sprinkler systems under certain conditions. Such conditions include a requirement for fire-rated enclosures with a rating of no less than that of the hoistway. There is no requirement for a flame spread rating on any of the equipment within the spaces covered by 3006.4.1. Conversely, the proposal would impose flame spread rating requirements for similar equipment in a fire-rated hoistway according to 3001.6 and 3001.7. No rationale has been provided for this inconsistency.

The elevator code and model building codes have traditionally treated the elevator machine, control and hoistway locations the same way. This proposal would de-harmonize those requirements in the state. Presently most new traction elevators are combining these areas within the hoistway.

NEII recommends expanding section 3006.4.1 to include all “machine rooms, machinery spaces, control rooms, control spaces and hoistways”. This will remove the inconsistency, accomplish the state’s goals as stated in the rationale, and increase safety in a cost effective manner.

Finally, an exception to NFPA 13 section 8.15.5.6 is required to not create a conflict with 3006.4.1 of the California Building Code.

As a trade association founded on the principle of providing safe building transportation for elevator riders and the general public, NEII shares the goal of the California State Fire Marshal for building codes and standards that ensure such safety. We thank the State Fire Marshal’s Office for its consideration of our comments and concerns in this rulemaking cycle and look forward to future discussion on these points.

**Response:**

The SFM is removing proposed building standards related to cables and belts as a result of additional modifications proposed to CBC Section 3006.5.1. These modifications are as a result of comments received by the National Elevator Industry Inc. for which the SFM concurs.

The SFM is proposing these amendments to allow the elimination of fire sprinklers in the elevator hoistway, elevator machine room, elevator machinery space, elevator control space, or elevator control room where all the requirements of the exception are met, including elevator machine room fire-resistive construction and separation, smoke and heat detection and approved signage. By the elimination of sprinklers in elevator hoistways and elevator machine rooms/spaces, "shunt-trip" will also not be required. The SFM and other fire authorities have allowed these requirements as an acceptable alternate means of protection in lieu of sprinklers in elevator machine rooms on a case-by-case basis. The amendment will codify this proven alternate means of protection

Smoke detection is being required in the elevator hoistways where machinery or combustible belts are located to provide advance initiation and annunciation of fire or smoke within the hoistway. This modification to NFPA 72 Section 21.3.6 is correlated with the modifications to CBC Section 3006.4.1.

These amendments have the potential to save thousands of dollars in the elevator installation and the required annual shunt-trip inspection and testing cost by eliminating from the elevator machine room; fire sprinklers and associated supply piping, shunt-trip circuit breaker, and associated electrical conduit, wiring, relays and interfaces.

Additional reference to Section 3006.4.1 is proposed for Item 3 of 903.3.1.1.1 relating to fire service access elevators and occupant evacuation elevators. These provisions further clarify current model requirements prohibiting sprinklers in elevator machines of fire service access elevators and occupant evacuation elevators to the appropriate sections to conform to IBC format and for clarification and user-friendliness. These references are necessary as the controlling provisions are located in CBC Chapter 30. These modifications are as a result of comments received by the National Elevator Industry Inc. for which the SFM concurs.

**Additional justification provided by Wayne D. Moore, P.E., FSFPE, CFPS, Principal and Director of New England/North Central Operations, Hughes Associates, Inc.**

In response to your request from the meeting with Otis on May 12, 2011 in Sacramento, the results of the fire performance analysis conducted by Hughes Associates, Inc. (HAI) for the Otis Elevator Company Gen2™ coated steel belt (CSB) elevator suspension are summarized in this letter. The analysis described below was initiated, in part by both Otis concerns as well as questions from jurisdictions. These concerns included:

1. The probability of ignition of the CSB;
2. Fire spread outside hoistway;
3. Fire and smoke spread below the fire floor within the hoistway;
4. Smoke spread through the building for a fire involving the CSB; and
5. The toxicity of the CSB combustion by-products.

Full-scale fire tests, combined with analytical computer smoke modeling, and statistical fire data were used to predict the impact of fires involving the CSB and to address the concerns described above.

All testing conducted utilized the current formulation of CSB, which incorporates a polyurethane (PU) covering over high-tensile, zinc plated steel cords. Two types of CSB products were evaluated: a grooved belt configuration and a groove-less belt configuration. Installation and testing of the CSB was representative of typical field installations, using 5 lengths of parallel belts (width depending on elevator car size) spaced nominally 1 inch apart.

A series of full-scale fire tests were conducted to evaluate the fire performance of the grooved and groove-less CSB suspension systems. The test results were used as input to a fire and smoke spread model to predict the effects of a fire involving the CSB in an elevator hoistway. Fire spread outside the hoistway and smoke infiltration to the upper floors of the building were evaluated. An analysis of the smoke toxicity was also undertaken to predict the building conditions (CO concentration and occupant % carboxyhemoglobin (COHb)).

The results of the full-scale fire tests provided the following conclusions regarding the burning behavior of the CSB suspension system.

1. The CSB was easily ignited from a flaming ignition source;
2. Sustained, vertical flame spread up the entire length of the CSB would be expected (i.e., high vertical flame spread rate);

3. The heat release from the CSB was approximately 1,800 kW per 11 ft of sample or approximately 1,650 kW per floor (assuming a 10 ft floor to ceiling height);
4. The peak burning of the CSB (i.e., sample visually fully engulfed in flame) would be expected to occur approximately 2 to 2.5 minutes after application of the flaming ignition source;
5. The vertical run of CSB would be fully consumed within 30 to 45 seconds after the peak burning occurred;
6. The peak smoke production rate corresponded to the time of the peak heat release rate;
7. Flaming droplets of burning, molten PU were observed accumulating below the vertical run of CSB igniting any CSB below the ignition source;
8. The molten PU pool fire would be expected to burn for approximately 6 to 8 minutes or more depending on the total installed CSB height after the vertical run of CSB was consumed;
9. The burning pool of molten PU did not spread beyond the general area under the vertical run of the CSB;
10. A second spike in the smoke production rate was observed corresponding to the molten PU pool fire; and
11. The short duration fire involving the CSB within the hoistway shaft would not be expected to breach the fire-resistance rated enclosure.

The results of the analysis of the test results and smoke modeling led to the development of the following conclusions:

1. Given the low occurrence of statistical data for fires igniting inside the hoistway, and the fact that the hoistway is fire resistance rate assembly, ignition of the CSB would be very unlikely;
2. The short burning duration (3 minutes) of the CSB demonstrated in the full-scale fire tests, compared to the hourly fire-resistance rating of the hoistway enclosure (2 hours, as required by code), would indicate that fire spread outside the hoistway would be unlikely;
3. The entire length of the CSB would be expected to be involved in a fire, however, fire spread to floors below the fire floor would not be expected due to the containment within the rated hoistway enclosure;
4. Ignition of the CSB due to breaching of the hoistway (i.e., after a 2-hour post flashover fire exposure to the hoistway) would not materially increase the hazards (i.e., visibility) within the building due to the existing deteriorated conditions;
5. Statistical fire data does not support fires starting in the hoistway above the cab. If the CSB was ignited by flames the result would be smoke infiltration onto the upper floors of the building. This scenario was included in a conservative approach to the analysis, however it is not expected to occur; and
6. Fires involving the CSB would not be expected to result in CO concentrations exceeding threshold levels or result in elevated %COhb levels in occupants remaining in the building for the fire durations examined.

In HAI's opinion, given the results and analysis of the testing, the Otis Elevator Company Gen2™ CSB has a low probability of adverse effects as they relate to the original concerns expressed by Otis and jurisdictions reviewing the product.

**SFM change to accommodate as follows:**

**903.3.1.1.1 Exempt locations.** *In other than Group I-2, I-2.1 and I-3 occupancies, automatic sprinklers shall not be required in the following rooms or areas where such rooms or areas are protected with an approved automatic fire detection system in accordance with Section 907.2 that will respond to visible or invisible particles of combustion. Sprinklers shall not be omitted from any room merely because it is damp, of fire-resistance rated construction or contains electrical equipment.*

1. Any room where the application of water, or flame and water, constitutes a serious life or fire hazard.
2. Any room or space where sprinklers are considered undesirable because of the nature of the contents, when approved by the fire code official.
3. ~~Elevator machine rooms and machinery spaces~~ Elevator hoistways, elevator machine rooms, elevator machinery spaces, elevator control spaces, or elevator control rooms in accordance with 3006.4.1.
4. *Spaces or areas in telecommunications buildings used exclusively for telecommunications equipment, and associated electrical power distribution equipment, provided those spaces or areas are equipped throughout with an automatic smoke detection system in accordance with Section 907.2 and are separated from the remainder of the building by not less than 1-hour fire barriers constructed in accordance with Section 707 of the California Building Code or not less than 2-hour horizontal assemblies constructed in accordance with Section 712 of the California Building Code, or both.*

~~**3001.6 Elevator cables and bolts.** Elevator cables and bolts, including counterweight cables shall be non-combustible or limited combustible (Material) as defined in accordance with NFPA 13.~~

~~Exception: Elevators in single family dwellings.~~

~~3001.7 Equipment within elevator hoistways. Equipment within and exposed to elevator hoistways shall be non-combustible or limited combustible (Material) as defined in accordance with NFPA 13.~~

~~Exception: Elevators in single family dwellings~~

~~Note: For the purpose of this Chapter, Limited Combustible (Material) as defined in accordance with NFPA 13, Section 3.3.13 applies and reads as follows:~~

~~3.3.13 Limited Combustible (Material). Refers to a building construction material not complying with the definition of noncombustible material that, in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg), when tested in accordance with NFPA 259, Standard Test Method for Potential Heat of Building Materials, and includes either of the following: (1) materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm) that has a flame spread index not greater than 50; or (2) materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E 84, Standard Test Method of Surface Burning Characteristics of Building Materials, or ANSI/UL 723, Standard Test Method of Surface Burning Characteristics of Building Materials.~~

~~3006.4.1 Automatic sprinkler system. Automatic sprinklers shall not be required to be installed in elevator machine rooms and machinery spaces, the elevator hoistway, elevator machine room, elevator machinery space, elevator control space, or elevator control room where all the following are met:~~

- ~~1. Approved smoke detectors shall be installed in elevator machine rooms and machinery spaces, the elevator hoistway, elevator machine room, elevator machinery spaces, elevator control spaces, or elevator control rooms and connected to the building fire alarm system in accordance with Section 907.~~
- ~~2. Activation of the any smoke detectors located in the elevator machine rooms and machinery spaces, elevator hoistway, elevator machine room, elevator machinery space, elevator control space, or elevator control room shall cause the actuation of the building fire alarm notification appliances in accordance with 907.~~
- ~~3. Activation of any smoke detectors located in the elevator machine rooms and machinery spaces, elevator hoistway, elevator machine room, elevator machinery space, elevator control space, or elevator control room shall cause all elevators having any equipment located in that machine room, elevator hoistway, elevator machine room, elevator machinery space, elevator control space, or elevator control room to recall nonstop to the appropriate designated floor in accordance with CCR Title 8, Division 1, Chapter 4, Subchapter 6, Elevator Safety Orders.~~
- ~~4. Elevator machine rooms and machinery spaces, The elevator machine room, elevator machinery space, elevator control space, or elevator control room shall be enclosed with fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. The fire-resistance rating shall not be less than the required rating of the hoistway enclosure served by the machinery. Openings in the fire barriers shall be protected with assemblies having a fire protection rating not less than that required for the hoistway enclosure doors. The exceptions to Section 3006.4 shall not apply.~~
- ~~5. The building fire alarm system shall be monitored by an approved supervising station in accordance with 907.~~
- ~~6. An approved sign shall be permanently displayed in elevator machine rooms and machinery spaces, the elevator machine room, elevator machinery space, elevator control space, or elevator control room in a conspicuous location with a minimum of 1½ inch letters on a contrasting background, stating:~~

NO COMBUSTIBLE STORAGE  
PERMITTED IN THIS ROOM  
By Order of the Fire Marshal [or name of fire authority]

## Chapter 35 Referenced Standards

**NFPA**

National Fire Protection Association  
1 Batterymarch Park  
Quincy, MA 02269-9101

| Standard reference number | Title | Referenced in code section number |
|---------------------------|-------|-----------------------------------|
|---------------------------|-------|-----------------------------------|

13—10 Installation of Sprinkler Systems *as amended*\* .....708.2, 903.3.1.1, 903.3.2, 903.3.5.1.1, 903.3.5.2, 904.11, 905.3.4, 907.6.3, 1613.6.3

*\*NFPA 13, Amended Sections as follows:*

8.15.5.6 Sprinklers shall be installed at the top and bottom of elevators that utilize polyurethane-coated steel belts or other similar combustible belt material.

~~Exception: Elevator cables and bolts, including counterweight cables that are limited combustible (Material).~~

8.15.5.7 The sprinkler required at the top and bottom of the elevator hoistway by 8.15.5.6 shall not be required where permitted by Chapter 30 of the California Building Code.



National Fire Protection Association  
1 Batterymarch Park  
Quincy, MA 02269-9101

| Standard reference number | Title | Referenced in code section number |
|---------------------------|-------|-----------------------------------|
|---------------------------|-------|-----------------------------------|

72—10 National Fire Alarm Code, *as amended*\* .....901.6, 903.4.1, 904.3.5, 907.2, 907.2.5, 907.2.11, 907.2.13.2, 907.3, 907.3.3, 907.3.4, 907.5.2.1.2, 907.5.2.2, 907.6, 907.6.1, 907.6.5, 907.7, 907.7.1, 907.7.2, 911.1.5, 3006.5, 3007.6

*\*NFPA 13, Amended Sections as follows:*

21.3.6 Smoke detectors shall not be installed in unsprinklered elevator hoistways unless they are installed to activate the elevator hoistway smoke relief equipment or where required by Chapter 30 of the California Building Code.

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**COMMENTS RECEIVED DURING THE 15-DAY COMMENT PERIOD.**

Subsequent to the original public comment period, text with the modifications clearly indicated, was made available to the public for a 15-day public written comment period June 16, 2011 through June 30.

[910.1, 910.2, 910.4, 910.4.1, 910.4.2]

**Additional discussion / justification made by the SFM:**

During the 15-Day Comment Period the OSFM and several members of Task Group 400 met to address concerns raised regarding the additional modifications to Section 910 that accomplish the following:

1. Removes the requirement that the fire code official must decide to allow the use of mechanical smoke exhaust in lieu of smoke/heat vents.
2. Allows the building designer or owner to determine whether smoke/heat vents or mechanical smoke exhaust system will be installed.
3. Revises the ventilation rate when mechanical smoke exhaust systems are installed for high-piled combustible storage.

Issues were raised as a result of the modified text. Those issues are as follows:

1. The local fire code official may want to be able to make the determination whether smoke/heat vents are required, or whether the alternate mechanical smoke exhaust system will be allowed. Additionally, there may be situations where the local fire code official will prefer automatic smoke/heat vents to the manually operated mechanical smoke exhaust system.

2. The mechanical smoke exhaust system will be allowed as a substitute even in non-sprinklered buildings. However, in non-sprinklered buildings, the mechanical exhaust system could pull smoke across the building and draw the fire towards the exhaust fan.

The issues were discussed and evaluated as follows:

1. The issue of code official control over whether a mechanical smoke exhaust system is allowed or not is a response to the revision in CFC Section 910.4 which reads as follows:

~~Where approved by the fire code official, e~~Engineered mechanical smoke exhaust systems shall be an acceptable alternative to smoke and heat vents.

**Response:** This revision does NOT remove or eliminate the approval authority from the fire code official. This section shifts the decision making authority from the code official to the owner and designer. The owner and designer can determine 'which method' will be used to meet the code requirements, and the code official will approve the design and installation that method.

This revision recognizes the proven fact that mechanical smoke exhaust systems are equivalent to, or better than, smoke/heat vents.

Similar to other decisions made by the owner and designer such as whether to use Type II or III construction, the decision as to whether to use smoke/heat vents or mechanical smoke exhaust system is also an owner or designer decision. Once the decision is made which method to use, the code official determines compliance with the code requirements for such a choice.

2. The issue of mechanical smoke exhaust systems in non-sprinklered buildings stems from the fact that CFC 910 applies to all situations where smoke/heat vents or mechanical smoke exhaust systems are required. Smoke and heat removal is specified in CFC Table 2306.2 and this table provides for two scenarios where sprinklers are not required, but smoke and heat removal is required. This occurs in:
  - i. Option 2 for a non-public accessible building storing Class I-IV commodities with a high-piled storage area of 2,501 to 12,000 sq.ft.
  - ii. Option 2 for a non-public accessible building storing high hazard commodities with a high-piled storage area of 501 to 12,000 sq.ft.

**Response:** Based on the proposed revision to CFC 910.4, the code will offer the option of installing a mechanical smoke exhaust system rather than smoke/heat vents in a non-sprinklered building. However, the fact that the code allows a mechanical smoke exhaust system does not necessarily mean that it will happen. Taking a look at the practical application of this requirement the only "new" buildings which would not be sprinklered would be less than 12,000 sq.ft., essentially 100' x 120'. With a storage height of 20', and the smoke/heat vent ratio of 1:100, we would need 120 sq.ft. of vent, or four 4'x8' vents. If a vent is located within the center of each quadrant of the building, the furthest distance to a vent from a possible fire location is 39 feet. In that same building, two exhaust fans could be used to be installed to meet the code requirements. When two exhaust fans are installed, the furthest distance to a fan from a possible fire location is 65 feet. This is a potential additional distance of 26 feet for the worst case situation. When considering that pre-attached hose lines are typically 150 feet or more, the 26 feet becomes insignificant.

Additionally, as the building size decreases, the potential additional distance of 26 feet shrinks. For example, a 75' x 125' building will require 3 smoke/heat vents resulting in the furthest distance to a vent from a possible fire location is 42 feet. In that same building, two exhaust fans would result in the furthest distance to a fan from a possible fire location is 49 feet. This results in a potential additional distance of only 7 feet.

Additionally, when sprinklers are not chosen as the method of protection in Table 2306.2, a fire detection system is required. So the building which does not exceed 12,000 sq.ft. will also have a fire detection system. CFC Section 2306.5 states that the fire detection system must be monitored. This monitored system will provide early notification to the Fire Department, which is beneficial particularly in areas where longer response times occur.

It must also be considered that the installation of a mechanical smoke exhaust system in a small building will be far more expensive than the installation of smoke/heat vents. The likelihood is that the owner and designer will

select smoke/heat vents to comply with the code rather than a mechanical smoke exhaust system. The revision to allow the owner/designer to choose which option to utilize recognizes the significant difference in cost and allows the owner to make the determination.

As a result of the items discussed above, it was determined that no additional revision is needed to the Modified Code Change. The revisions shown in the 15-Day Comment Period – Modifications to Express Terms for Proposed Building Standards of the Office of the State Fire Marshal Regarding the 2010 California Building Code, California Code of Regulations Title 24, Part 2, Chapter 9 do not need further revision.

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[Section 910.4]

**Name/Organization: Supervising Fire Inspector Justin Beal, Fresno Fire Department**

The change proposed above is not in conflict with, overlap, or duplicate other building standards (Item 1. from below). The inclusion of this text should continue to be required for this section, and should not be altered from the adopted model code. As noted in the International Code Council Fire Code commentary, having the text, "Where approved by the fire code official" in this section provides for, "Installation of an alternative mechanical smoke exhaust system is subject to the specific approval of the building code official and fire code official so that the design can be reviewed and the operational sequence and control information can be shared with the fire department". Re-establishing this text within the section ensures that the intent of the section is correctly applied and it provides assurances that fire department personnel will not simply have to rely on a third party engineering judgment that the system is sufficient.

In literal terms, this section would also seem to require that a fire official accept a design simply because it has been engineered, and in its current form, it removes approval discretion from the personnel who will be using this system under the worst possible circumstances.

**Response:**

The SFM disagrees with the commenter, the commenter contends that this language is needed in order for the mechanical smoke exhaust system to meet the approval of the fire code official. However, as with any fire protection system, the design and installation is subject to the approval of the fire code official.

The requirements for the mechanical smoke exhaust system are found in CFC Chapter 9 *Fire Protection Systems*. The general requirements in Section 901 apply to all fire protections systems and in CFC Section 901.2 it states:

*"The fire code official shall have the authority to require construction documents and calculations for all fire protection systems and to require permits be issued for the installation, rehabilitation or modification of any fire protection system. Construction documents for fire protection systems shall be submitted for review and approval prior to system installation."*

Therefore, the provision for fire code official approval is not lost as the commenter appears to believe. The provision which allows for the fire code official to approve the design, installation and operation of the mechanical smoke exhaust system is retained in the code. In fact, the CFC continues by providing the fire code official additional authority to require documentation from the installer/contractor in Section 901.2.1 where it states:

*"Before requesting final approval of the installation, where required by the fire code official, the installing contractor shall furnish a written statement to the fire code official that the subject fire protection system has been installed in accordance with approved plans and has been tested in accordance with the manufacturer's specifications and the appropriate installation standard. Any deviations from the design standards shall be noted and copies of the approvals for such deviations shall be attached to the written statement."*

It may be that the commenter's comment is based on a misinterpretation of the intent of the language in CFC Section 910.4. The language "where approved by the fire code official" is not intended in the CFC, or even the IFC, to ensure that the mechanical smoke exhaust system meets the approval of the fire code official. But rather, this language allows the fire code official to disallow the use of mechanical smoke exhaust system to be used in lieu of smoke/heat vents. The ability for the fire code official to disallow the installation of a mechanical smoke exhaust system to substitute for smoke/heat vents is being removed by the proposal from the State Fire Marshal's Office.

The intent of the SFM proposal is to remove the need for the building owner or designer to obtain approval from the fire code official just to utilize a mechanical smoke exhaust system. The mechanical smoke exhaust system is better

technology, and does not place firefighters at risk. The SFM proposal allows the building owner or designer to choose whether smoke/heat vents are installed or whether a mechanical smoke exhaust system is installed.

Bottom-line is that the concern expressed by the commenter in his reason statement is not lost. The ability for the fire code official to review the design and installation is still in the code, and in fact it is required as part of the construction process.

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[3006.4.1, 903.3.1.1.1, Chapter 35 Referenced Standards NFPA 13 - 8.15.5.6 and NFPA 72 – 21.3.6 ]

**Name/Organization: Brian Black, NEII Code & Safety Consultant, National Elevator Industry Inc. comments:**

The National Elevator Industry, Inc. (NEII®) strongly supports the modifications proposed to those portions of the California Building Standards Code (CBSC) that will allow the elimination of fire sprinklers in the elevator hoistway, elevator machine room, elevator machinery space, elevator control space, or elevator control room where the companion requirements of the CBSC are met [§3006.4.1, §903.3.1.1.1, Chapter 35 Referenced Standards NFPA 13 – 8.15.5.6 and NFPA 72 – 21.3.6].

We appreciate the response of the Office of the State Fire Marshal to the comments we previously submitted, and agree that the proposed modification, if adopted, will have the potential to save thousands of dollars in the elevator installation and the required annual shunt-trip inspection and testing costs. They will also have a cost benefit for businesses and building owners by allowing elevator equipment that conforms to the nationally recognized codes and standards to be installed in California. Most importantly, these savings will be achieved without compromising the safety of building occupants, first responders, firefighters or elevator personnel, ensuring that the state will maintain its traditionally high level of life safety for its citizens.

As a trade association founded on the principle of providing safe building transportation for elevator riders and the general public, NEII® shares the goal of the California Building Standards Commission for building codes and standards that ensure such safety. We thank the Commission for its consideration of our comments and concerns in this rulemaking cycle.

**Response:**

The SFM acknowledges the commenter's acceptance of the proposed amendments to the California Building Standards Code and further acknowledges the commenter's appreciation of the SFM code development process. The SFM appreciates the opportunity to work with the National Elevator Industry to produce the final proposals and looks forward to working with NEII in future rulemaking endeavors as technology advances.

**DETERMINATION OF ALTERNATIVES CONSIDERED AND EFFECT ON PRIVATE PERSONS**

(Government Code Section 11346.9(a)(4))

The SFM has determined that no alternative considered would be more effective in carrying out the purpose for which the regulation is proposed or would be as effective and less burdensome to affected private persons than the adopted regulation.

**REJECTED PROPOSED ALTERNATIVE THAT WOULD LESSEN THE ADVERSE ECONOMIC IMPACT ON SMALL BUSINESSES**

(Government Code Section 11346.9(a)(5))

No proposed alternatives were received by the SFM.

**COMMENTS MADE BY THE OFFICE OF SMALL BUSINESS ADVOCATE**

(Government Code Section 11347.6)

No comments were received from the Office of Small Business Advocate.