Technician

Course Plan

Course Details

CTS Guide: Structural Collapse Specialist 1 and 2 (2021)

Description: This course provides the skills and knowledge needed for the technician-level structural collapse specialist to rescue victims from a collapsed heavy construction-type structure; including size up, incident action plans, search, cribbing systems, lifting and moving heavy loads, stabilization, breaching, and rescue.

Designed For: Personnel preparing to pursue technical rescue certification (pending); personnel responsible for meeting local, state, or federal minimum standards; or anyone who functions in a technical rescue environment.

Prerequisites: Structural Collapse Specialist 1: Operations (SFT) **OR**
Rescue Systems 1 (SFT) **AND** Rescue Systems 2 (SFT)

Confined Space Rescue: Technician (SFT)

Powder Actuated Tool Licensing (RAMSET / online certificate)

Structural Collapse Specialist (FEMA / computer-based training / 2017 or newer edition) – within two years prior to course registration *

Standard: Attend and participate in all course sections.

Successful completion of all skills identified on the Training Record.

Hours (Total): 40 hours

(8.5 lecture / 31.5 application)

Maximum Class Size: 48

Instructor Level: SFT Registered Structural Collapse Specialist 2 Instructor

Instructor/Student Ratio: 1:48 (lecture)

24 students or less 1:8 (application)

Over 24 students 1:6 (application)

Restrictions: All instructors counted toward student ratios, including application components, must be SFT Registered Structural Collapse Specialist 2 Instructors.

SFT Designation: FSTEP (CFSTES pending)

* Courses taught by outside agencies often change names and numbers. Students should enroll in the most current version of any course, even if the course name or number has changed.

Table of Contents

Required Resources

Instructor Resources

To teach this course, instructors need:

- *Structural Collapse Specialist Instructor-Led Training (ILT)*
  - (FEMA, Participant Guide, April 2017)
- NFPA 1006: Standard for Technical Rescue Personnel (2021) (physical or digital access)
- FIRESCOPE ICS 420-1 Field Operations Guide (2017)
- USACE Field Operations Guide (current edition)
- USACE Shoring Operations Guide (current edition)
- Personal Protective Equipment (PPE)

Online Instructor Resources

The following instructor resources are available online at https://www.caltraining.org/fstep

- *Structural Collapse Specialist Instructor-Led Training (ILT)*
  - (FEMA, Participant Guide, April 2017)
- Sample Timetables
- Wedge Anchor Load Ratings
- Mobile Crane Hand Signals
- FEMA Search Sticker

Student Resources

To participate in this course, students need:

- *Structural Collapse Specialist Instructor-Led Training (ILT)*
  - (FEMA, Participant Guide, April 2017)
- NFPA 1006: Standard for Technical Rescue Personnel (2021) (physical or digital access)
- FIRESCOPE ICS 420-1 Field Operations Guide (2017)
- USACE Field Operations Guide (current edition)
- USACE Shoring Operations Guide (current edition)
- Personal Protective Equipment (PPE)

Facilities, Equipment, and Personnel

Facilities

The following facilities are required to deliver this course:

- Standard learning environment or facility, which may include:
  - Writing board or paper easel chart
  - Markers, erasers
  - Amplification devices
  - Projector and screen
  - Laptop or tablet with presentation or other viewing software

    - Internet access with appropriate broadband capabilities
- Access to an outdoor facility that enables participants to meet the requisite knowledge and skills of NFPA 1006 and fulfill the assigned activities and skills.

Equipment

Student safety is of paramount importance when conducting the type of high-risk training associated with this Structural Collapse course. The equipment listed below is the minimum for the delivery of this course. The equipment complies with or exceeds the standards listed in NFPA 1983: Standard on Fire Service Life Safety Rope, Harness, and Hardware. The student is responsible for providing all PPE and ensuring that all PPE meets AHJ and site requirements.

The following equipment is required to deliver this course:

Amount	Heavy Object Equipment (1 Squad)
1	Webbing – 1” x 40’
2	Webbing – 1” x 8’
1	Airbag – Control kit storage container
2	Airbag – Regulators
2	Airbag – Control heads (two bag capable)
2	Airbag – Supply air lines
4	Airbag – Airlines (minimum 16 foot)
1	Airbag – 3 ton
1	Airbag – 5 ton
2	Airbag – 8 to 15 ton
2	Airbag – 16 to 20 ton
1	Airbag – Any type or size (AHJ specific)
As needed	Air supply (SCBA cylinder)
6	Pry Bar – Pinch point (60” minimum)
10	Pry Bar – Crowbar (30” minimum) (2 for HO/8 for Shoring)
12	Rollers – Steel pipe (minimum 1.5” by schedule 40)
6	Jacks - Hydraulic low profile (e.g., bottle jack)
2	Jacks - High lift
2	Tape measure (25’ minimum)
2	Come-a-long (minimum capacity 1.25 ton)
2	Chain fall (3-ton capacity)
2	Grip hoist
120	Cribbing – 4” x 4” x 18 to 24”
40	Cribbing – 2” x 4” x 18 to 24”
60 sets	Cribbing wedges – 4” x 4” x 18”
20 sets	Cribbing wedges – 2” x 4” x 12”
Optional	Cribbing – 6” x 6” x 36 to 48”
12	Pickets – 1” x 36”

Optional	Improvised levers (optional, e.g., long 4’ x 4’, >8’ ladders)
Optional	Jack – floor
8	Hoist ring – Steel ½” x 2½” (Crosby or other US equivalent)
8	Eye nut – ½” (Crosby or other US equivalent)
2	Hammer – Rotary – electric (with accessories needed to support operations)
2	Bulb syringe
4	Deep well sockets for use with torque wrench (½” drive)
4	Torque wrench – ½” drive, 10-250 lbs. adjustable
12	Screw pin shackles – round
12	Screw Pin shackles – flat
1	Crane or other piece of heavy equipment capable of lifting anticipated loads w/operator
As needed	Synthetic sling edge protection
2	Synthetic sling (various size/lengths and capabilities)
8	Wire rope sling (various Lengths and capabilities)
1	50’ tag line
Optional	Vehicle extrication tools (with accessories needed to support operations)
2	Paratech – Hydra fusion w/pump and hose
1	Paratech – Strut with two base plates
Amount	**Shoring**
1	Drill – right angle (with accessories needed to support operations)
24	Pickets – 1” x 48”
4	Lumber – 6” x 6” Deadman for raker systems
4	Lumber - 4”x6” Deadman for mechanical sloped floor
1	Paratech – US&R strut system or equivalent
6	Lumber – 4” x 6” x 3’ header/footer mechanical spot shore
4	Lumber – 4” x 6” x 8’ header/footer mechanical vertical shore system
4	Lumber – 4” x 4” x 4’ header/footer mechanical window shore
4	Lumber – 4” x 4” x 7’ header/footer mechanical door shore
SHORING Equipment (Double if running timber and mechanical shores at the same time.)	
12	Tool belts
12	Hammer – Framing (24 oz minimum)
12	Tape measure (25’ minimum)
4	Square – Framing
12	Square – Speed
12	Marking pencils
12	Nail pullers
12	Sheetrock knives
12	Torpedo levels
2	Chalk lines
Optional	Saw – Miter – 12” (with accessories needed to support operations)

4	Saw – Circular – 7¼" (with accessories needed to support operations)
4	Saw – Circular – 10¼" (with accessories needed to support operations)
2	Saw – Chain (with accessories/PPE needed to support operations)
2	Nail gun (framing) (with accessories needed to support operations)
2	Nail gun (palm nailer) (with accessories needed to support operations)
As needed	Air supply (SCBA cylinder) or compressor
4	Hammer – Sledge 3 lbs.
2	Hammer – Sledge 8 lbs.
1	Cutting table (per AHJ)
2	Magnets (for picking up nails) (Optional)
12	Pins ½' x 18"
Amount	**Breaching/Burning/Breaking (BBB)**
2	Set of irons
2	Axes – Pick head
2	Hammer – Framing (24 oz minimum)
2	Hammer – Sledge (3 lbs.)
2	Hammer – Sledge (8 lbs.)
2	Hammer – Rotary (with accessories needed to support operations)
1	Manikins or other items to represent victims
1	Litter
2	Drill core – w/2" bit (with accessories needed to support operations)
Optional	Saw – Ring (with accessories needed to support operations)
Optional	Saw – Cut and break (with accessories needed to support operations)
4	Saw – Rotary (with accessories needed to support operations)
4	Saw – Reciprocating (with accessories needed to support operations)
1	Grinder (with accessories needed to support operations)
2	Breaker – Combination of 60 lbs. to 90 lbs. (with accessories needed to support operations)
1	Rebar cutter
1	Stanley hydraulic power unit w/ tools or equivalent (with accessories needed to support operations)
2	Torch – Oxygen/acetylene (with accessories needed to support operations)
2	Torch – Petrogen (with accessories needed to support operations)
Optional	Torch – Exothermic (with accessories needed to support operations)
Optional	Torch – Plasma (with accessories needed to support operations)
6	Torch – Strikers
6	Torch – PPE (Nomex hoods, burner's eye protection, gloves, outerwear)
6	Torch – Tip charts
2	Full face shield (minimum)
4	Fire extinguisher
1	Air monitor
1	Ventilation fan w/ducting

1	Powder actuated device (e.g., RamSet, Hilti)
As needed	Steel marking utensil (e.g., soapstone)
As needed	Water supply (with accessories needed to support training)
As needed	Other hand tools (specific to AHJ)
Amount	**Props and Required Site Items**
	Need to be able to cantilever steel beams
	Breaches must be done within limited access (inside a 36" pipe or something similar)
	Need a high-profile object to lift using Paratech Hydra Fusion
	Items for lifting (cars, pipes, scrap concrete, scrap steel, etc.)
2	Large pieces of concrete and or steel (minimum 500 lbs.)
2	Large piece of concrete (minimum 1,000 lbs.)
4	Concrete slabs and blocks for lifting (3' x 3' x 3')
4	Concrete slabs and blocks for lifting (1' x 4' x 6')
	Door/window shores shall represent current door/window building code standards. At least one window and one door will have a rack and frame.
	Insertion points for exterior shores shall be 8' minimum.
	Insertion points for interior shores shall be determined by the Registered Instructor.
	Heavy objects must have an improved and an unimproved surface to work on.
	Need one tensioning device for the five-strand cable.
Amount	**Consumables (Multiply by the number of modules to be taught for final counts.)**
	BREACHING/BURNING/BREACKING (BBB)
3	Breach panel – 4' x 4' x 6" concrete with rebar (single row)
1	Breach panel – 4' x 4' x 9" concrete with rebar (double row)
2	Steel I-beams – 6" x 5'
2	Rebar #5 – 10' bar
3	Plate steel – (minimum ¼") (4' x 4')
1	20' x 5 strand steel wire (tensioned)
	SHORING
40	Lumber – 2" x 4" x 8'
14	Lumber – 2" x 4" x 12'
120	Lumber – 4" x 4" x 8' *
25	Lumber – 4" x 4" x 12' *
12	Lumber – 4" x 4" x 16' *
30	Lumber – 2" x 6" x 12'*
30	Lumber – ¾" x 4' x 8' (Plywood)
2 TBD	Lumber – 6" x 6" x 4' (Deadman)
Optional	Wood pallets – For cribbing and end cuts
Optional	Lumber – 6" x 6" x 12' (for lace post)

8	Lumber – 4” x 6” x 12’ (for mechanical shores
1	Nails – 8d duplex 12 lbs.
1	Nails – 16d duplex 12 lbs.
1	Nails – 8d 12 lbs.
1	Nails – 16d 12 lbs.
1	Nails – 8d nail gun nails 12 lbs.
1	Nails – 16d nail gun nails 12 lbs.
	HEAVY OBJECTS
36	Concrete screws (with accessories needed to support operation)
25	Concrete wedge anchors – ½” x5½”

* Lumber sizes are dependent on prop sizes. AHJ shall provide the appropriate amount of wedge sets.

Personnel

The following personnel are required to deliver this course:

- Any instructor counted toward student ratios must be an SFT Registered Structural Collapse Specialist 2 Instructor.

Time Table

Segment	Lecture	Application	Unit Total
Unit 1: Technician (Computer-based Training)			
Completed by students outside of course time.	0.0	0.0	
Unit 1 Totals	**0.0**	**0.0**	**0.0**
Unit 2: Introduction (Instructor-led Training)			
Topic 2-1: Orientation and Administration	1.0	0.0	
Unit 2 Totals	**1.0**	**0.0**	**1.0**
Unit 3: PPE and Tools (Instructor-led Training)			
3-1: Maintaining Hazard-specific PPE	0.25	0.0	
3-2: Maintaining Rescue Equipment	1.0	1.0	
Unit 3 Totals	**1.25**	**1.0**	**2.25**
Unit 4: Technician (Instructor-led Training)			
Topic 4-1: Conducting a Size-up of a Collapsed Heavy Construction-type Structure	0.25	0.0	
Topic 4-2: Developing a Collapse Rescue Incident Action Plan	0.25	0.0	
Topic 4-3: Implementing a Collapse Rescue Incident Action Plan	0.25	0.0	
Topic 4-4: Determining Potential Victim Locations	0.0	0.0	
Topic 4-5: Searching a Collapsed Structure	0.0	0.0	
Topic 4-6: Constructing Cribbing Systems	0.50	0.50	
Topic 4-7: Lifting a Heavy Load as a Team Member	0.50	0.0	
Topic 4-8: Moving a Heavy Load as a Team Member	0.50	6.0	
Topic 4-9: Stabilizing a Collapsed Structure Using Timber Shoring Systems as a Member of a Team	0.50	5.5	
Topic 4-10: Stabilizing a Collapsed Structure Using Mechanical Shoring Systems as a Member of a Team	0.50	5.5	
Topic 4-11: Breaching Structural Components	1.0	7.0	
Topic 4-12: Cutting Through Structural Steel	1.0	3.0	
Topic 4-13: Coordinating the Heavy Equipment Use	1.0	3.0	
Topic 4-14: Releasing a Victim from Entrapment	0.0	0.0	
Topic 4-15: Removing a Victim from a Collapse Incident	0.0	0.0	
Unit 4 Totals	**6.25**	**30.5**	**36.75**
Formative Assessments			
Determined by AHJ or educational institution	**0.0**	**0.0**	**0.0**
Summative Assessment			
Determined by AHJ or educational institution	**0.0**	**0.0**	**0.0**
Course Totals	**8.5**	**31.5**	**40.0**

Time Table Key

1. The Time Table documents the amount of time required to deliver the content included in the course plan.

2. Time is documented using the quarter system: 15 min. = .25 / 30 min. = .50 / 45 min. = .75 / 60 min. = 1.0.

3. The Course Totals do not reflect time for lunch (1 hour) or breaks (10 minutes per every 50 minutes of instruction or assessment). It is the instructor's responsibility to add this time based on the course delivery schedule.

4. Application (activities, skills exercises, and formative testing) time will vary depending on the number of students enrolled. The Application time documented is based on the maximum class size identified in the Course Details section.

5. Summative Assessments are determined and scheduled by the authority having jurisdiction. These are not the written or psychomotor State Fire Training certification exams. These are in-class assessments to evaluate student progress and calculate course grades.

Suggested Teaching Schedule

Day	Content	Topics
1	• Orientation • Tool lab • Pneumatic struts	4-1, 4-2, 4-3, 4-10
2	• Breaking and breaching (clean and dirty)	4-3, 4-4, 4-5, 4-11, 4-14
3	• Heavy equipment • Exterior Shores	4-9, 4-13, 4-15
4	• Lifting and moving • Interior Shores	4-6, 4-7, 4-8, 4-9, 4-15
5	• Cutting and burning • Obstacle course	4-6, 4-7, 4-8, 4-12

Unit 1: Technician (Computer-based Training)

Topic 1-1: Maintaining Hazard-specific PPE

Terminal Learning Objective

At the end of this topic a student, given clothing or equipment for the protection of the rescuers, including respiratory protection, cleaning and sanitation supplies, maintenance logs or records, inspection procedures, and such tools and resources as are indicated by the manufacturer's guidelines for assembly or disassembly of components during repair or maintenance, will be able to maintain hazard-specific PPE so that damage, defects, and wear are identified and reported or repaired; equipment functions as designed; and preventive maintenance has been performed and documented consistent with the manufacturer's recommendations.

Enabling Learning Objectives

1. Describe the functions, construction, and operation of PPE
   - FEMA CBT: Module 1, ELO 3
2. Evaluate operational readiness of PPE
   - FEMA CBT: Module 1, ELO 3

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 3-1.

CTS Guide Reference: CTS 2-13

Topic 1-2: Maintaining Rescue Equipment

Terminal Learning Objective

At the end of this topic a student, given maintenance logs and records, tools, and resources as indicated by the manufacturer's guidelines, inspection procedures, equipment replacement protocol, and organizational standard operating procedure, will be able to maintain rescue equipment so that the operational status of equipment is verified and documented, all components are checked for operation, deficiencies are repaired or reported as indicated by standard operating procedure, and items subject to replacement are correctly disposed of and changed out.

Enabling Learning Objectives

1. Describe functions and operations of rescue equipment
   - (FEMA CBT: Module 4, ELO 1)

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 3-2.

CTS Guide Reference: CTS 2-14

Topic 1-3: Conducting a Size-up of a Collapsed Heavy Construction-type Structure

Terminal Learning Objective

At the end of this topic a student, given an incident and specific incident information, will be able to conduct a size-up of a collapsed heavy construction–type structure, so that existing and potential conditions within the structure and the immediate periphery are evaluated, needed resources are defined, hazards are identified, construction and occupancy types are determined, collapse type is identified if possible, the need for rescue is assessed, a scene security perimeter is established, and the size-up is conducted within the scope of the incident management system.

Enabling Learning Objectives

1. Identify heavy construction types
   - FEMA CBT: Module 3, ELO 1
2. Identify characteristics, and probable occupant locations
   - FEMA CBT: Module 3, ELO 6
3. Describe methods to assess rescue needs
   - FEMA CBT: Module 8, ELO 2
4. Describe expected behavior of heavy construction in a structural collapse incident
   - FEMA CBT: Module 3, ELO 3
5. Describe causes and associated effects of structural collapses
   - FEMA CBT: Module 3, ELO 5
6. Describe types and capabilities of resources
   - FEMA CBT: Module 3, ELO 7
7. Identify general hazards associated with structural collapse and size-up
   - FEMA CBT: Module 1, ELO 2
   - FEMA CBT: Module 3, ELO 7
8. Describe procedures for implementing site control and scene management
   - FEMA CBT: Module 1, ELO 2
9. Categorize heavy construction types
   - FEMA CBT: Module 3, ELO 1
10. Evaluate structural stability and hazards
    - FEMA CBT: Module 3, ELO 3
    - FEMA CBT: Module 5, ELO 1
11. Implement resource and security (scene management) protocols
    - FEMA CBT: Module 1, ELO 2

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-1.

CTS Guide Reference: CTS 3-1

Topic 1-4: Developing a Collapse Rescue Incident Action Plan

Terminal Learning Objective

At the end of this topic a student, given size-up information and a heavy collapsed structure, will be able to develop a collapse rescue incident action plan so that initial size-up information is utilized, an incident management system is incorporated, existing and potential conditions within the structure and the immediate periphery are included, specialized resource needs are identified, work perimeters are determined, collapse type/category and associated hazards are identified, construction and occupancy types are determined, incident objectives are established, and scene security measures are addressed.

Enabling Learning Objectives

1. Describe incident-specific size-up information
   - FEMA CBT: Module 8, ELO 3
2. Describe incident management system components
   - FEMA CBT: Module 8, ELO 3
   - IS-100, IS-200, IS-700, IS-800
3. Describe dynamics of incident conditions and peripheral areas
   - FEMA CBT: Module 8, ELO 1 and 2
4. Identify specific incident security requirements
   - FEMA CBT: Module 1, ELO 2
5. Describe construction and occupancy types
   - FEMA CBT: Module 3, ELO 1
   - FEMA CBT: Module 8, ELO 2
6. Describe scene security requirements
   - FEMA CBT: Module 1, ELO 2
7. Identify personnel needs and limitations
   - FEMA CBT: Module 1, ELO 2
8. Identify rescue scene operational priorities
   - FEMA CBT: Module 8, ELO 2
9. Utilize size-up information
   - FEMA CBT: Module 8, ELO 3
10. Implement an incident management system
    - FEMA CBT: Module 8, ELO 3
    - IS-100, IS-200, IS-700, IS-800
11. Monitor changing conditions specific to the incident
    - FEMA CBT: Module 1, ELO 2
12. Identify potential specialized resources
    - FEMA CBT: Module 3, ELO 7
13. Determine construction and occupancy types
    - FEMA CBT: Module 3, ELO 1
    - FEMA CBT: Module 8, ELO 2
14. Create written documentation

- FEMA CBT: Module 3, ELO 1
- FEMA CBT: Module 8, ELO 2

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-2.

CTS Guide Reference: CTS 3-3

Topic 1-5: Implementing a Collapse Rescue Incident Action Plan

Terminal Learning Objective

At the end of this topic a student, given an action plan and a heavy construction–type collapsed structure, will be able to implement a collapse rescue incident action plan, so that pertinent information is used, an incident management system is established and implemented, monitoring of dynamic conditions internally and externally is established, specialized resources are requested, hazards are mitigated, victim rescue and extraction techniques are consistent with collapse and construction type, and perimeter security measures are established.

Enabling Learning Objectives

1. Describe components of an action plan specific to collapse incidents
   - FEMA CBT: Module 8, ELO 1, 2, 3
2. Describe incident management systems
   - IS-100, IS-200, IS-700, IS-800
3. Identify dynamics of incident conditions and peripheral areas
   - FEMA CBT: Module 3, ELO 1, 2, 3
4. Identify specialized resource lists
   - FEMA CBT: Module 3, ELO 7
5. Recognize hazards
   - FEMA CBT: Module 3, ELO 7
6. Describe rescue and extrication techniques consistent with each collapse and construction type
   - FEMA CBT: Module 2, ELO 3
   - FEMA CBT: Module 8, ELO 2
7. Describe perimeter security measures
   - FEMA CBT: Module 1
8. Identify personnel needs and limitations
   - FEMA CBT: Module 1, ELO 2
9. Implement the components of an action plan in a collapse incident
   - FEMA CBT: Module 8, ELO 3
10. Implement an incident management system
    - FEMA CBT: Module 8, ELO 3
11. Initiate hazard mitigation objectives
    - FEMA CBT: Module 3, ELO 7
12. Request specialized resources
    - FEMA CBT: Module 3, ELO 7
13. Initiate rescue objectives
    - FEMA CBT: Module 8, ELO 2
14. Demonstrate perimeter security measures
    - FEMA CBT: Module 1, ELO 2

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-3.

CTS Guide Reference: CTS 3-4

Topic 1-6: Determining Potential Victim Locations

Terminal Learning Objective

At the end of this topic a student, given size-up information, a structural collapse tool cache, the type of construction and occupancy, time of day, and collapse pattern, will be able to determine potential victim locations in a heavy construction–type incident so that search areas are established and victims can be located.

Enabling Learning Objectives

1. Describe capabilities and limitation of search instruments and resources
   - FEMA CBT: Module 8, ELO 2
2. Identify types of building construction
   - FEMA CBT: Module 3, ELO 1
3. Describe occupancy classifications
   - FEMA CBT: Module 8, ELO 2
4. Identify collapse patterns
   - FEMA CBT: Module 3, ELO 6
5. Describe victim behavior
   - FEMA CBT: Module 2, ELO 1
6. Recognize potential areas of survivability
   - FEMA CBT: Module 3, ELO 6
7. Use size-up information
   - FEMA CBT: Module 3, ELO 7
8. Use occupancy classification information
   - FEMA CBT: Module 8, ELO 2
9. Use search devices
   - FEMB CBT: Module 8, ELO 2
10. Assess and categorize type of collapse
    - FEMA CBT: Module 3, ELO 3
    - FEMA CBT: Module 3, ELO 6

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-4.

CTS Guide Reference: CTS 3-2

Topic 1-7: Searching a Collapsed Structure

Terminal Learning Objective

At the end of this topic a student, given PPE, the structural collapse tool cache, an assignment, operational protocols, and size-up information, will be able to search a heavy construction–type collapsed structure so that all victim locations and potential hazards are identified, marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained.

Enabling Learning Objectives

1. Describe concepts and operation of the incident management system as applied to the search function
   - FEMA CBT: Module 3, ELO 8
   - FEMA CBT: Module 8, ELO 3
2. Describe how to apply specialty tools and locating devices
   - FEMA CBT: Module 8, ELO 2
3. Describe how to apply recognized marking systems
   - FEMA CBT: Module 3, ELO 8
4. Describe voice sounding techniques
   - FEMA CBT: Module 8, ELO 2
5. Identify potential victim locations as related to the type of structure and occupancy
   - FEMA CBT: Module 8, ELO2
6. Identify building construction type
   - FEMA CBT: Module 3, ELO 3
7. Describe collapse types and their influence on the search function
   - FEMA CBT: Module 3, ELO 6
8. Describe operational search protocols
   - FEMA CBT: Module 8, ELO 2
9. Recognize various hazards
   - FEMA CBT: Module 3, ELO 7
10. Implement an incident management system
    - FEMA CBT: Module 8, ELO 3
11. Apply search techniques
    - FEMA CBT: Module 8, ELO 2
12. Use marking systems
    - FEMA CBT: Module 3, ELO 8
13. Identify and mitigate hazards
    - FEMA CBT: Module 3, ELO 7
14. Select and use victim locating devices
    - FEMA CBT: Module 8, ELO 2

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-5.

CTS Guide Reference: CTS 3-5

Topic 1-8: Constructing Cribbing Systems

Terminal Learning Objective

At the end of this topic a student, given an assignment, PPE, a structural collapse tool cache, various lengths and dimensions of lumber, wedges, and shims, will be able to construct cribbing systems, so that the cribbing system will safely support the load, the system is stable, and the assignment is completed.

Enabling Learning Objectives

1. Describe different types of cribbing systems and their construction methods
   - FEMA CBT: Module 7, ELO 2
2. Describe limitations of construction lumber
   - FEMA CBT: Module 7, ELO 3
3. Describe load calculations
   - FEMA CBT: Module 7, ELO 3
4. Describe principles of and applications for cribbing
   - FEMA CBT: Module 7, ELO 2 and 3
5. Describe safety protocols
   - FEMA CBT: Module 7, ELO 3
6. Select and construct cribbing systems
   - FEMA CBT: Module 7, ELO 2
7. Evaluate the structural integrity of the system
   - FEMA CBT: Module 7, ELO 2 and 3
8. Determine stability
   - FEMA CBT: Module 7, ELO 3
9. Calculate loads
   - FEMA CBT: Module 7, ELO 1

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-6.

CTS Guide Reference: CTS 3-12

Topic 1-9: Lifting a Heavy Load as a Team Member

Terminal Learning Objective

At the end of this topic a student, given a structural collapse tool cache and a load to be lifted, will be able to lift a heavy load as a team member, so that the load is lifted; control and stabilization are maintained before, during, and after the lift; and access can be gained.

Enabling Learning Objectives

1. Describe how to apply levers
   - FEMA CBT: Module 7, ELO 2
2. Describe classes of levers
   - FEMA CBT: Module 7, ELO 2
3. Describe principles of leverage, gravity, and load balance
   - FEMA CBT: Module 7, ELO 1
4. Describe resistance force
   - FEMA CBT: Module 7, ELO 3
5. Describe mechanics of load stabilization
   - FEMA CBT: Module 7, ELO 2
6. Describe mechanics of load lifting
   - FEMA CBT: Module 7, ELO 2 and 3
7. Describe how to apply pneumatic, hydraulic, mechanical, and manual lifting tools
   - FEMA CBT: Module 4, ELO 1
8. Describe how to calculate the weight of the load
   - FEMA CBT: Module 7, ELO 2
9. Describe stabilization systems
   - FEMA CBT: Module 7, ELO 2
10. Evaluate and estimate the weight of the load
    - FEMA CBT: Module 7, ELO 2
11. Operate lifting tools
    - FEMA CBT: Module 7, ELO 3
12. Apply a lever
    - FEMA CBT: Module 7, ELO 2
13. Apply load stabilization systems
    - FEMA CBT: Module 7, ELO 2

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-7.

CTS Guide Reference: CTS 3-9

Topic 1-10: Moving a Heavy Load as a Team Member

Terminal Learning Objective

At the end of this topic a student, given a structural collapse tool cache, will be able to move a heavy load as a team member, so that the load is moved the required distance to gain access and control is constantly maintained.

Enabling Learning Objectives

1. Describe how to apply rigging systems
   - FEMA CBT: Module 7, ELO 2 and 3
2. Describe how to apply levers
   - FEMA CBT: Module 7, ELO 2 and 3
3. Describe classes of levers
   - FEMA CBT: Module 7, ELO 3
4. Describe how to apply rollers
   - FEMA CBT: Module 7, ELO 3
5. Describe inclined planes
   - FEMA CBT: Module 7, ELO 3
6. Describe gravity, center of gravity, and load balance
   - FEMA CBT: Module 7, ELO 1
7. Describe friction
   - FEMA CBT: Module 7, ELO 3
8. Describe mechanics of load stabilization and load lifting
   - FEMA CBT: Module 7, ELO 2
9. Describe capabilities and limitations of lifting tools
   - FEMA CBT: Module 4, ELO 1
10. Describe how to calculate the weight of the load
    - FEMA CBT: Module 5, ELO 2
11. Describe safety protocols
    - FEMA CBT: Module 1, ELO 2
12. Evaluate and estimate the weight of the load
    - FEMA CBT: Module 5, ELO 2
13. Operate required tools
    - FEMA CBT: Module 4, ELO 1
14. Construct and use levers, rollers, and inclined planes
    - FEMA CBT: Module 7, ELO 3
15. Utilize rigging systems
    - FEMA CBT: Module 7, ELO 2 and 3
16. Stabilize the load
    - FEMA CBT: Module 7, ELO 2

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-8.

CTS Guide Reference: CTS 3-10

Topic 1-11: Stabilizing a Collapsed Structure Using Timber Shoring Systems as a Member of a Team

Terminal Learning Objective

At the end of this topic a student, given size-up information, a specific pattern of collapse, a basic structural collapse tool cache, and an assignment, will be able to stabilize a collapsed heavy construction–type structure using timber shoring systems as a member of a team so that strategies to effectively minimize the movement of structural components are identified and implemented; hazard warning systems are established and understood by participating personnel; hazard-specific PPE is identified, provided, and utilized; physical hazards are identified; confinement, containment, and avoidance measures are discussed; and a rapid intervention team is established and staged.

Enabling Learning Objectives

1. Identify appropriate PPE
   - FEMA CBT: Module 1, ELO 3
2. Describe confinement, containment, and avoidance measures
   - FEMA CBT: Module 3, ELO 7
3. Describe structural load calculations for shoring system requirements
   - FEMA CBT: Module 5, ELO 2
4. Describe shoring systems for stabilization
   - FEMA CBT: Module 5, ELO 3
5. Describe specific hazards associated with heavy structural collapse
   - FEMA CBT: Module 5, ELO 4
6. Describe strategic planning for collapse incidents
   - FEMA CBT: Module 8, ELO 2
7. Describe communications and safety protocols
   - FEMA CBT: Module 8, ELO 2
8. Identify the need for atmospheric monitoring equipment
   - FEMA CBT: Module 3, ELO 8
9. Identify characteristics, expected behavior, type, causes, and associated effects of heavy structural collapses
   - FEMA CBT: Module 3, ELO 2
10. Recognize potential for and signs of impending secondary collapse
    - FEMA CBT: Module 5, ELO 1
11. Select and construct shoring systems for collapses in heavy structures
    - FEMA CBT: Module 5, ELO 3
12. Perform structural load calculations
    - FEMA CBT: Module 5, ELO 2
13. Determine resource needs
    - FEMA CBT: Module 5, ELO 4
14. Select and operate basic and specialized tools and equipment
    - FEMA CBT: Module 4, ELO 1
15. Use PPE (AHJ)

- FEMA CBT: Module 1, ELO 3

16. Implement communications and safety protocols
    - FEMA CBT: Module 8, ELO 2
17. Mitigate specific hazards associated with shoring tasks
    - FEMA CBT: Module 5, ELO 3 and 4

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-9.

CTS Guide Reference: CTS 3-6

Topic 1-12: Stabilizing a Collapsed Structure Using Mechanical Shoring Systems as a Member of a Team

Terminal Learning Objective

At the end of this topic a student, given size-up information, hazard-specific PPE, an assignment, a specific pattern of collapse, a structural collapse tool cache, specialized equipment necessary to complete the task, and engineering resources if needed, will be able to stabilize a collapsed heavy construction–type structure using mechanical shoring systems as a member of a team so that hazard warning systems are established and understanding by team members is verified, all unstable structural components that can impact the work and egress routes are identified, alternative egress routes are established when possible, expert resource needs are determined and communicated to command, load estimates are calculated for support system requirements, all shoring systems meet or exceed load-bearing demands, shoring systems are monitored continuously for integrity, safety protocols are followed, a rapid intervention crew (RIC) is established and staged to aid search and rescue personnel in the event of entrapment, an accountability system is established, atmospheric monitoring is ongoing, and progress is communicated as required.

Enabling Learning Objectives

1. Identify appropriate PPE
   - FEMA CBT: Module 1, ELO 3
2. Describe how to evaluate structural load calculations for shoring system requirements
   - FEMA CBT: Module 5, ELO 2
3. Describe how to select shoring systems for stabilization
   - FEMA CBT: Module 5, ELO 3 and 4
4. Describe specific hazards associated with heavy structural collapse
   - FEMA CBT: Module 3, ELO 3 and 6
5. Describe hazard warning systems
   - FEMA CBT: Module 3, ELO 7
6. Recognize and describe specialized resource and equipment needs
   - FEMA CBT: Module 3, ELO 7
7. Describe communications and rescuer safety protocols
   - FEMA CBT: Module 1, ELO 1 and 2
8. Describe atmospheric monitoring equipment needs
   - FEMA CBT: Module 1, ELO 3
9. Identify construction types
   - FEMA CBT: Module 3, ELO 1
10. Describe characteristics and expected behavior of heavy construction in a structural collapse incident
    - FEMA CBT: Module 3, ELO 2 and 3
11. Identify causes and associated effects of structural collapses
    - FEMA CBT: Module 3, ELO 2 and 6
12. Recognize potential for and signs of impending secondary collapse
    - FEMA CBT: Module 5, ELO 1

13. Select and construct shoring systems for heavy construction–type collapses
    - FEMA CBT: Module 5, ELO 3 and 4
14. Use PPE
    - FEMA CBT: Module 1, ELO 3
15. Perform structural load calculations
    - FEMA CBT: Module 5, ELO 2
16. Determine resource needs
    - FEMA CBT: Module 3, ELO 7
17. Select and operate basic and specialized tools and equipment
    - FEMA CBT: Module 4, ELO 1
18. Implement communications and rescuer safety protocol
    - FEMA CBT: Module 8, ELO 2
19. Mitigate specific hazards associated with shoring tasks
    - FEMA CBT: Module 5, ELO 3 and 4

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-10.

CTS Guide Reference: CTS 3-13

Topic 1-13: Breaching Structural Components

Terminal Learning Objective

At the end of this topic a student, given an assignment, PPE, various types of construction materials, and a structural collapse tool cache, will be able to breach heavy structural components, so that the opening supports the rescue objectives, the necessary tools are selected, structural stability is maintained, and the methods utilized are safe and efficient.

Enabling Learning Objectives

1. Describe effective breaching techniques
   - FEMA CBT: Module 6, ELO 1, 2, 3
2. Describe types of building construction and characteristics of materials used in each
   - FEMA CBT: Module 3, ELO 3
3. Describe the selection, capabilities, and limitations of tools
   - FEMA CBT: Module 4, ELO 1
4. Describe safety protocols for breaching operations
   - FEMA CBT: Module 6, ELO 2 and 3
5. Describe how to calculate weight
   - FEMA CBT: Module 6, ELO 1 and 3
   - FEMA CBT: Module 7, ELO 1
6. Describe how to anticipate material movement during breaching and stabilization techniques
   - FEMA CBT: Module 6, ELO 3
7. Select and use breaching tools
   - FEMA CBT: Module 6, ELO 2
8. Implement breaching techniques based on heavy construction types
   - FEMA CBT: Module 6, ELO 2 and 3
9. Use PPE
   - FEMA CBT: Module 1, ELO 3
10. Apply stabilization where required
    - FEMA CBT: Module 5, ELO 3 and 4

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-11.

CTS Guide Reference: CTS 3-11

Topic 1-14: Cutting Through Structural Steel

Terminal Learning Objective

At the end of this topic a student, given a structural collapse tool cache, PPE, and an assignment, will be able to cut through structural steel so that the steel is efficiently cut, the victim and rescuer are protected, fire control measures are in place, and the objective is accomplished.

Enabling Learning Objectives

1. Describe safety considerations
   - FEMA CBT: Module 6, ELO 2
2. Describe the selection, capabilities, and limitations of steel cutting tools
   - FEMA CBT: Module 4, ELO 1 and 2
3. Identify cutting tool applications
   - FEMA CBT: Module 4, ELO 1 and 2
4. Identify types of potential and actual hazards and mitigation techniques
   - FEMA CBT: Module 1, ELO 2
   - FEMA CBT: Module 3, ELO 7
5. Describe characteristics of steel used in building construction
   - FEMA CBT: Module 3, ELO 3
6. Assess tool needs
   - FEMA CBT: Module 4, ELO 1 and 2
7. Use cutting tools
   - FEMA CBT: Module 4, ELO 1 and 2
8. Mitigate hazards
   - FEMA CBT: Module 1, ELO 2
   - FEMA CBT: Module 3, ELO 7
9. Stabilize heavy loads
   - FEMA CBT: Module 7, ELO 2

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-12.

CTS Guide Reference: CTS 3-14

Topic 1-15: Coordinating Heavy Equipment Use

Terminal Learning Objective

At the end of this topic a student, given PPE, means of communication, equipment and operator, and an assignment, will be able to coordinate the use of heavy equipment so that common communications are established, equipment usage supports the operational objective, hazards are avoided, and rescuer and operator safety protocols are followed.

Enabling Learning Objectives

1. Describe types of heavy equipment, capabilities, application, and hazards of heavy equipment and rigging
   - FEMA CBT: Module 7, ELO 2 and 3
2. Describe safety protocols
   - FEMA CBT: Module 7, ELO 3
3. Describe types and methods of communication
   - FEMA CBT: Module 7, ELO 2
4. Use hand signals and radio equipment
   - FEMA CBT: Module 7, ELO 2
5. Recognize hazards
   - FEMA CBT: Module 1, ELO 2
   - FEMA CBT: Module 3, ELO 7
6. Assess for operator and rescuer safety
   - FEMA CBT: Module 1, ELO 2
7. Use PPE
   - FEMA CBT: Module 1, ELO 3

Application

1. Completed within CBT

Instructor Notes

1. See corresponding ILT content in Topic 4-13.

CTS Guide Reference: CTS 3-15

Topic 1-16: Releasing a Victim from Entrapment

Terminal Learning Objective

At the end of this topic a student, given PPE and resources for breaching, breaking, lifting, prying, shoring, and/or otherwise moving or penetrating the offending structural component, will be able to release a victim from entrapment by components of a heavy construction–type collapsed structure so that hazards to rescue personnel and victims are minimized, considerations are given to compartment syndrome due to crush injuries, techniques enhance patient survivability, tasks are accomplished within projected time frames, and techniques do not compromise the integrity of the existing structure or structural support systems.

Enabling Learning Objectives

1. Identify appropriate PPE
   - FEMA CBT: Module 1, ELO 3
2. Identify general hazards associated with each type of structural collapse
   - FEMA CBT: Module 3, ELO 7
3. Describe methods of evaluating structural integrity
   - FEMA CBT: Module 8, ELO 2
4. Describe compartment syndrome protocols
   - FEMA CBT: Module 2, ELO 2
5. Identify construction types and collapse characteristics of heavy construction–type structures
   - FEMA CBT: Module 3, ELO 1
6. Describe causes and associated effects of structural collapses
   - FEMA CBT: Module 3, ELO 7
7. Identify potential signs of impending secondary collapse
   - FEMA CBT: Module 5, ELO 1
8. Describe how to select and apply rescue tools and resources
   - FEMA CBT: Module 4, ELO 1
9. Describe risk/benefit assessment techniques for extrication methods and time constraints
   - FEMA CBT: Module 2, ELO 3
10. Select, use, and care for PPE
    - FEMA CBT: Module 1, ELO 3
11. Operate rescue tools and stabilization systems
    - FEMA CBT: Module 4, ELO 1
    - FEMA CBT: Module 5, ELO 3
12. Recognize compartment syndrome signs and symptoms
    - FEMA CBT: Module 2, ELO 2
13. Complete risk/benefit assessments for selected methods of rescue and time constraints
    - FEMA CBT: Module 2, ELO 3

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-14.

CTS Guide Reference: CTS 3-7

Topic 1-17: Removing a Victim from a Collapse Incident

Terminal Learning Objective

At the end of this topic a student, given a disentangled victim, a basic first aid kit, and victim packaging resources, will be able to remove a victim from a heavy construction–type collapse incident so that basic life functions are supported as required, victim is evaluated for signs of compartment syndrome, advanced life support is called if needed, methods and packaging devices selected are compatible with intended routes of transfer, universal precautions are employed to protect personnel from bloodborne pathogens, and extraction times meet time constraints for medical management.

Enabling Learning Objectives

1. Identify appropriate PPE
   - FEMA CBT: Module 1, ELO 3
2. Identify general hazards associated with structural collapse
   - FEMA CBT: Module 3, ELO 3
   - FEMA CBT: Module 3, ELO 7
3. Identify heavy construction types
   - FEMA CBT: Module 3, ELO 3
4. Describe characteristics and expected behavior of each type in a structural collapse incident
   - FEMA CBT: Module 3, ELO 1
5. Describe causes and associated effects of structural collapses
   - FEMA CBT: Module 3, ELO 7
6. Recognize potential for, and signs of, impending secondary collapse
   - FEMA CBT: Module 5, ELO 1
7. Describe characteristic mechanisms of injury and basic life support
   - FEMA CBT: Module 2, ELO 1
8. Describe patient packaging principles
   - FEMA CBT: Module 2, ELO 1
9. Select, use, and care for PPE
   - FEMA CBT: Module 1, ELO 3
10. Perform basic prehospital care and treatment of soft-tissue injuries
    - FEMA CBT: Module 2, ELO 1
11. Stabilize fractures
    - FEMA CBT: Module 2, ELO 1
12. Perform airway maintenance techniques and cardiopulmonary resuscitation
    - FEMA CBT: Module 2, ELO 1
13. Identify signs and symptoms of compartment syndrome
    - FEMA CBT: Module 2, ELO 2
14. Select and use of patient packaging equipment
    - FEMA CBT: Module 2, ELO 4

Application

1. Completed within CBT modules

Instructor Notes

1. See corresponding ILT content in Topic 4-15.

CTS Guide Reference: CTS 3-8

Unit 2: Introduction (Instructor-led Training)

Topic 2-1: Orientation and Administration

Terminal Learning Objective

At the end of this topic, a student will be able to identify facility and classroom requirements and identify course objectives, events, requirements, assignments, activities, skills exercises, resources, evaluation methods, and participation requirements in the course syllabus.

Enabling Learning Objectives

1. Identify facility requirements
    - Restroom locations
    - Food locations
    - Smoking locations
    - Emergency procedures
2. Identify classroom requirements
    - Start and end times
    - Breaks
    - Electronic device policies
    - Special needs and accommodations
    - Other requirements as applicable
3. Review course syllabus
    - Course objectives
    - Calendar of events
    - Course requirements
    - Student evaluation process
    - Assignments
    - Activities
    - Required student resources
    - Class participation requirements

Discussion Questions

1. Determined by instructor

Application

1. Have students complete all required registration forms.

Unit 3: PPE and Tools (Instructor-led Training)

Topic 3-1: Maintaining Hazard-specific PPE

Terminal Learning Objective

At the end of this topic a student, given clothing or equipment for the protection of the rescuers, including respiratory protection, cleaning and sanitation supplies, maintenance logs or records, inspection procedures, and such tools and resources as are indicated by the manufacturer's guidelines for assembly or disassembly of components during repair or maintenance, will be able to maintain hazard-specific PPE so that damage, defects, and wear are identified and reported or repaired; equipment functions as designed; and preventive maintenance has been performed and documented consistent with the manufacturer's recommendations.

Enabling Learning Objectives

1. Identify PPE
    - Required
        - Helmet
        - Eye protection
        - Ear protection
        - Protective clothing
        - Safety boots
        - Gloves
        - Respirator (half mask)
    - Recommended
        - Head lamp
        - Radio
        - Knee and elbow pads
2. Describe how to use record-keeping systems of the AHJ
3. Describe requirements and procedures for cleaning, sanitizing, and infectious disease control
4. Describe how to use provided assembly and disassembly tools
5. Identify manufacturer and department recommendations
6. Describe pre-use inspection procedures
7. Describe how to determine operational readiness
8. Identify wear and damage indicators for PPE
9. Complete logs and records
10. Use cleaning equipment, supplies, and reference materials
11. Select and use tools specific to the task

Discussion Questions

1. In what environment did you use your PPE?
2. How do the contaminants from that environment affect your PPE?
3. What is your AHJ's policy or procedure for inspecting, cleaning, maintaining, or discarding PPE?

Application

1. Determined by instructor

Instructor Notes

1. See corresponding CBT content in Topic 1-1.

CTS Guide Reference: CTS 2-13

Topic 3-2: Maintaining Rescue Equipment

Terminal Learning Objective

At the end of this topic a student, given maintenance logs and records, tools, and resources as indicated by the manufacturer's guidelines, inspection procedures, equipment replacement protocol, and organizational standard operating procedure, will be able to maintain rescue equipment so that the operational status of equipment is verified and documented, all components are checked for operation, deficiencies are repaired or reported as indicated by standard operating procedure, and items subject to replacement are correctly disposed of and changed out.

Enabling Learning Objectives

1. Describe how to use record-keeping systems
2. Describe manufacturer and organizational care and maintenance requirements
3. Describe how to select and use maintenance tools
4. Describe replacement protocol and procedures
5. Describe disposal methods
6. Describe AHJ standard operating procedures
7. Identify wear and damage indicators for rescue equipment
8. Evaluate operational readiness of equipment
9. Complete logs and records
10. Select and use maintenance tools

Discussion Questions

1. Determined by instructor

Application

1. FEMA ILT:
   - Activity 2.1 Pneumatic Tools (Module 2, Section 92)
   - Activity 2.3 Electric Tools and Manual Tools (Module 2, Section 94)
   - Activity 2.4 Gas-powered Tools (Module 2, Section 95)
   - Activity 2.5 Patient Packaging (Module 2, Section 96)

Instructor Notes

1. This is your "tool lab".
2. Use FEMA ILT: Module 2 as reference.
3. See corresponding CBT content in Topic 1-2.

CTS Guide Reference: CTS 2-14

Unit 4: Technician (Instructor-led Training)

Topic 4-1: Conducting a Size-up of a Collapsed Heavy Construction-type Structure

Terminal Learning Objective

At the end of this topic a student, given an incident and specific incident information, will be able to conduct a size-up of a collapsed heavy construction–type structure, so that existing and potential conditions within the structure and the immediate periphery are evaluated, needed resources are defined, hazards are identified, construction and occupancy types are determined, collapse type is identified if possible, the need for rescue is assessed, a scene security perimeter is established, and the size-up is conducted within the scope of the incident management system.

Enabling Learning Objectives

1. Describe types and capabilities of resources
    - ICS 420-1 (FIRESCOPE – 2017), Chapter 16

Discussion Questions

1. Determined by instructor.

Application

1. Determined by instructor.

Instructor Notes

1. See NFPA 1006 (2021) Annex F, Confined Space Entry Permit. Discuss with students.
2. See corresponding CBT content in Topic 1-3.

CTS Guide Reference: CTS 3-1

Topic 4-2: Developing a Collapse Rescue Incident Action Plan

Terminal Learning Objective

At the end of this topic a student, given size-up information and a heavy collapsed structure, will be able to develop a collapse rescue incident action plan so that initial size-up information is utilized, an incident management system is incorporated, existing and potential conditions within the structure and the immediate periphery are included, specialized resource needs are identified, work perimeters are determined, collapse type/category and associated hazards are identified, construction and occupancy types are determined, incident objectives are established, and scene security measures are addressed.

Enabling Learning Objectives

1. Identify incident-specific resources in a given geographical area
   - ICS 420-1 FOG (FIRESCOPE – 2017), Chapter 16
2. Identify potential specialized resources
   - ICS 420-1 FOG (FIRESCOPE – 2017), Chapter 16

Discussion Questions

1. Determined by instructor

Application

1. Determined by instructor

Instructor Notes

1. See corresponding CBT content in Topic 1-4.

CTS Guide Reference: CTS 3-3

Topic 4-3: Implementing a Collapse Rescue Incident Action Plan

Terminal Learning Objective

At the end of this topic a student, given an action plan and a heavy construction–type collapsed structure, will be able to implement a collapse rescue incident action plan, so that pertinent information is used, an incident management system is established and implemented, monitoring of dynamic conditions internally and externally is established, specialized resources are requested, hazards are mitigated, victim rescue and extraction techniques are consistent with collapse and construction type, and perimeter security measures are established.

Enabling Learning Objectives

1. Identify specialized resource lists
   - ICS 420-1 FOG (FIRESCOPE – 2017), Chapter 16
2. Request specialized resources
   - What to request
   - How to request
   - From whom to request
   - When to request

Discussion Questions

1. Determined by instructor

Application

1. Determined by instructor

Instructor Notes

1. See corresponding CBT content in Topic 1-5.

CTS Guide Reference: CTS 3-4

Topic 4-4: Determining Potential Victim Locations

Terminal Learning Objective

At the end of this topic a student, given size-up information, a structural collapse tool cache, the type of construction and occupancy, time of day, and collapse pattern, will be able to determine potential victim locations in a heavy construction–type incident so that search areas are established and victims can be located.

Enabling Learning Objectives

1. None

Discussion Questions

1. Determined by instructor

Application

1. Given available AHJ search devices (i.e., thermal imager, fiber optics, search cameras, mirrors, flashlights, night vision goggles) have students familiarize themselves with their use.

Instructor Notes

1. See corresponding CBT content in Topic 1-6.

CTS Guide Reference: CTS 3-2

Topic 4-5: Searching a Collapsed Structure

Terminal Learning Objective

At the end of this topic a student, given PPE, the structural collapse tool cache, an assignment, operational protocols, and size-up information, will be able to search a heavy construction–type collapsed structure so that all victim locations and potential hazards are identified, marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained.

Enabling Learning Objectives

1. None

Discussion Questions

1. Determined by instructor

Application

1. Given a collapse incident scenario (real or simulated), have students apply building markings.

Instructor Notes

1. See corresponding CBT content in Topic 1-7.

CTS Guide Reference: CTS 3-5

Topic 4-6: Constructing Cribbing Systems

Terminal Learning Objective

At the end of this topic a student, given an assignment, PPE, a structural collapse tool cache, various lengths and dimensions of lumber, wedges, and shims, will be able to construct cribbing systems, so that the cribbing system will safely support the load, the system is stable, and the assignment is completed.

Enabling Learning Objectives

1. Describe different types of cribbing systems and their construction methods
   - FEMA ILT: Module 5, ELO 7
2. Describe limitations of construction lumber
   - FEMA ILT: Module 5, ELO 7
3. Describe load calculations
   - FEMA ILT: Module 5, ELO 7
4. Describe principles of and applications for cribbing
   - FEMA ILT: Module 5, ELO 7
5. Describe safety protocols
   - FEMA ILT: Module 1, ELO 1
6. Select and construct cribbing systems
   - FEMA ILT: Module 5, ELO 7
7. Evaluate the structural integrity of the system
   - FEMA ILT: Module 5, ELO 7
8. Determine stability
   - FEMA ILT: Module 5, ELO 7
9. Calculate loads
   - FEMA ILT: Module 5, ELO 3 and 7

Discussion Questions

1. Determined by instructor

Application

1. Given materials, have students build cribbing systems.

Instructor Notes

1. Describe all five cribbing systems (two-piece layer crosstie, three-piece layer crosstie, platform crosstie, triangle crosstie, modified cross tie).
2. See corresponding CBT content in Topic 1-8.

CTS Guide Reference: CTS 3-12

Topic 4-7: Lifting a Heavy Load as a Team Member

Terminal Learning Objective

At the end of this topic a student, given a structural collapse tool cache and a load to be lifted, will be able to lift a heavy load as a team member, so that the load is lifted; control and stabilization are maintained before, during, and after the lift; and access can be gained.

Enabling Learning Objectives

1. Describe how to apply levers
   - FEMA ILT: Module 5, ELO 2
2. Describe classes of levers
   - FEMA ILT: Module 5, ELO 2
3. Describe principles of leverage, gravity, and load balance
   - FEMA ILT: Module 5, ELO 2
4. Describe mechanics of load stabilization
   - FEMA ILT: Module 5, ELO 7
5. Describe mechanics of load lifting
   - FEMA ILT: Module 5, ELO 2, 5, 6
6. Describe how to apply pneumatic, hydraulic, mechanical, and manual lifting tools
   - FEMA ILT: Module 5, ELO 2, 5, 6
7. Describe how to calculate the weight of the load
   - FEMA ILT: Module 5, ELO 3
8. Describe safety protocols
   - FEMA ILT: Module 1, ELO 1 and 4
9. Describe stabilization systems
   - FEMA ILT: Module 5, ELO 7
10. Evaluate and estimate the weight of the load
    - FEMA ILT: Module 5, ELO 3
11. Operate lifting tools
    - FEMA ILT: Module 2, ELO 2
12. Apply a lever
    - FEMA ILT: Module 5, ELO 2
13. Apply load stabilization systems
    - FEMA ILT: Module 5, ELO 7

Discussion Questions

1. Determined by instructor

Application

1. See Topic 3-8 Application.

Instructor Notes

1. Teach Topic 3-7 in combination with Topic 3-8.
2. ELO 7 is covered in Topics 1-7 and 1-8. You do not need to repeat the material.
3. See corresponding CBT content in Topic 1-9.

CTS Guide Reference: CTS 3-9

Topic 4-8: Moving a Heavy Load as a Team Member

Terminal Learning Objective

At the end of this topic a student, given a structural collapse tool cache, will be able to move a heavy load as a team member, so that the load is moved the required distance to gain access and control is constantly maintained.

Enabling Learning Objective s

1. Describe how to apply rigging systems
   - FEMA ILT: Module 5, ELO 3
2. Describe how to apply levers
   - FEMA ILT: Module 5, ELO 2
3. Describe classes of levers
   - FEMA ILT: Module 5, ELO 2
4. Describe how to apply rollers
   - FEMA ILT: Module 5, ELO 6
5. Describe inclined planes
   - FEMA ILT: Module 5, ELO 6
6. Describe gravity, center of gravity, and load balance
   - FEMA ILT: Module 5, ELO 3
7. Describe capabilities and limitations of lifting tools
   - FEMA ILT: Module 2, ELO 1
8. Describe how to calculate the weight of the load
   - FEMA ILT: Module 5, ELO 1
9. Describe safety protocols
   - FEMA ILT: Module 1, ELO 1 and 4
10. Evaluate and estimate the weight of the load
    - FEMA ILT: Module 5, ELO 1
11. Operate required tools
    - FEMA ILT: Module 2, ELO 2
12. Construct and use levers, rollers, and inclined planes
    - FEMA ILT: Module 5, ELO 6
13. Utilize rigging systems
    - FEMA ILT: Module 5, ELO 3

Discussion Questions

1. Determined by instructor

Application

1. FEMA ILT:
   - Activity 5.1 – Lever Type 1-3, Rollers, and Bridging (Module 5, Section 14)
   - Activity 5.2 – Airbags and Cribbing (Module 5, Section 17)
   - Activity 5.3 – Rigging (Module 5, Section 20)
   - Activity 5.4 – Cranes (Module 5, Section 22)
   - Activity 5.5 – Anchors and Bolting (Module 5, Section 25)
   - Activity 5.6 – Mechanical Advantage (MA) Systems (Module 5, Section 27)

- Activity 5.7 – Obstacle (O) Course (Module 5, Section 29)

Instructor Notes

1. Teach Topic 3-7 in combination with Topic 3-8.
2. Only do the load calculation portion of Activity 5.4. The rest is covered in another topic.
3. Use USACE Shoring Operations Guide (current edition) as a reference.
4. See corresponding CBT content in Topic 1-10.

CTS Guide Reference: CTS 3-10

Topic 4-9: Stabilizing a Collapsed Structure Using Timber Shoring Systems as a Member of a Team

Terminal Learning Objective

At the end of this topic a student, given size-up information, a specific pattern of collapse, a basic structural collapse tool cache, and an assignment, will be able to stabilize a collapsed heavy construction–type structure using timber shoring systems as a member of a team so that strategies to effectively minimize the movement of structural components are identified and implemented; hazard warning systems are established and understood by participating personnel; hazard-specific PPE is identified, provided, and utilized; physical hazards are identified; confinement, containment, and avoidance measures are discussed; and a rapid intervention team is established and staged.

Enabling Learning Objectives

1. Describe PPE care and maintenance requirements

Discussion Questions

1. Determined by instructor

Application

1. FEMA ILT:
   - Activity 3.5 – Class 3 Shoring Laced Post Shore (Module 3, Section 31)
     - Traditional
     - Plywood Laced Post (PLP)
   - Activity 3.6 – Class 3 Shoring Sloped Floor Shore (Module 3, Section 34)
     - Application 3.1 – Sloped Floor Shore Build (Module 3, Section 37)
   - Activity 3.7 – Class 3 Shoring Raker Shore (Module 4, Section 40)
2. Given hazard-specific PPE, an assignment, a specific pattern of collapse, a structural collapse tool cache, and specialized equipment necessary to complete the task, have students build a:
   - Double raker shore (required)
   - Triple raker shore (optional)

Instructor Notes

1. ELO 1 is covered in Topic 1-1. You do not need to repeat the material.
2. See corresponding CBT content in Topic 1-11.

CTS Guide Reference: CTS 3-6

Topic 4-10: Stabilizing a Collapsed Structure Using Mechanical Shoring Systems as a Member of a Team

Terminal Learning Objective

At the end of this topic a student, given size-up information, hazard-specific PPE, an assignment, a specific pattern of collapse, a structural collapse tool cache, specialized equipment necessary to complete the task, and engineering resources if needed, will be able to stabilize a collapsed heavy construction–type structure using mechanical shoring systems as a member of a team so that hazard warning systems are established and understanding by team members is verified, all unstable structural components that can impact the work and egress routes are identified, alternative egress routes are established when possible, expert resource needs are determined and communicated to command, load estimates are calculated for support system requirements, all shoring systems meet or exceed load-bearing demands, shoring systems are monitored continuously for integrity, safety protocols are followed, a rapid intervention crew (RIC) is established and staged to aid search and rescue personnel in the event of entrapment, an accountability system is established, atmospheric monitoring is ongoing, and progress is communicated as required.

Enabling Learning Objectives

1. Describe PPE care and maintenance requirements
2. Describe how to evaluate structural load calculations for shoring system requirements
   - FEMA ILT: Module 5, ELO 3
3. Describe how to select shoring systems for stabilization
   - FEMA ILT: Module 3, ELO 3 and 4
4. Describe specific hazards associated with heavy structural collapse
   - FEMA ILT: Module 1, ELO 1 and 3
5. Describe hazard warning systems
   - FEMA ILT: Module 1, ELO 1 and 3
6. Recognize and describe specialized resource and equipment needs
   - FEMA ILT: Module 1, ELO 1 and 3
7. Describe communications and rescuer safety protocols
   - FEMA ILT: Module 1, ELO 1 and 3
8. Describe atmospheric monitoring equipment needs
   - FEMA ILT: Module 1, ELO 1 and 3
9. Select and construct shoring systems for heavy construction–type collapses
   - FEMA ILT: Module 3, ELO 4
10. Perform structural load calculations
    - FEMA ILT: Module 5, ELO 3
11. Select and operate basic and specialized tools and equipment
    - FEMA ILT: Module 2, ELO 1 and 2
12. Mitigate specific hazards associated with shoring tasks
    - FEMA ILT: Module 1, ELO 5

Discussion Questions

1. Determined by instructor

Application

1. Given hazard-specific PPE, an assignment, a specific pattern of collapse, a structural collapse tool cache, and specialized equipment necessary to complete the task, have students build the following shoring systems:
    - Single T-shore (spot shore)
    - Double T-shore
    - Two-post vertical shore
    - Multi-post vertical shore
    - Horizontal shore
    - Door and window shore
    - Raker shore
    - Slope floor shore (type 2)
    - Slope floor shore (type 3)
    - Raker shore (flying) (optional)

Instructor Notes

1. ELO 1 is covered in Topic 1-1. You do not need to repeat the material.
2. See corresponding CBT content in Topic 1-12.

CTS Guide Reference: CTS 3-13

Topic 4-11: Breaching Structural Components

Terminal Learning Objective

At the end of this topic a student, given an assignment, PPE, various types of construction materials, and a structural collapse tool cache, will be able to breach heavy structural components, so that the opening supports the rescue objectives, the necessary tools are selected, structural stability is maintained, and the methods utilized are safe and efficient.

Enabling Learning Objectives

1. Describe effective breaching techniques
   - FEMA ILT: Module 4, ELO 1, 2, 3, 4, 5, 6, 7
2. Describe the selection, capabilities, and limitations of tools
   - FEMA ILT: Module 2, ELO 1 and 2
3. Describe safety protocols for breaching operations
   - FEMA ILT: Module 4, ELO 1, 2, 3, 4, 5, 6, 7
4. Describe how to calculate weight
   - FEMA ILT: Module 5, ELO 3
5. Describe how to anticipate material movement during breaching and stabilization techniques
   - FEMA ILT: Module 4, ELO 5
6. Select and use breaching tools
   - FEMA ILT: Module 2, ELO 2
7. Implement breaching techniques based on heavy construction types
   - FEMA ILT: Module 4, ELO 1, 2, 3, 4, 5, 6, 7
8. Use PPE
   - FEMA ILT: Module 1, ELO 1 and 8
9. Apply stabilization where required
   - FEMA ILT: Module 3, ELO 1, 2, 3, 4

Discussion Questions

1. Determined by instructor

Application

1. FEMA ILT:
   - Activity 4.1 – Drill and Breaker Workshop (Module 4, Section 10)
   - Activity 4.2 – Saw Workshop (Module 4, Section 13)
   - Activity 4.4 – Horizontal Breach (Clean and Dirty) (Module 4, Section 17)
     - Application 4.1 – Performing a Step Cut (Module 4, Section 21)
   - Activity 4.5 – Vertical Breach (Clean and Dirty) (Module 4, Section 25)
     - Application 4.2 – Performing a Stitch Cut (Module 4, Section 27)
   - Activity 4.7 – Confined Space Breach (Module 4, Section 31)
   - Activity 4.8 – Fun House (Module 4, Section 33)
2. Gallows – Given PPE, a rope system, and tools, have students demonstrate breaching concrete and performing a bit change while suspended by a rope system. (Optional, based on resources)

Instructor Notes

1. Torch use Application is covered in Topic 3-12.

2. See corresponding CBT content in Topic 1-13.

CTS Guide Reference: CTS 3-11

Topic 4-12: Cutting Through Structural Steel

Terminal Learning Objective

At the end of this topic a student, given a structural collapse tool cache, PPE, and an assignment, will be able to cut through structural steel so that the steel is efficiently cut, the victim and rescuer are protected, fire control measures are in place, and the objective is accomplished.

Enabling Learning Objectives

1. Describe safety considerations
   - FEMA ILT: Module 4, ELO 3 and 7
2. Describe the selection, capabilities, and limitations of steel cutting tools
   - FEMA ILT: Module 2, ELO 1 and 2
   - FEMA ILT: Module 4, ELO 3, 6, 7
3. Identify cutting tool applications
   - FEMA ILT: Module 2, ELO 1 and 2
   - FEMA ILT: Module 4, ELO 3, 6, 7
4. Assess tool needs
   - FEMA ILT: Module 2, ELO 1 and 2
5. Use cutting tools
   - FEMA ILT: Module 2, ELO 1 and 2
6. Implement necessary extinguishment techniques
7. Stabilize heavy loads
   - FEMA ILT: Module 5, ELO 7

Discussion Questions

1. Determined by instructor

Application

1. FEMA ILT:
   - Activity 4.3 – Torch Use Workshop (Module 4, Section 15)
   - Activity 4.6 – Torch Application Workshop (Module 4, Section 29)
2. Crane Cart Cutting – Given PPE, a torch, and crane with a basket, have students cut steel while suspended in the basket. (Optional, based on resources)

Instructor Notes

1. See corresponding CBT content in Topic 1-14.

CTS Guide Reference: CTS 3-14

Topic 4-13: Coordinating the Heavy Equipment Use

Terminal Learning Objective

At the end of this topic a student, given PPE, means of communication, equipment and operator, and an assignment, will be able to coordinate the use of heavy equipment so that common communications are established, equipment usage supports the operational objective, hazards are avoided, and rescuer and operator safety protocols are followed.

Enabling Learning Objectives

1. Describe types of heavy equipment, capabilities, application, and hazards of heavy equipment and rigging
   - FEMA ILT: Module 5, ELO 3 and 5
2. Describe safety protocols
   - FEMA ILT: Module 1, ELO 1
3. Describe types and methods of communication
   - FEMA ILT: Module 5, ELO 4
4. Use hand signals and radio equipment
   - FEMA ILT: Module 5, ELO 4
5. Assess for operator and rescuer safety
   - FEMA ILT: Module 1, ELO 1

Discussion Questions

1. Determined by instructor

Application

1. FEMA ILT:
   - Activity 5.3 – Rigging (Module 5, Section 20)
   - Activity 5.4 – Cranes (Module 5, Section 22)
     - You can use a crane or a rotator (14-ton minimum) for this activity.
   - Activity 5.5 – Anchors and Bolting (Module 5, Section 25)

Instructor Notes

1. See corresponding CBT content in Topic 1-15.

CTS Guide Reference: CTS 3-15

Topic 4-14: Releasing a Victim from Entrapment

Terminal Learning Objective

At the end of this topic a student, given PPE and resources for breaching, breaking, lifting, prying, shoring, and/or otherwise moving or penetrating the offending structural component, will be able to release a victim from entrapment by components of a heavy construction–type collapsed structure so that hazards to rescue personnel and victims are minimized, considerations are given to compartment syndrome due to crush injuries, techniques enhance patient survivability, tasks are accomplished within projected time frames, and techniques do not compromise the integrity of the existing structure or structural support systems.

Enabling Learning Objectives

1. Describe PPE care and maintenance requirements

Discussion Questions

1. Determined by instructor

Application

1. Determined by instructor

Instructor Notes

1. ELO 1 is covered in Topic 1-1. You do not need to repeat the material.
2. See corresponding CBT content in Topic 1-16.

CTS Guide Reference: CTS 3-7

Topic 4-15: Removing a Victim from a Collapse Incident

Terminal Learning Objective

At the end of this topic a student, given a disentangled victim, a basic first aid kit, and victim packaging resources, will be able to remove a victim from a heavy construction–type collapse incident so that basic life functions are supported as required, victim is evaluated for signs of compartment syndrome, advanced life support is called if needed, methods and packaging devices selected are compatible with intended routes of transfer, universal precautions are employed to protect personnel from bloodborne pathogens, and extraction times meet time constraints for medical management.

Enabling Learning Objectives

1. Describe PPE care and maintenance requirements (AHJ)

Discussion Questions

1. Determined by instructor

Application

1. Given a disentangled victim and victim packaging resources, remove a victim from a heavy construction type construction collapse incident.

Instructor Notes

1. ELO 1 is covered in Topic 1-1. You do not need to repeat the material.
2. See corresponding CBT content in Topic 1-17.

CTS Guide Reference: CTS 3-8

How to Read a Course Plan

A course plan identifies the details, logistics, resources, and training and education content for an individual course. Whenever possible, course content is directly tied to a national or state standard. SFT uses the course plan as the training and education standard for an individual course. Individuals at fire agencies, academies, and community colleges use course plans to obtain their institution's consent to offer courses and provide credit for their completion. Instructors use course plans to develop syllabi and lesson plans for course delivery.

Course Details
The Course Details segment identifies the logistical information required for planning, scheduling, and delivering a course.

Required Resources
The Required Resources segment identifies the resources, equipment, facilities, and personnel required to deliver the course.

Unit
Each Unit represents a collection of aligned topics. Unit 1 is the same for all SFT courses. An instructor is not required to repeat Unit 1 when teaching multiple courses within a single instructional period or academy.

Topics
Each Topic documents a single Terminal Learning Objective and the instructional activities that support it.

Terminal Learning Objective
A Terminal Learning Objective (TLO) states the instructor's expectations of student performance at the end of a specific lesson or unit. Each TLO includes a task (what the student must be able to do), a condition (the setting and supplies needed), and a standard (how well or to whose specifications the task must be performed). TLOs target the performance required when students are evaluated, not what they will do as part of the course.

Enabling Learning Objectives
The Enabling Learning Objectives (ELO) specify a detailed sequence of student activities that make up the instructional content of a lesson plan. ELOs cover the cognitive, affective, and psychomotor skills students must master to complete the TLO.

Discussion Questions
The Discussion Questions are designed to guide students into a topic or to enhance their understanding of a topic. Instructors may add to or adjust the questions to suit their students.

Application
The Application segment documents experiences that enable students to apply lecture content through cognitive and psychomotor activities, skills exercises, and formative testing. Application experiences included in the course plan are required. Instructors may add additional application experiences to suit their student population if time permits.

Instructor Notes
The Instructor Notes segment documents suggestions and resources to enhance an instructor's ability to teach a specific topic.

CTS Guide Reference
The CTS Guide Reference segment documents the standard(s) from the corresponding Certification Training Standard Guide upon which each topic within the course is based. This segment is eliminated if the course is not based on a standard.

Skill Sheet
The Skill Sheet segment documents the skill sheet that tests the content contained within the topic. This segment is eliminated if the course does not have skill sheets.