M E M O R A N D U M

To: Partnership for Safer Buildings Date: 21 March 2003

From: Codes Assessment Subcommittee
Walter Smittle III, Chairman

Re: Building Code Fire Safety Concerns:
NFPA 5000, Building Construction and Safety Code

This is the second report of the Codes Assessment Subcommittee of the Partnership for Safer Buildings, which has been tasked with reviewing the major model building codes for concerns about fire safety.

The following comments are in reference to the National Fire Protection Association (NFPA) 5000™, Building Construction and Safety Code™ 2003 edition. The NFPA 5000 Code™ was issued in October 2002, and had not been adopted by any jurisdictions during the time of our inquiry. Moreover, no buildings would have been built to its specifications at this time.

The provisions of NFPA 5000™ regarding reduction in passive fire protection are somewhat consistent with the International Building Code (IBC) provisions identified previously by the Codes Assessment Committee (see report of 11 October 2002). The concerns represent a compilation of comments received from Partnership members and are addressed by chapter. The concerns about assembly occupancies (Chapter 16) on page 4 may be of special interest, given the attention to these occupancies since the Rhode Island nightclub tragedy of February 2003.

Chapter 5: Performance-Based Option

Performance-based codes, as opposed to prescriptive codes, have been advocated as allowing more flexibility in meeting requirements, thus resulting in significant cost savings and possibly even improved safety and protection. However – as the Partnership's On-Site Inspections Subcommittee has observed – in practice, performance-based (PB) design can result in much more dangerous situations if the scenario for which

the building is designed changes without a corresponding change in fire protection features.

The Partnership's collective opinion is that, while PB design can work if used properly, there are enough concerns about its implementation that it is premature for PB codes to be an acceptable option to prescriptive codes. The reasons for this include the fact that the international fire research community agrees that the models available for PB design are not yet ready; that the data does not yet exist to support the models on issues such as the flammability characteristics of building contents; and code enforcement officials are not adequately trained to ensure that the codes are applied adequately to PB design proposals. The Society of Fire Protection Engineers (SFPE) has set up task groups that are addressing several of these issues.

Recommended code change: *Discuss the Partnership concerns about PB design with NFPA, the International Code Council (ICC) and SFPE. If we are unable to obtain the answers we seek, consider proposing the withdrawal of the PB option until the problems with its implementation are adequately addressed by the SFPE review. (This recommendation also applies to NFPA 5000; NFPA 1, the Fire Prevention Code; and NFPA 101, the Life Safety Code.)*

Note: if the Partnership decides not to accept the above recommendation, then the following is offered as an alternative:

Section 5.5.2.8, Fire Design Scenario 8. Design Scenario 8 implies that if performance-based design is conducted on the building, then one must consider those events when a fire protection system is rendered ineffective. However, the section contains language that this scenario need not be considered if the local official has accepted the level of performance and reliability of a single system ("This scenario shall not be required to be applied to fire protection systems or fire protection features for which both the level of reliability and the design performance in the absence of the system or feature are acceptable to the authority having jurisdiction."). This allows performance-based design or fire protection engineering to be conducted for buildings while relying on a single fire protection system and adds an exemption from Design Scenario 8.

Recommended code change: *Modify language to require Design Scenario 8 to always be considered with performance-based design for high-risk, high-occupancy buildings or other critical buildings.*

Chapter 7: Construction Types and Height and Area Requirements

Table 7.2.2, Fire Resistance Ratings for Type I through Type V Construction (hr). Type V construction is defined as "that type in which exterior wall, bearing walls, columns, beams, girders, trusses, arches, floors and roofs are entirely or partially of wood or other approved material." Given the homeland security problems facing this country, the subcommittee asks whether Type V (000) construction would be appropriate for

occupancies outside the classification for dwellings. The same concern exists for Type II (000) and Type III (200).

Recommended code change: *Upgrade Type V (000), Type II (000) and Type III (200) constructions to a minimum fire resistive construction or deleted from use by occupancies under the Partnership charter.*

Section 7.2.3.2.9, Roofs 20 feet (6m) or More Above Any Floor. This requirement exempts fire protection of structural members for roof construction, including protection of roof framing and decking, when all parts of the roof construction are 20 feet or more above any floor immediately below, in all occupancies except hazardous mercantile, industrial, storage and other occupancies with high hazard concerns exceeding maximum allowable quantities per control.

Recommended code change: *Remove this exemption.*

Table 7.4.1, Height and Area Requirements. This table identifies the types of construction and permitted square footage when sprinkler or non-sprinkler protection is in effect. Heights are allowed with and without sprinklers that exceed the current building codes' allowable heights (including the Uniform Building Code [UBC]). Areas are allowed with no sprinklers that exceed those areas permitted in current codes (including the UBC).

Type V Construction, specifically Type V (000), is permitted for most occupancies with limited square footage. In comparing the International Building Code (IBC) and NFPA 5000, the following is noted for mercantile occupancies: IBC permits a Type V (A) construction 3-story building with 1-hour protected construction at 14,000 feet per floor; and NFPA 5000 permits a 4-story building at 14,000 square feet per floor with sprinklers and only a 3-story building without sprinkler protection. Area modification to the IBC is permitted per Section 506, and NFPA permits area increase per Section 7.6. Business occupancies for IBC for Type V (A) construction permits 3 stories at 18,000 square feet per floor, and NFPA (111) permits 4 floors at 18,000 square feet per floor with sprinkler protection and only 3 floors without sprinkler protection. Similarities are noted throughout the remaining code requirements for the various occupancies. Basically, the codes are parallel in area and height limitations.

Recommended code change: *Modify the current chart to restrict the use of construction type for Type II (000) and Type V (000) for occupancy. The use of this type of construction is appropriate for non-occupied buildings or structures. Passive fire protection should not be less than one hour for these structures for occupancy. Therefore, inserting the NP for these types of construction is recommended.*

Section 7.5.2, Residential Sprinkler Increase. NFPA 13R (not full coverage) is allowed to be used in residential occupancies for heights up to 4 stories or 60 feet.

Recommended code change: *Add a new paragraph (b) and renumber first paragraph (a). New language for paragraph (b) will read, "Residential occupancies of Construction Type II (000) and Type II (200) shall be upgraded to require the columns and beams to be protected with a minimum of one-hour fire resistive construction, and Type V (000) shall not be permitted.*

Section 7.6.2.2, Automatic Sprinkler Increase. Maximum allowable areas per floors can be increased by 200% for multiple-story buildings and by 300% for single-story buildings with sprinklers (meaning that building areas will exceed most current approved maximum areas per floor and per building – including the UBC).

Recommended code change: *Add a statement to require the passive fire protection to be upgraded by one hour for increases over 200% per floor area for multistory buildings and the same for 300% increase in area for single-story buildings.*

Section 7.6.3.4, Two-Story Building. Two-story unlimited area buildings are allowed for business, industrial and mercantile occupancies with sprinklers (with 60-ft. frontage, irrespective of construction).

Recommended code change: *Add the sentence "Passive fire protection shall be provided for at least one hour on beams, columns and floor-ceiling assemblies."*

Chapter 16: Assembly Occupancies

In light of the nightclub fire in Rhode Island on February 20, 2003, there has been heightened attention to the fire protection code provisions for assembly occupancies. In addition to the specific code changes outlined below, the committee recommends the following based on input from the Partnership:

- Given the need to eliminate ignition sources from hazardous areas, pyrotechnics should be prohibited in clubs or "small" enclosed places of entertainment; for other venues, pyrotechnics displays should be limited to those places that contain the appropriate fire suppression systems and comply with interior finishing standards.

- Given that enforcement of building capacity is difficult, building owners should be required to provide adequate exit capacity assuming a worst-case scenario, e.g., the building is full, with "standing room only" crowds.

- "Grandfathering" (i.e., the practice of exempting existing buildings from new code requirements) should be discontinued for assembly occupancies. Similarly, any code language applying to the rehabilitation of existing buildings should be no less stringent than that for new construction.

- The Partnership supports the decision of the NFPA Technical Committee on Assembly Occupancies which voted, at its meeting on March 13, 2003, to issue a Tentative Interim Amendment (TIA) to NFPA 101-2003 to require sprinklers in

existing assembly occupancies. (Note: the minutes of that meeting can be accessed at http://www.nfpa.org/Research/fireinvestigation/rislandfire/RIFire.asp.) However, while the NFPA Committee agreed to limit the applicability of the requirement to "clubs with live entertainment, dance halls, discotheques, and popular music halls with occupant loads of more than 300," the Partnership believes that occupant load above which sprinklers are required should be lowered 100.

Additional recommendations are as follows:

Table 16.1.5.2, Construction Type Limitations. This table contains a footnote (marked by †) that exempts protection of structural members including columns when supporting roofs 20 ft or higher (in Type I and Type II construction.) This section actually stops the fireproofing of columns at 20 ft and allows portions of columns above 20 ft to be left unprotected. This provision came from NFPA 101; however, it does not make sense to partially protect columns.

Recommended code change: *Remove this exemption.*

Section 16.3.3, Interior Finish. Interior finish requirements in section 16.3.3.2 apply only to corridors, lobbies and enclosed stairways.

Recommended code change: *Modify Section 16.3.3.2 to require interior finish requirements in all areas of assembly buildings. Delete Section 16.3.3.3.*

Section 16.3.6, Corridors. Exceptions 2, 4, and 5 remove requirements for corridor and lobby fire protection for interior corridors when the building is protected with a sprinkler system, or when the corridor walls terminate at ceiling with a 1-hour assembly, or when a complete smoke detection system with occupant notification is provided.

Recommended code change: *Require at least a 30-minute fire barrier.*

Section 16.4.5.1, Platform Construction. Temporary platforms are allowed to be constructed of any materials.

Recommended code change: Temporary platforms used as a stage or part of a stage need to meet the stage requirements in Section 16.4.5.2.

Chapter 18: Educational Occupancies

Section 18.3.6, Corridors. Corridor protection of 1 hour is required except for where the occupied area has at least a door to the outside or sprinkler protection is required.

Recommended code change: *Require at least a 30-minute fire barrier in corridors that have at least a door to the outside or sprinkler protection.*

Chapter 19: Health Care Occupancies

Section 19.3.6.2, Corridors. This section does not require corridor walls to be of any fire resistive construction. A sprinkler system for health care occupancies is required; therefore, passive fire barrier construction for corridor walls is not required. Minimum construction requirements are reflected in *Section 19.1.6*.

Recommended code change: *Require at least a 30-minute fire barrier.*

Chapter 27: Mercantile Occupancies

Section 27.3.6.1, Corridors. This section requires 1-hour corridor protection unless one of three exemptions is met. Is it realistic to have total dependence on a sprinkler system, or exits from an open floor area or occupied by a single tenant?

Recommended code change: *Remove this exemption.*

Chapter 28: Business Occupancies

Section 28.3.6.1, Corridors. This section requires 1-hour corridor construction unless one of three exceptions is met. Is the reduction in corridor protection justified?

Recommended code change: *Remove this exemption.*

Chapter 33: High-Rise Occupancies

S*ection 33.1.3, Construction Requirements,* allows for reductions in *Table 7.2.2, Fire Resistance Ratings for Type I through V*. *Table 7.4.1, Height and Area Limitations,* identifies what may be permitted based upon the occupancy. How much should passive fire protection be reduced in the world we live in today with the potential for catastrophic acts of terrorism?

Recommended code changes: *In Section 7.5, Height Increases Permitted: Add language to the end of Section 7.5.1 to read, "…and passive fire protection shall be increased by one hour when the height increases as permitted. Exception: industrial and storage occupancies." In Section 7.6, Area Increases Permitted, add a statement at the end of Section 7.6.1 to read, "At no time shall passive fire protection be less than one hour on beams, columns and floor/ceiling assembly ratings when occupied. Exception: industrial and storage occupancies."*

Section 33.1.3.2 allows Type I (442, 332) construction of high-rise buildings with sprinkler control valves with supervisory initiating devices used on every floor to be reduced to Type II (222) construction.

Recommended code change: *Remove the language allowing reduction to Type II (222) construction.*

Section 33.1.3.3 allows reduction of Type II (222) to Type II (111) construction of high-rise buildings less than 120 ft in height (except column ratings remain at 2 hrs.) again with sprinkler control valves with supervisory initiating devices used on every floor.

Recommended code change: *Remove the language allowing reduction to Type II (111) construction.*

Passive Fire Protection

During the last several decades the codes have gradually eroded away passive fire protection in the name of active fire protection. The National Association of State Fire Marshals' position is to have a combination of active and passive fire protection. Redundant systems effectively protect people, property and the firefighters who must respond to the real-world emergencies. The On-Site Inspections Subcommittee found several instances in which fire walls and fire-resistive coatings were compromised with no requirements for continual maintenance. Therefore, the Subcommittee recommends that a new requirement entitled "Passive Fire Protection" be added to both the NFPA and ICC building or fire codes, wherever it is most appropriate, which states: *Passive fire protection for construction types shall be inspected annually and repairs made to ensure construction classification.*