

CHAPTER II Operations

Rev. 6/88

SUBJECT 3 Emergency Operations**TOPIC 9 Structural Collapse****A. SCOPE**

In recent times, structural collapse has been a leading cause of serious injuries and death to fire fighters. For this reason the possibility of structural collapse should be a major consideration in the development of any tactical plan.

B. PRIORITIES

Priorities at the scene of structurally unsafe buildings.

1. Determine structural stability of building before allowing fire fighters to conduct interior fire fighting.
2. A knowledge of various types of building construction can be invaluable to the fire officers as well as all fire fighters. Certain types of construction can be expected to fail sooner than others, e.g. under fire conditions, light weight truss and bar joist roof construction can be expected to fail after minimal fire exposure.

C. SAFETY

Structures have been known to collapse without warning, but usually there are signs which may tip off an alert Fire Officer. Action might be taken to avert any imminent hazard.

TELL TALE SIGNS OF BUILDING COLLAPSE:

1. Cracks in exterior walls.
2. Bulges in exterior walls.
3. Sounds of structural movement are creaking, groaning, snapping, etc.
4. Smoke or water leaking through walls.
5. Flexible movement of any floor or roof where fire fighters walk.

C. SAFETY (CONT)

Rev. 8/89

6. Interior or exterior bearing walls or columns - leaning, twisting or flexing.
7. Sagging or otherwise distorted rooflines.

D. CONSTRUCTION FEATURES THAT CAN CONTRIBUTE TO BUILDING COLLAPSE

Some construction features that have been known to fail prematurely or to contribute to early structural failure when affected by fire.

1. Parapet Walls.
2. Large open (unsupported) areas, e.g. supermarkets, bowling alleys, warehouses, etc.
3. Large signs or marquees, which may pull away from weakened walls.
4. Cantilevered canopies, which usually depend on the roof for support and may collapse as the roof fails.
5. Ornamental or secondary front or sidewalls, which may pull away and collapse.
6. Buildings with light weight truss, bar joist, or bow string truss roofs.
7. Buildings supported by unprotected metal - beams, columns, etc.

Buildings containing one or more of the above features must be constantly evaluated for collapse potential. These evaluations should be of major consideration toward determining the tactical mode, i.e. OFFENSIVE/DEFENSIVE.

E. RESPONSIBILITY

It is a principal command responsibility to continually evaluate and determine if the fire building is tenable for interior operations. This ongoing evaluation of structural/fire conditions requires the input of persons in charge of fire companies advising Command of conditions in their area of operations.

F. COLLAPSE CAUSED BY FIRES

Rev. 6/88

1. Structural collapse and/or partial collapse (stairs, floors) is always a possibility when a building is subject to intense fire. If fire is allowed to affect a structure long enough, some structural failure is inevitable, weight of water and/or firefighters can further compromise the integrity of structures and/or appendages (fire escapes).
2. Regardless of the age and exterior appearance of the building, there is always the possibility that a principal structural supporting member is being seriously affected by heat and may collapse suddenly, inflicting serious injury to fire fighters.

Example: A 100' length of unprotected steel will expand 9" when heated to 1100° F.

3. Structures of ordinary construction can be expected to fail after approximately twenty minutes of heavy fire involvement. Fire resistive, and heavy timber construction will withstand the effects of fire for a longer period of time. Buildings of unprotected non-combustible construction may collapse in less than 20 minutes.

If after 10-15 minutes of interior operations, heavy fire conditions still exist, command should initiate a careful evaluation of structural conditions, and should be fully prepared to withdraw interior fire companies and resort to a defensive position.

4. If structural failure of a building or section of a building appears likely, a perimeter must be established a safe distance from the area which may collapse. All personnel must remain outside this perimeter. Fire apparatus must also be moved outside this perimeter.

G. OTHER CAUSES OF COLLAPSE

1. Dilapidated buildings usually vacant/condemned structures that have been abandoned by owners, are usually opened to the elements, and no maintenance is performed on them. After a period of years they become structurally unsound and portions of the building sometimes collapse.

G. OTHER CAUSES OF COLLAPSE (continued)

Rev. 6/88

2. Collapse due to nature, e.g. Tornados, Earthquakes, Lightning Strikes and Floods.
3. Buildings struck by auto's, etc.
4. Explosions.

H. OPERATIONS AT BUILDINGS THAT HAVE COLLAPSED

1. Determine if there are victims in collapsed structure.
2. Determine if collapsed structure is safe enough to allow fire fighters to search for victims.

When working in collapsed structures, members shall support and shore access way as they progress.
3. Command must secure proper equipment to insure safety of fire personnel as well as to properly conduct search and possible rescues.
4. Make sure all natural gas and electric service is shut off to collapsed structures before allowing fire fighters to enter area of rubble.