

To stay or not to stay: egress and the I-Codes

Following all major tragedies, code-making bodies are faced with numerous code change proposals; in the wake of Sept. 11, emergency egress took the lion's share of the attention.

By Gary Lewis, Chief Inspector, City of Summit, N.J. -- Consulting-Specifying Engineer, 5/1/2008 1:00:00 AM

About 30 years ago, the nation suffered a tragedy known as the Beverly Hills Supper Club fire, in which 165 club patrons lost their lives. As happens so frequently following a tragedy, fire codes were consequently strengthened to prevent such an event from recurring.

Fast forward to the World Trade Center (WTC) bombing in 1993, the Oklahoma City bombing in 1995, and then the events of September 2001. It is understandable that high-rise occupants no longer wish to remain inside a structure in the case of an emergency. As the [Final WTC Report by the National Institute of Standards and Technology](#) (NIST) found, some WTC occupants received conflicting instructions during the incident regarding whether to evacuate or remain in place.

As was the case following previous tragedies with large loss of life, the [International Code Council](#) (ICC) was faced with a number of building code change proposals after Sept. 11 from well-meaning parties looking to prevent similar occurrences. The ICC subsequently appointed an Ad Hoc Committee on Terrorism Resistant Buildings to review the NIST study and evaluate its 30 recommendations for potential modifications to the ICC's model codes to achieve a deliberate, measured response to the lessons learned. Needless to say, egress received the lion's share of attention.

The International Building Code (IBC) already has been modified (2007 Supplement) as a result of the committee's efforts to require—for the first time ever—an additional stair in all super high-rise buildings (greater than 420 ft.) over and above the minimum required number of exits. The extra stair is necessary to address fire department counterflow and the potential for one or more of the other required stairs being compromised and unavailable as a result of an intentional act.

Counterflow is the common scenario where downward occupant movement (egress) comes into direct conflict with upward emergency responder movement and equipment. Studies conclude that the typical 44-in.-wide stair is too narrow for effective side-by-side movement—imagine how much slower that travel speed is when facing fully geared firefighters and equipment coming up the stairs. “Compromised stairs” is a polite means to describe the possible destruction of one or more stair towers as part of an intentional act attempting to cause damage and loss of life.

A second post-WTC achievement is a committee proposal that requires the marking of stairwells and exit paths with photoluminescent markings to help guide evacuees down multiple stair runs in potentially limited lighting. The committee now seeks to make this the first truly retroactive requirement for high-rise structures already in existence.

The ICC also is considering a number of related proposals affecting high-rise and super high-rise building fire and life safety. The current methodology for determining the minimum distance between exit accesses does not require commensurate consideration of the physical distance between the actual stair tower enclosures; rather, it is measured from the exit access doorways. Therefore, the two required stair enclosures, even in a super high-rise building, potentially could be placed abutting one another. Given that there is no structural standard for the stair tower integrity (another Ad Hoc committee recommendation), a deliberate event that seeks to maximize life loss through the disabling of exit routes could compromise both exit stairs in a single event. The Ad Hoc committee seeks to require certain minimum physical separation between the towers as well as the access doors to maximize the likelihood of an event not compromising more than one stair tower.

Opponents of the additional stair point out correctly that above a certain number of stories, full-building evacuation via stairs becomes difficult at best, if not impractical. The Ad Hoc Committee has supported the current proposal for a water-resistant fire service elevator (see “[Rethinking high-rise egress, top to bottom](#)”). The committee also supported exploring the potential use of hardened elevators for occupant egress. But there is still much research to do before the technology is ready for the building code.

Needless to say, there are many other building considerations that can impact the efficacy of a building evacuation, partial or otherwise. In conjunction with recommendations from the NIST study, ICC is considering a full gamut of proposals ranging from structural enhancements to prevent disproportionate collapse, to enhanced situational awareness for emergency responders, to a full threat-and-risk-based assessment of structures on an individual basis. Measures to increase the reliability of fire sprinkler operation also have been proposed to minimize the probability that a deliberate event would be able to disable the active fire protection.

All of these provisions represent strategies the code can undertake to ensure the additional egress time is available for full-building evacuation if needed. They understandably also amount to greater design limitation and greater expense than the current codes prescribe. The ICC process has thus far been very deliberative and respectful of both objectives. The final outcome will be a balanced, thoughtful approach to the complex issues at hand, and in the end that occupants of super-high-rise buildings going forward will be markedly safer as a result.

Author Information

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At a glance

In the wake of Sept. 11, the International Code Council appointed an Ad Hoc Committee on Terrorism Resistant Buildings. As a result of the committee's efforts, the International Building Code was modified to require an additional stair, over and above the minimum required number of exits, in buildings taller than 420 ft. The committee also ruled that stairwells and exit paths must be marked with photoluminescent guides to help evacuees.

Terrorism protection: building codes or risk assessment?

There has been a stunning amount of research dating back to the Oklahoma City Murrah Office Building bombing, driven by both the private and public sector. Among the most comprehensive was the NIST World Trade Center Study and Recommendations following the Sept. 11 tragedy. Teams of experts analyzed virtually every facet of building performance, occupant behavior, and emergency operations, producing 30 recommendations.

The model code community has been responsive on balance to the NIST study and recommendations. The International Code Council currently has two committees dealing with the appropriate level of response to the report. Both committees have concluded that a number of the NIST recommendations are clearly outside the scope of the model code purview, and represent needed modifications within the standards industry. Those aside, ICC still has approximately 16 building performance areas in which building or fire code amendments are being sought.

A continuous underlying theme, however, is what types of buildings exactly are duly classified as targets, and what range of hazards are appropriate to protect against? The model codes currently do not allow a community to apply varying standards to buildings in the same overall classification. In other words, there is no accounting for relative threat hazards.

An alternate point of view gaining some momentum is to require, on buildings inside a particular subset, a thorough threat analysis by a qualified entity, followed by a risk analysis and mitigation plan where a threat is deemed credible. This approach would relieve many building owners from what may be viewed as punitive measures for buildings of low risk, if such measures were located in the building code. It also opens the door to much more tailored solutions and a potential wiser use of protection resources.

To that end, the ICC has taken the first step towards allowing use of the ICC Performance Code for design of super-high-rise structures. It will no doubt be an arduous debate between what ought to be required versus what hazards owners should be directed to address on a case-by-case basis.