TOPIC: INDICATIONS OF POTENTIAL BUILDING COLLAPSE

TIME FRAME: :45

LEVEL OF INSTRUCTION: Level I

BEHAVIORAL OBJECTIVE:

Condition: A written quiz

Behavior: The student will list and describe indications of potential building collapse.

Standard: With a minimum of 80% accuracy

MATERIALS NEEDED:

- 1 per student, printed copy of current 1738 section of the 1700 CAL FIRE Safety Handbook
- Appropriate visual aids
- Audio visual equipment

REFERENCES:

- Building Construction for Fire Suppression Forces, National Fire Academy
- Fire Protection Handbook, NFPA, 16th Edition, Section 7, Chapters 8, 17
- Basic Urban Search and Rescue, USAR 1990, Structural Hazard Identification at the Urban Search and Rescue Site, D.J. Hammond
- IFSTA 5th Edition, Essentials of Fire Fighting, Chapter 4

PREPARATION: During emergency incidents such as fires, floods, earthquakes, or any other major disaster, the strength of the construction materials used in the involved buildings can be greatly compromised. It is imperative that fire personnel have a basic understanding of the indicators of a potential building collapse if they are to safely conduct emergency operations.

PRESENTATION	APPLICATION
I. INDICATORS OF COLLAPSE DUE TO FIRE	
A. General indicators for all building construction types	What are some of the indicators of building collapse during a fire?
1. Sagging floors and or roofs	
2. Spongy floors and or roofs	
3. Out of plumb, bulging or leaning walls	
4. Abnormally tight doors and or windows	
5. Windows removed from the fire breaking without apparent cause	
6. Direct flame impingement on floor, walls or roof	
7. Large volume of fire in relation to size of room or building	
8. Smoke showing through walls low in structure (potential backdraft)	
9. Fire venting self through windows, doors and or roof	
10. Fire which has been burning for an unknown or extended period of time	
11. Cracking, groaning or creaking noises	
B. Specific indicators for various building construction types	
1. Masonry construction	Information sheet #1
a. Unreinforced (pre 1933)	

PRESENTATION	APPLICATION

(1) Rafter tie plates and bars protruding from wall

(2) Rafter tie plates and bars pulled back into wall

(3) Cracks running full wall height

(4) Numerous individual bricks fragmenting or breaking in a highly localized area

(5) Separation of sections of plaster overcoat

b. Reinforced masonry

(1) Damage occurs after prolonged exposure of 450° F

(2) Cracks running full wall height generally along mortar lines

(3) Reinforcing rods or bars are visible

(4) Separation of sections of plaster overcoat from underlying wall

2. Unprotected steel construction

a. Warping, sagging, or distortion of steel support members

(1) Begins to weaken at 500° F

(2) Begins to fail at 1000° F

b. Roughened appearance of steel support members

c. Cracking of columns, corbels and beams particularly in precast structures

PRESENTATION	APPLICATION
d. Cracking of welds	
II. INDICATORS OF COLLAPSE DUE TO EARTHQUAKE, TORNADO, EXPLOSION, OR OTHER MAJOR DISASTER	Information sheet #2
A. General Indicators for all building construction types	
1. Out of plumb, bulging or leaning walls	
2. Sagging floors or roofs	
3. Spongy floors or roofs	
4. Abnormally tight doors and or windows	
5. Windows periodically breaking without apparent cause	
6. Cracking, groaning or creaking noises	
7. Collapsed, broken, cracked or separated chimney	
8. House sliding off foundation	
B. Specific indicators for various building construction types	
1. Masonry construction	
a. Unreinforced (pre 1933)	
(1) Rafter tie plates protruding from wall	
(2) Rafter tie plates pulled back into wall	
(3) Cracks running full wall height	

PRESENTATION	APPLICATION

(4) Numerous individual bricks fragmenting or breaking in a highly localized area

(5) Separation of large sections of plaster from underlying masonry wall

b. Reinforced

(1) Cracks running full wall height

(2) Reinforcing rods or bars exposed

(3) Separation of large sections of plaster overcoat from underlying wall

(4) Separation of one course or layer of bricks or blocks from underlying courses or layers

(5) Parapets and or cornices separated, cracked or fallen from building

(6) Cracked corners

2. Steel construction

a. Cracking in slabs adjacent to columns

b. Broken or damaged connection between wall and floor

c. Loose or broken connection between beams and columns

d. Badly cracked walls, columns or corbels

e. Broken welds at beam to column connections

PRESENTATION	APPLICATION

III. INDICATORS OF COLLAPSE DUE TO WATER (FLOOD, FIRE STEAMS, ETC.)

A. General indicators for all building construction types

1. Sagging floors or roofs, or ceilings
2. Spongy floors or roofs
3. Out of plumb, bulging, or leaning walls
4. Cracking, groaning or creaking noises
5. Water confined to some depth within structure
6. Volume of water entering building exceeds amount exiting the building
7. Washed out foundation
   a. Clearly exposed
   b. Undermined
8. Building sliding off foundation

IV. IDENTIFICATION AND MANAGEMENT OF LIVE HAZARD

A. The person who recognizes the potential life hazard shall immediately contact the Incident Commander

1. Use “EMERGENCY TRAFFIC” to advise of the situation

B. Notification Information

1. Type/nature of the hazardous condition
   a. Imminent building collapse
   b. Downed electrical wires
   c. Etc.

PRESENTATION	APPLICATION
C. Responsibility of Incident Commander 1. Ensure on-scene and additional response personnel are made aware of the life hazard 2. Request appropriate resources(s) or agency to respond to the incident to evaluate and mitigate life hazard a. Utility company b. Structural engineer c. Etc.	
D. CAL FIRE Policy 1. Found in the CAL FIRE Intranet handbook library 2. 1700 Handbook, Section 1738	Handout the 1738 Policy

SUMMARY:

All structural materials, whether classified combustible or noncombustible, are adversely affected when exposed to elevated temperatures during a fire. In many cases, damage may be compounded by excessive expansion and instability in unit design. During explosions, earthquakes or other major disaster, the structural stability of a building is compromised in numerous ways. Flooding from whatever source can also cause structural collapse. For safety reasons, firefighters must recognize the indicators of potential building collapse prior to collapse.

EVALUATION:

A written quiz.

ASSIGNMENT:

To be determined by instructor(s).