

8.3.3 Interaction of Professions in Design

The structural, fire protection, mechanical, architectural, blast, explosion, earthquake, and wind engineering communities need to work together to develop guidance for vulnerability assessment, retrofit, and the design of concrete and steel structures to mitigate or reduce the probability of progressive collapse under single- and multiple-hazard scenarios.

An improved level of interaction between structural and fire protection engineers is encouraged. Recommendations are to:

- Consider behavior of the structural system under fire as an integral part of the design process.
- Provide cross-training of fire protection and structural engineers in the performance of structures and building fires.

8.3.4 Fire Protection Engineering Discipline

The continued development of a system for performance-based design is encouraged. Recommendations are to:

- Improve the existing models that simulate fire and spread in structures, as well as the impact of fire and smoke on structures and people.
- Improve the database on material burning behavior.

8.3.5 Building Evacuation

The following topics were not explicitly examined during this study, but are recognized as important aspects of designing buildings for impact and fire events. Recommendations for further study are to:

- Perform an analysis of occupant behavior during evacuation of the buildings at WTC to improve the design of fire alarm and egress systems in high-rise buildings.
- Perform an analysis of the design basis of evacuation systems in high-rise buildings to assess the adequacy of the current design practice, which relies on phased evacuation.
- Evaluate the use of elevators as part of the means of egress for mobility-impaired people as well as the general building population for the evacuation of high-rise buildings. In addition, the use of elevators for access by emergency personnel needs to be evaluated.

8.3.6 Emergency Personnel

One of the most serious dangers firefighters and other emergency responders face is partial or total collapse of buildings. Recommended steps to provide better protection to emergency personnel are to:

- Have fire protection and structural engineers assist emergency personnel in developing pre-plans for buildings and structures to include more detailed assessments of hazards and response of structural elements and performance of buildings during fires, including identification of critical structural elements.
- Develop training materials and courses for emergency personnel with regard to the effects of fire on steel.
- Review collaboration efforts between the emergency personnel and engineering professions so that engineers may assist emergency personnel in assessments during an incident.