LESSON

08

RESCUE STRATEGIES AND TECHNIQUES

Lecture: 02 Periods, Practical: 09 Periods, Total: 11 Periods

LESSON OBJECTIVES

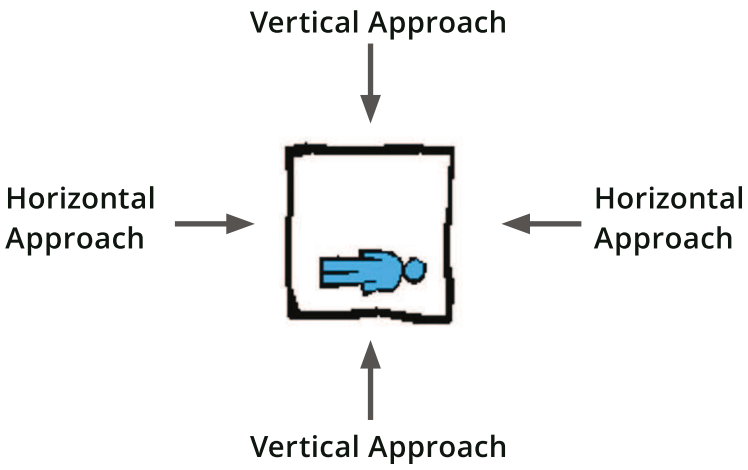
Upon completion of this lesson, you should be able to:

1. Describe the two ways of approaching a located trapped victim.
2. List the four techniques for accessing and rescuing a victim.
3. List the five factors to analyse when evaluating access conditions.
4. List the steps for removing rubble.
5. Describe the procedures for penetrating five different materials: wood, metal, concrete, brick and cinder block.
6. Demonstrate in a practical exercise the procedure for cutting and penetrating the five materials listed above, correctly using the required TEA.

1

Approach Strategies

Once the search has ended and the trapped victim has been located, it is then necessary to make a decision on how to approach the victim.



Vertical Approach

_____

_____

Horizontal Approach

_____

_____

Notes

APPROACH STRATEGIES

	Advantages	Disadvantages
Vertical	• Body position is more comfortable • Easier to use tools and equipment • Easy accessw • Cleaner work conditions	• Likely to work with concrete • Debris may fall on the victim. (Must ensure piece being cut does not fall on the victim) • Time-consuming
Horizontal	• Easy penetration • Material in most cases is not concrete • Debris does not fall on the patient	• Uncomfortable body position • Crawling frequently required • Tool positioning awkward • Dirtier working conditions • Aftershocks risky to rescuer

Figure 1 ▸
Vertical Approach

Figure 2 ▾
Horizontal Approach

2 Access and Rescue Techniques

2.1 **Removing rubble**

2.2 **Shoring**

2.3 **Cutting and penetrating**

2.4 **Lifting and stabilising loads**

3 Evaluating Access Conditions

At this point, the search has been conducted and victims located. Now the focus is to analyse _____ to make sure the route is safe for victim extrication efforts to begin. The following five steps must also be taken:

3.1 Ensure utilities are cut off.

- Water lines
- Gas pipes
- Electrical system
- Air conditioning system

_____

_____

3.2 Proceed to victim marking location.

_____

_____

_____

3.3 Mitigate hazards.

- Shoring

_____

_____

3.4 Establish safety zones and escape routes.

_____

3.5 Secure your access area and remove rubble.

_____

Notes

4 Removing Rubble

When victims are trapped near the surface of a collapsed structure, you will need to remove the rubble surrounding **them** in order to extricate them. It is very important to be very _____and work _____when removing rubble. Use the following procedure:

CAUTION:
Be careful not to move pieces that may affect the stability of the structure or rubble pile.

When in doubt, consult a structural engineer.

2.1.1 Determine the manner in which the building collapsed and verify the condition of its components.

2.1.2 Remove small pieces first and only large pieces that may be loose. Never remove any pieces that are under pressure or wedged in place.

Figure 3 ▸
Rubble removal following an earthquake

2.1.3 To remove pieces that are under pressure it may be necessary to shore first.

2.1.4 Avoid cutting into load-bearing walls.

Notes

4 Removing Rubble (Cont.)

Notes

NOTE:
Simple methods such as a bucket brigade may be very effective for removing rubble.

Figure 4 ▸
Rubble removal following an earthquake

5 Procedures for Cutting and Penetrating Materials

When breaching a wall or floor, always be aware that a _____ ____ may be in direct contact with the other side of the material you are cutting through. Therefore, you must use extreme caution when cutting and penetrating to avoid accidentally injuring the person you are trying to save. Additionally avoid cutting too deeply to prevent damaging _____ , wires, water pipes, etc.

To properly select a tool for a task, you should have a good understanding of the capabilities and limitations of the tools available to you. You must always work within the capabilities of the tool and use it properly.

5

Procedures for Cutting and Penetrating Materials
(Cont.)

Notes

5.1 Cutting and Penetrating Metal and Wood

Several tools and pieces of equipment are used in cutting and penetrating metal and wood:

Tools for Cutting Metal	Tools for Cutting Wood
• Tin snips • Bolt cutters • Hacksaw • Reciprocating saw • File • Power drill • Rotary rescue saw • Circular saw (with metal-cutting blade) • Air chisel • Acetylene torch	• Axe • Hatchet • Hand saw • Power drill or hand drill • Chainsaw • Circular saw • Reciprocating saw • Rotary rescue saw

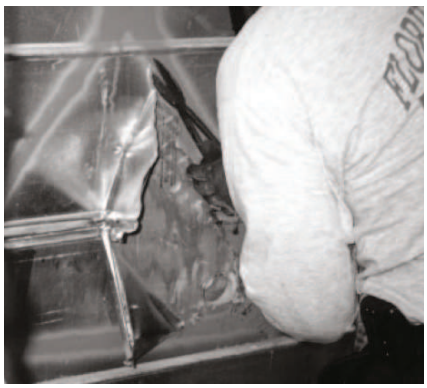


Figure 5 ▲
Cutting sheet metal

Figure 6 ▲
Cutting a wood panel

Procedures for Cutting and Penetrating Materials
(Cont.)

Procedure for Cutting Metal and Wood

1. Use full PPE.

2. Select the proper tool.

3. Make the work area is free of hazards.

4. Knock on the metal or wood to find a hollow area.

5. Make an inspection hole. Use caution when breaking through the other side.

6. Cut a triangular access hole, large enough to permit access. Additionally avoid cutting too deeply.

7. Remove the piece you have cut. Protect against any sharp edges by filing, covering them, or bending the metal back.

8. Shore if necessary.

Notes

5.2 Cutting and Penetrating Concrete Block and Brick

The procedure discussed in this section refers to vertical walls that are still in or close to their original position. Penetration is horizontal. Other techniques would be used for these materials when collapsed or in a horizontal position.

A word of caution: It is best to avoid cutting through walls. Breaching through unreinforced masonry (URM) walls may cause_____or building instability. Instead, you should look for existing natural or created horizontal openings.

Tools for Cutting Brick and Concrete Block

- Large and small sledgehammer
- Chisel
- Pick
- Pry bar or crowbar
- Chipping hammer
- Impact hammer
- Impact drill
- Rotary hammer drill
- Rotary rescue saw
- Saw

Figure 7 ▸ Breaching concrete block

5

Procedures for Cutting and Penetrating Materials
(Cont.)

Notes

Procedure for Cutting and Penetrating Concrete Block and Brick

1. Use full PPE.

2. Select the proper tool.

3. Make the work area is free of hazards.

4. Make an inspection hole. Use caution when breaking through the other side.

5. Break into the block or brick, cutting a triangular hole, starting at the bottom (base of triangle). Additionally avoid cutting too deeply.

   With concrete block, first break into the hollow area (cell), which is weaker. With bricks, first break into the mortar between the bricks.

6. Remove the broken pieces. Always move the pieces out of the hole; do not push them in.

Figure 8 ▾
Breaching a brick wall

7. Shore if necessary.

Notes

5.3 Cutting and Penetrating Reinforced Concrete

Tools for Cutting Reinforced Concrete	
• Large and small sledgehammer • Chisel • Pick • Pry bar or crowbar • Chipping hammer • Impact hammer • Impact drill • Rotary hammer drill • Rotary rescue saw	**For cutting steel reinforcements:** • Reciprocating saw • Hacksaw • Bolt-cutter • Acetylene torch

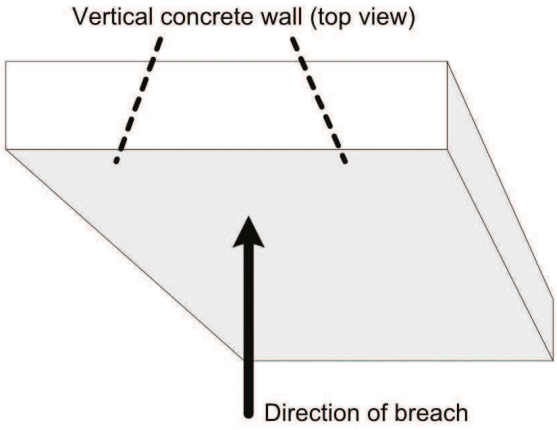
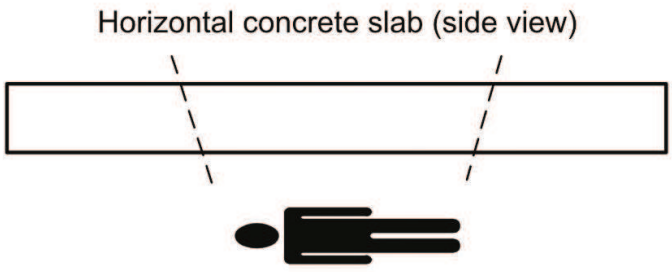


Figure 9 ▸
Cut concrete at an angle to prevent loose piece from falling on or toward victim.



5

Procedures for Cutting and Penetrating Materials
(Cont.)

Notes

Procedure for Cutting and Penetrating Reinforced Concrete

Cable reinforcements need to be identified early to ensure the rescue team can recognise the difference between cables and rebar. Cutting pre/post-tensioned cables can result in the immediate failure of the slab or _____. Generally, rescue teams should not cut tensioned cable or should cut them only under the direction of a structural engineer.

1. Use full PPE.

2. Select the proper tool.

3. Make sure the work area is free of hazards.

4. If possible, make a _____
   Use caution when breaking through the other side.

   _____

5. **Horizontal approach:** Your goal is to cut a _____ hole (70 cm) in the concrete.

   5.1 Make the two upper cuts at a slight angle off perpendicular (80-85 degrees). This will prevent the cut portion from falling inward, where it could potentially injure a victim.

   _____

   _____

   5.2 If the concrete is thicker than the depth of the saw blade, begin chiselling and remove pieces, starting from the bottom (base) and working upward.

   _____

   _____

5

Procedures for Cutting and Penetrating Materials
(Cont.)

Notes

Figure 10 ▸
Breaching on horizontal approach

6. **Vertical approach:** Your goal is to cut a _____ hole in the concrete.

6.1 Make a small hole in the centre of the piece you will be cutting out, that you will use to lift the cut portion.

6.2 Cut two opposing sides of the square at a slight angle off perpendicular (70-80 degrees). This will later prevent the cut portion from falling downward.

6.3 Complete the square by cutting the remaining two sides in a normal perpendicular fashion.

6.4 Then lift out the piece using the hole in the centre. If the concrete is thicker than the depth of the saw blade, you will need to chisel and remove pieces.

5

Procedures for Cutting and Penetrating Materials
(Cont.)

Notes

Figure 11 ▸
Breaching during a vertical approach

7. **Cutting reinforcements:** A different approach is required when encountering reinforced concrete with steel rebar or stranded cable. Loosen the concrete around the rebar to make room for tools. Then you can use a reciprocating saw, bolt cutters, rebar cutters or a torch to cut the individual bars away. If for any reason it becomes necessary to cut cables, you should use a ____ _____ to cut **one strand at a time** to allow for slow de-tensioning.

_____

_____

_____

8. Shore if necessary

PRACTICAL EVALUATION

Lesson 8
Rescue Strategies and Techniques

Group #:

	Activity*	Techniques for Cutting			
		Concrete	Metal & Wood	Bricks	Blocks
1	**Identified the access area using appropriate criteria.**				
2	Measured and painted the access area properly.				
3	Made an inspection hole using the proper technique.				
4	Viewed inside the hole and used the hailing method.				
5	**Demonstrated mastery of the techniques for cutting and/or breaching the various materials.**				
6	**Correctly operated all TEA and used proper work positioning.**				
7	Removed hazardous elements from the entryway into the structure.				
8	Cleared the access area to facilitate entry for the rescue group.				
9	**Followed safety rules while performing work.**				

**Activities in bold type require satisfactory performance for a passing grade on this evaluation.*

Metal Pass: ☐ Fail: ☐ Notes: _____	**Wood** Pass: ☐ Fail: ☐ Notes: _____
Bricks & Blocks Pass: ☐ Fail: ☐ Notes: _____	**Concrete** Pass: ☐ Fail: ☐ Notes: _____
Instructor: (Further comments on reverse)	**Date:**

ID #

POST-TEST | LESSON 8

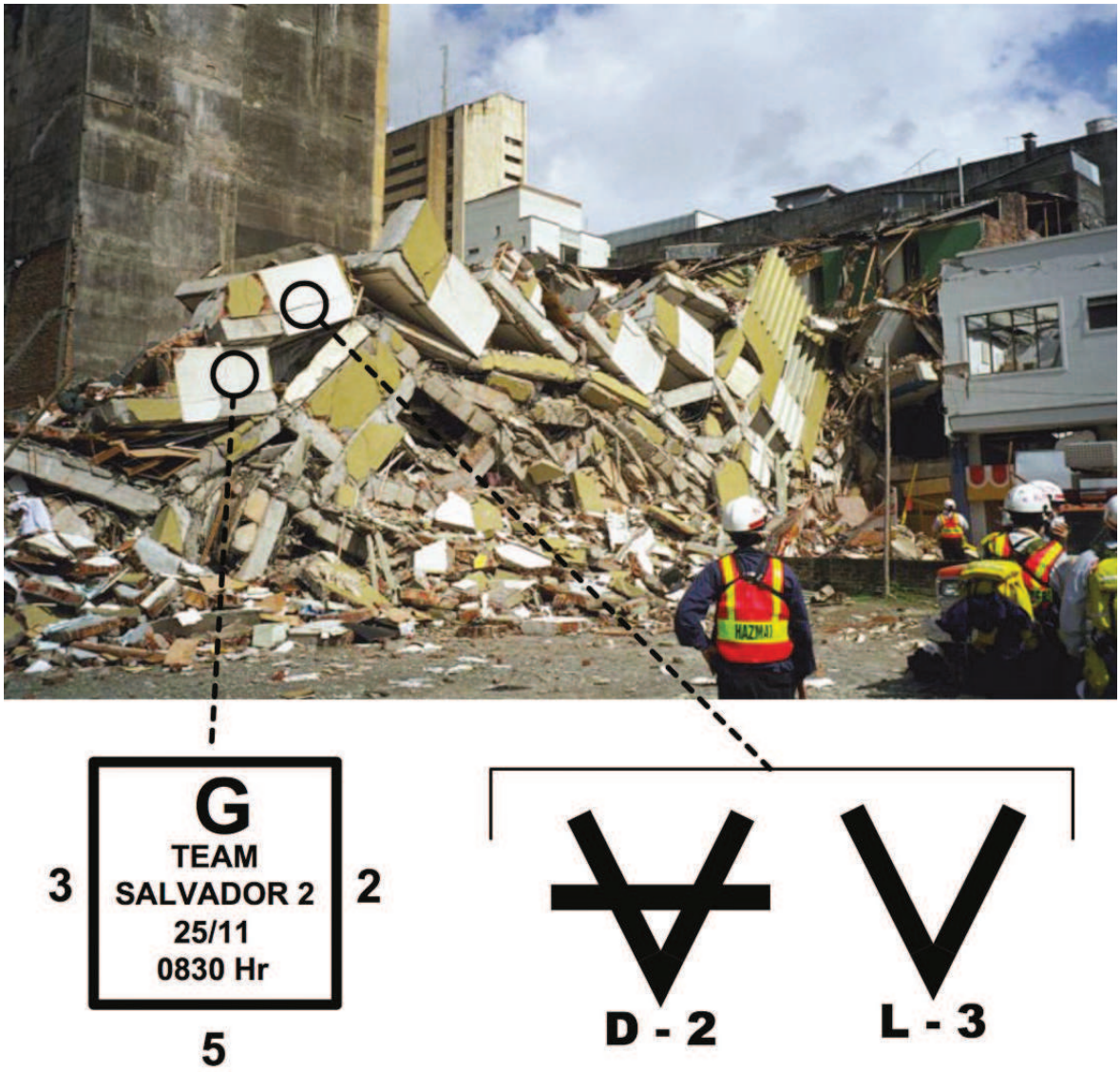
Rescue Strategies and Techniques

1. When a victim trapped in a collapsed structure is found, the two types of approaches used can be either vertical or horizontal. State two advantages and disadvantages of each type of approach.

	Advantages	Disadvantages
Vertical		
Horizontal		

2. List the four different techniques used for gaining access and rescuing a victim.

3. You arrive with your CSSR squad at the collapsed building pictured below. The building was evaluated and two potential victims were detected. What steps would you and your squad take to evaluate access conditions? Please make your answer brief.



4. **(True or False). When removing rubble from a collapsed structure, it is best to remove debris that is found under pressure first and then proceed to the lighter and looser debris next.**

_____

_____

_____

5. **When removing rubble from a collapsed structure, if you have any doubts pertaining to what you can or cannot remove, you should consult with: (Circle one.)**

    a) Safety Officer

    b) Disaster Engineer

    c) Incident Commander

    d) Structural Engineer

For the following questions, please fill in the missing steps.

6. **Procedure for cutting and penetrating concrete block and brick.**

    1. _____.
    2. Select the proper tool.
    3. Make sure the work area is free of hazards.
    4. _____.
    5. Break into the block or brick, cutting a triangular hole, starting at the bottom (base of triangle). Additionally avoid cutting too deeply.
    6. Remove the broken pieces. Always move the pieces out of the hole; do not push them in.
    7. _____ if necessary.

7. **Procedure for cutting metal and wood.**

    1. Use full PPE.
    2. Select the proper tool.
    3. Make the work area is free of hazards.
    4. _____
    5. Make an inspection hole. Use caution when breaking through the other side.
    6. _____
    7. Remove the piece you have cut. Protect against any sharp edges by filing, covering them, or bending the metal back.
    8. Shore if necessary.

8. Procedure for penetrating reinforced concrete.

1. Use full PPE.
2. Select the proper tool.
3. Make sure the work area is free of hazards.
4. If possible, make an _____.
5. Horizontal approach: cut a _____ hole in the concrete.
    (1) The two upper cuts should be _____ (perpendicular/angled).
    (2) If the concrete is thicker than the depth of the saw blade, begin _____ and remove pieces, starting from the _____ and working _____.
6. Vertical approach: cut a _____ hole in the concrete.
    (1) Make a small hole in the centre of the piece you will be cutting out, that you will use to _____.
    (2) Cut two opposing sides of the square_____ (perpendicular / angled). This will later prevent the cut portion from falling downward.
    (3) Complete the square by cutting the remaining two sides in a normal perpendicular fashion.
    (4) Then lift out the piece using the hole in the centre. If the concrete is thicker than the depth of the saw blade, you will need to _____.
7. Cutting reinforcements: Chip away the concrete around the rebar to make room for tools. Then you can use a reciprocating saw, _____ rebar cutters or a _____ to cut the individual bars away. If for any reason it becomes necessary to cut cables, you should use a _____ to cut one strand at a time to allow for slow de-tensioning.
8. Shore if necessary.

CSSR LESSON 8 EVALUATION

Course Location: _____ **Dates:** _____

Do not write your name on this form. Please complete a copy of this form at the end of every lesson. Your evaluations are very valuable towards improving the course. Please use the ratings below.

1 VERY POOR	2 POOR	3 AVERAGE	4 GOOD	5 EXCELLENT

Please fill in the required information.	**Lesson Number :**	**Lesson Name :**	
	Instructor's Name		
Use a scale from 1 to 5 as described above to rate the various lesson components.	**Lesson Rating (rate 1 to 5)**		
	Content	Instructor	Method
	Workbook	Interaction	
Mark your selection with an "**X**"	**Instruction Level** ☐ Too basic	☐ Appropriate	☐ Too advanced
	Duration ☐ Too short	☐ Appropriate	☐ Too long
	Usefulness Was this lesson useful to you?	☐ Yes	☐ No
Rate from 1 to 5	**Overall Lesson Rating** Taking all the above into consideration, I rate this lesson: _____		
If you need additional space, please use the back of the sheet.	**Comments and Observations**		

Thank you for your help. Your input is valuable.
Please turn in this completed form to the instructor.

EXERCISE EVALUATION
LESSON 8

Course Location: _____ **Dates:** _____

Do not write your name on this form. Please complete a copy of this form at the end of every lesson. Your evaluations are very valuable towards improving the course. Please use the ratings below.

1 VERY POOR	2 POOR	3 AVERAGE	4 GOOD	5 EXCELLENT

Lesson 8 **Rescue Strategies and Techniques**	**Station Number:**	**Station Name:** Techniques for Cutting and Penetrating Metal,Wood, Bricks and Blocks, and Reinforced Concrete
	Instructor:	
Use a scale from 1 to 5 as described above to rate the various lesson components.	**Station Rating (rate 1 to 5)** Instructor ____ Materials ____ Method ____ Location ____	
Mark your selection with an "**X**"	**Instruction Level** ☐ Too basic ☐ Appropriate ☐ Too advanced	
	Duration ☐ Too short ☐ Appropriate ☐ Too long	
	Comments and Observations	

Thank you for your help. Your input is valuable.
Please turn in this completed form to the instructor.