



Recommendations—NIST Investigation of The Station Nightclub Fire

Recommendation 1. Model Code Adoption and Enforcement: NIST recommends that all state and local jurisdictions:

- a) adopt a building and fire code covering nightclubs based on one of the national model codes (as a minimum requirement) and update local codes as the model codes are revised;
- b) implement aggressive and effective fire inspection and enforcement programs that address: (i) all aspects of those codes; (ii) documentation of building permits and alterations; (iii) means of egress inspection and record keeping; (iv) frequency and rigor of fire inspections, including follow-up and auditing procedures; and (v) guidelines on recourse available to the inspector for identified deviations from code provisions; and
- c) ensure that enough fire inspectors and building plan examiners are on staff to do the job and that they are professionally qualified to a national standard such as NFPA 1031 (Professional Qualifications for Fire Inspector and Plan Examiner).

Recommendation 2. Sprinklers: NIST recommends that model codes require sprinkler systems according to NFPA 13 (Standard for the Installation of Sprinkler Systems), and that state and local authorities adopt and aggressively enforce this provision:

- a) for all new nightclubs regardless of size, and
- b) for existing nightclubs with an occupancy limit greater than 100 people.

Recommendation 3. Finish Materials and Building Contents: NIST recommends that:

- a) state and local authorities adopt and aggressively enforce the existing provisions of the model codes;
- b) non-fire retarded flexible polyurethane foam, and other materials that ignite as easily and propagate flames as rapidly as non-fire retarded flexible polyurethane foam: (i) be clearly identifiable to building owners, operators, contractors and authorities having jurisdiction (regulatory agencies); and (ii) be specifically forbidden, with no exceptions, as finish materials from all new and existing

nightclubs;

c) NFPA 286 (Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth) be modified to provide more explicit guidance for when large-scale tests are required to demonstrate that materials (other than those already forbidden in b above) do not pose an undue hazard for the use intended; and

d) ASTM E-84 (Standard Test Method for Surface Burning Characteristics of Building Materials), NFPA 255 (Standard Method of Test of Surface Burning Characteristics of Building Materials), and NFPA 286 be modified to ensure that product classification and the pass/fail criteria for flame spread tests and large-scale tests are established using the best measurement and prediction practices available.

Recommendation 4. Indoor Use of Pyrotechnics: NIST recommends that NFPA 1126 (Use of Pyrotechnics before a Proximate Audience) be strengthened as described below, and that state and local authorities adopt and aggressively enforce the revised standard.

a) Pyrotechnic devices should be banned from indoor use in new and existing nightclubs not equipped with an NFPA 13 compliant automatic sprinkler system.

b) NFPA 1126 should be modified to include a minimum occupancy and/or area for a nightclub below which pyrotechnic devices should be banned from indoor use, irrespective of the installation of an automatic sprinkler system.

c) Plans for the use of indoor pyrotechnics in new and existing nightclubs should be posted on site; and in addition to the items listed in paragraph 4.3.2 of NFPA 1126, should describe the measures that have been established to provide crowd management, security, fire protection, and other emergency services.

d) Section 6.6.2 of NFPA 1126 should be modified to require the minimum clearance between (i) the nearest fixed or moveable contents, and (ii) any part or product (igniter, spark, projectile, or debris) of a pyrotechnic device permitted for indoor use in new and existing places of assembly, to be twice the designed projection of the device, until such time that studies show that a smaller minimum clearance can guarantee safe operation in spite of the possibility that building decorations or temporary features that greatly exceed flame spread or fire load provisions of the fire code may occur.

Recommendation 5. Occupancy Limits and Emergency Egress: NIST recommends that the factor of safety for determining occupancy limits of all new and existing nightclubs be increased in the model codes in the following manner, and that state and local authorities adopt and aggressively enforce the following provisions:

- a) Within the model codes, establish the threshold building area and occupant limits for egress provisions using best practices for estimating tenability and evacuation time; and, unless further studies indicate another value is more appropriate, use 1-1/2 minutes as the maximum permitted evacuation time for nightclubs similar to or smaller than The Station.
- b) Compute the number of required exits and the permitted occupant loads assuming at least one exit (including the main entrance) will be inaccessible in an emergency evacuation.
- c) For nightclubs with one clearly identifiable main entrance, increase the minimum capacity of the main entrance to accommodate two-thirds of the maximum permitted occupant level (based upon standing space or festival seating, if applicable) during an emergency.
- d) Eliminate trade-offs between sprinkler installation and factors that impact the time to evacuate buildings.
- e) Require staff training and evacuation plans for nightclubs that cannot be evacuated in less than 1-1/2 minutes.
- f) Provide improved means for occupants to locate emergency routes—such as explicit evacuation directions prior to the start of any public event, exit signs near the floor, and floor lighting—for when standard exit signs become obscured by smoke.

Recommendation 6. Portable Fire Extinguishers: NIST recommends that a study be performed to determine the minimum number and appropriate placement (based upon the time required for access and application in a fully occupied building) of portable fire extinguishers for use in new and existing nightclubs, and the level of staff training required to ensure their proper use.

Recommendation 7. Emergency Response: To ensure an effective response to a rapidly developing mass casualty event, NIST recommends that state and local authorities adopt and adhere to existing model standards on communications, mutual aid, command structure and staffing, such as:

- a) NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems
- b) NFPA 1561, Standard on Emergency Services Incident Management Systems
- c) NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments

d) NFPA 1720, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments

Recommendation 8. Research on Human Behavior: NIST recommends that research be conducted to better understand human behavior in emergency situations, and to predict the impact of building design on safe egress in fires and other emergencies (real or perceived), including the following:

- a) the impact of fire products (gases, heat, and obscuration) on occupant decisions and egress speeds;
- b) exit number, placement, size and signage;
- c) conditions leading to and mitigating crowd crush;
- d) the role of crowd managers and group interactions;
- e) theoretical models of group behavior suitable for coupling to fire and smoke movement simulations; and
- f) the level of safety that model codes afford occupants of buildings.

Recommendation 9. Research on Fire Spread and Suppression: NIST recommends that research be conducted to understand fire spread and suppression better in order to provide the tools needed by the design profession to address recommendations 2, 3 and 5, above. The following specific capabilities require research:

- a) prediction of flame spread over actual wall, ceiling and floor lining materials, and room furnishings;
- b) quantification of smoke and toxic gas production in realistic room fires; and
- c) development of generalized models for fire suppression with fixed sprinklers and for firefighter hose streams.

Recommendation 10. Research on Computer-aided Decision Tools: NIST recommends that research be conducted to:

- a) refine computer-aided decision tools for determining the costs and benefits of alternative code changes and fire safety technologies; and
- b) develop computer models to assist communities in allocating resources (money and staff) to ensure that their response to an emergency with a large number of casualties is effective.

[Also see NIST Construction Safety Investigations](#)

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