LESSON

# 06

# SEARCH AND LOCATION TECHNIQUES

**Lecture-02 Periods  Practical-07 Periods  Total-09 Periods**

## LESSON OBJECTIVES

**Upon completion of this lesson, you will be able to:**

1. Define search and location and describe its importance in the success of a CSSR operation.
2. Describe the composition of a search team and the basic equipment used.
3. List and describe the steps for searching and locating.
4. Define void space and identify probable locations in the four basic collapse patterns.
5. Describe the modes, types and patterns of conducting a search.
6. Demonstrate in two practical exercises the steps for a physical search and location, using two different patterns.

### Instructor Activity

▶ *PPT 6-1 to 6-3*

Introduce yourself and your assistant.

Present the lesson topic, explain the relevance of the lesson to the course, state the duration, and describe scheduled activities and method of evaluation.

This lesson is very important because it tells the rescuers where the trapped victims are located so that they can begin extricating them.

Present lesson objectives. Ask a participant to read them aloud from the workbook.

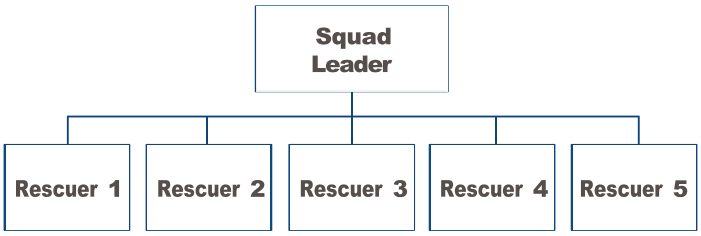
Ensure that the objectives are clear to all participants.

Discuss disasters in which victims were rescued after being trapped in void spaces for extended periods.

## 1 Searching and Locating

A set of techniques and procedures whose purpose is to obtain a response or indication of the presence of **live victims** in a void space within the collapsed structure.

## 2 Composition of a Search Squad




▲ *Figure 1: Basic search squad composition.*

**Squad Leader:**

- Responsible for developing the search plan, drawing diagrams, keeping documentation and making recommendations to the **Team Commander**.
- Performs the duties of the **Safety Officer** and is responsible for monitoring security during the search operation.

**Rescuers:**

- Physically carry out the search operation as outlined by the squad leader.

**Instructor Activity**

▶ Ask participants to review the Operations Phase as discussed in Lesson 2.

▶ *PPT 6-4*
Discuss definition of searching and locating.

▶ *PPT 6-5 Survival Chart*

Review importance of Operations Phase as discussed in Lesson 2.
Review phases diagram on page WB 2-5.

▶ *PPT 6-6*
Explain the structure of a CSSR Search Squad and the functions of the positions

2

## Composition of a Search Squad (Cont.)

### Basic Equipment Required for Physical Searches

- Complete set of personal protective equipment and emergency medical kit.
- Minimum personal supplies required to function unassisted for at least 12 hours. These supplies includes:
  - **Drinking water**
  - **Food**
  - **Proper clothing**
- Basic tools
- Radio equipment to communicate with team members and Command Post
- Portable radios (walkie-talkie)
- Building and work site marking supplies
  - **Paint**
  - **Chalk**
  - **Flags**
  - **Cones**
  - **Markers**
- Warning and alert devices
  - **Megaphone**
  - **Whistle**
  - **Hammer**
  - **Flags**
  - **Horn**
- Reconnaissance and vision
  - **Binoculars**
  - **Photo camera**
  - **Flashlight**
  - **Drone**

### Instructor Activity

▶ *PPT 6-7*

Discuss basic equipment needed for conducting a physical search and demonstrate the equipment in the classroom.

Continue discussion basic search equipment.

Ask participants to contribute ideas regarding equipment. You may also have equipment present in the classroom for demonstration purposes.

Allow time for questions and comments before moving to the next topic.

Ask participants to close their workbooks.

## 2

## Composition of a Search Squad (Cont.)

- Search diagrams, pencils, colour pens, clipboards
- Technical search equipment, specialised or improvised
- Additional materials
  - North American Hazardous Materials Response Guide
  - Hazardous gas detector

**Instructor Activity**

RM on North American Hazardous Materials Response Guide is available in the CD.

## 3

## Steps for Searching and Locating

*PPT 6-8*

*FC 6-1 to 6-2*

The purpose of the following steps is to develop an orderly and systematic procedure for correctly conducting a search.

3.1 Compile and analyse available information.

Distribute handouts (Victim Id form and Relative and Neighbors form).
Refer to RM 6-3 to 6.

3.2 Secure the scene.

Data collection is not only carried out by the squad leader, but all squad members as well.

3.3 Inspect and evaluate the structure.

Point out that the rescued portion of Victim ID form denotes live victims.

3.4 Rescue victims with **easy** access on or near the **surface**, if this has not already been done.

*PPT 6-9 to 6-11*

Generate a discussion among participants to have them figure out the steps. Simulate an operation and help them to discover each step.

## 3

## Steps for Searching and Locating (Cont.)

3.5 Make INSARAG markings on the structure as needed, if not already done.

3.6 Create a **diagram** of the structure. Refer to handout.

3.7 Select the area to be searched.

3.8 Select a search method.

3.9 Conduct an appropriate search pattern and place INSARAG markings where potential victims are detected, both on the structure and on the diagram.

3.10 Continually analyse the results and re-evaluate the search plan (make necessary adjustments).

3.11 Initiate pre-hospital treatment of the victim.

3.12 Confirm the **presence** and **location** of potential victims with the resources and equipment available.

### Instructor Activity

▶ *PPT 6-12*
*FC 6-3*
Distribute diagram handouts (One blank and one example form).

Emphasize that in Step 7 the search area selected is based on an analysis of the information gathered.

Step 8 refers to the modality, type and pattern of search to be used.

Refer participants back to Lesson 4 for marking system details.

▶ *PPT 6-13*
*FC 6-4*
For Step 10 emphasize that re-evaluating the results and the search plan is a continuous process that can stop or modify the search operation at any time.

Explain that the details for Step 11 will be covered in a later lesson and is of extreme importance.

In Step 12 the presence of victims is confirmed.

## 4 Void Spaces

> A physical space in a collapsed structure where a person trapped within could remain alive for a short period.

Possible location of void spaces in typical collapse patterns

**Structurally resistant areas:**

1. Basement
2. Elevator shaft
3. Bathrooms
4. Inside hallways
5. Concrete walls

*Figure 2* ▼
*V-shape collapse*

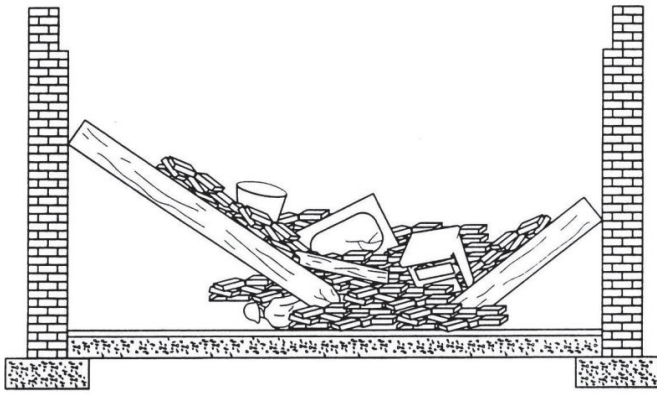


*Figure 3* ▶
*Pancake Collapse*

**Instructor Activity**

▶ *PPT 6-14*
Remind participants that victims trapped in void spaces represent only 15% of the total.

▶ *PPT 6-15*
Give examples of void spaces that might be created in a collapse. Identify the locations most likely to contain live victims.

▶ *PPT 6-16 to 6-25*
Discuss V-shape and pancake collapses.

Point out that void spaces, and therefore survivors, are least likely in pancake collapses.

## 4 Void Spaces (Cont.)

*Figure 4* ▶
*Cantilever collapse*

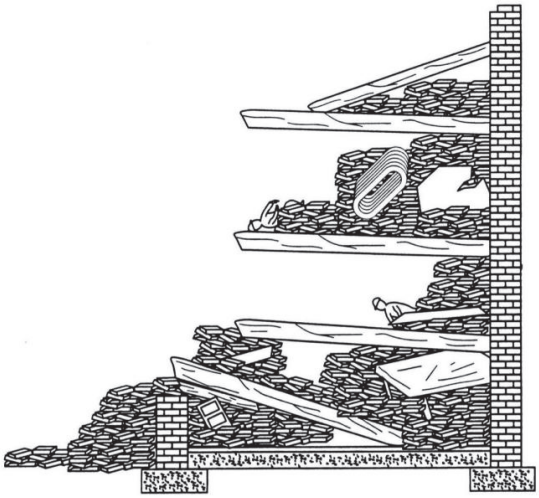
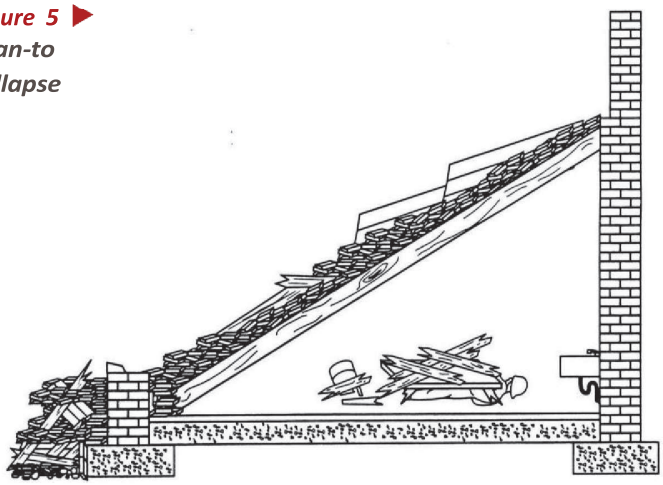


*Figure 5* ▶
*Lean-to collapse*



### Instructor Activity

▶ Discuss cantilever collapses.

▶ Discuss lean-to collapses.

Ask participants to review the four collapse patterns and their characteristics. This is a review of material from Lesson 3.

Discuss possible locations of void spaces.

## 5 Search Modalities

### 5.1 Hasty Search (Primary)

This type of search is conducted to **quickly** detect the presence of survivors on the **surface** or easily accessible void spaces. Hasty search accomplishes the following:

- Rapid detection of victims
- Scene assessment (information gathered as a result aids in size-up of the rescue problem)
- Sets priorities

### 5.2 Extensive (Grid) Search (Secondary)

This type of search is conducted in a methodical manner to pinpoint the exact location of victims. It is designed to cover the **entire assigned search area** carefully and in detail. An extensive or grid search accomplishes the following:

- A thorough, systematic search
- Redundant checks
- Allows for use of alternate search resources

This process may need to be repeated as new information is received and/or as the condition of the structure changes.

**Instructor Activity**

▶ *PPT 6-26*
Explain differences between hasty and extensive searches. Allow for discussion among participants.

▶ Use flipchart or blackboard to illustrate grid search.

## 6 Search Methods

### 6.1. Physical Search

Physical search operations do not require **specialists** or unique, expensive equipment. They only require the **senses** and some established procedures.

*Figure 6* ▼
*Physical search over a rubble pile*

This search tactic is the first, and sometimes the only, search method used by local emergency service agencies that do not possess technical or canine search resources.

**Instructor Activity**

▶ *PPT 6-27*
Explain the basics of the three types of search, beginning with physical search.

## 6 Search Methods (Cont.)

Local first responders must rely on fundamental search techniques. A readily accessible and willing group of volunteers can be quickly trained and supervised to safely conduct physical search operations after a disaster. Basic physical search is usually performed immediately after an incident, and may be done by locals.

Point out that physical search is the main type of search that will be discussed in this course, though the other two are very useful when the necessary equipment and resources are available.

▶ *PPT 6-28*

*Figure 7* ▼
*Physical search over a pancake collapse*

### Physical/Void Search

▶ *PPT 6-29*

*Figure 8* ▼
*Void search*

A search team may need to modify and adapt modes to fit their specific needs.

## 6 Search Methods (Cont.)

### 6.2 Canine Search

Uses the **acute sense of smell** of dogs specially trained to detect live humans.

*Figure 9* ▶ *Initiating a canine search*

Certified canine teams with highly specialized dogs provide the best way to locate trapped victims in a large area in the shortest amount of time. They are able to access areas too small or too unstable for humans to enter. Canines can be used for hasty and extensive operations.

A thorough site search with two well-qualified search dogs has a high probability of conclusive results. The disaster trained search canine is trained to detect those victims that are still alive. Rescuers should coordinate their activities with that of the canine team during their search operation.

### 6.3 Technical Search

Requires highly trained personnel and **specialized equipment** for sound and temperature detection, video, vibration, etc. Can be carried out using specially manufactured or locally improvised equipment.

The latest state-of-the-art electronic search equipment has added a new dimension to the search function by extending its range. Whenever possible, dogs and electronic devices should be utilised together. Technical search equipment can be classified into two groups:

- Visual search instruments
- Electronic listening devices

**Instructor Activity**

▶ Discuss canine search.

Comment on the rigorous training and resources required to conduct this search, and results that you are aware of during rescue operations.

▶ Discuss technical search.

Mention that modern technology has produced some very efficient equipment that unfortunately is extremely expensive. However, later in the lesson some suggestions are given in using ingenuity and creativity to create and improvise equipment locally at a reduced cost.

Briefly discuss visual search instruments.

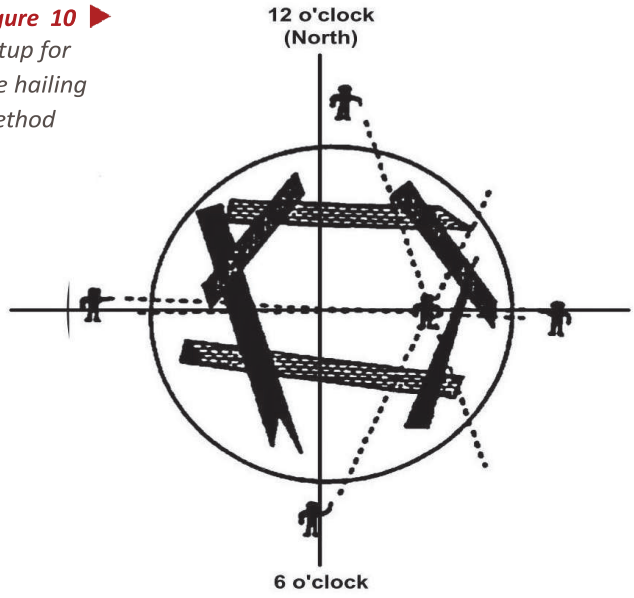
Refer to RM for additional information.

## 7 Hailing Search Method Procedure

The search team leader signals for silence and all work to stop around the area. Four team members form a **cross** pattern, spaced at intervals of approximately 8-16 metres, in safe locations as close as possible around the search area.

Going 'around the clock,' each searcher calls out loudly or with a megaphone, "If you can hear me call for help or knock five times on something solid." (Use both English and local language) Instead of hailing, searchers may also knock something solid (usually metallic) that is a contiguous part of the site debris in order to elicit a response.

*Figure 10* ▶
*Setup for the hailing method*




All searchers then listen and point in the direction of any potential response to the instructions. If more than one searcher hears the sound, the direction in which they point will triangulate on the source of the sound of the victim. This must be noted on the site sketch or on personal notes, where each rescuer makes a rough sketch of the area and the direction of the source of sound. Use a coordinate grid system and/or the clock system (using North as 12 o'clock).

> The collapse pattern, building materials and a multitude of other variables can cause voices to be heard clearer than knocking, and other times vice versa. Use both methods for greater efficiency.

### Instructor Activity

▶ Ask if the three search methods are clear.

Discuss hailing method and explain how it is part of the physical search. This will be discussed in greater detail later in the lesson.

Begin discussing hailing procedure.

Continue method discussion.

▶ *PPT 6-30*

Explain diagram and pointing toward the source of the sound.

Explain that everyone must have the same Site Sketch to ensure that triangulation is effective.

Other ways of indicating a direction are to use the hands of the clock or geographical orientation.

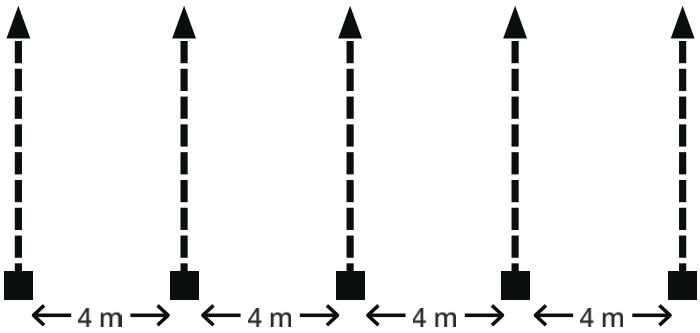
Use examples of the above to ensure that the participants are clear on using these references for direction.

## 7

## Hailing Search Method Procedure (Cont.)

A variation of the hailing method is to set up several searchers in a straight line across the site, or in grid patterns, as when performing the physical/void search. In this scenario, rescuers are also aligned next to, but off, the rubble pile to detect sound the others on the pile may not hear. The rescuers will hail in the order given, listen and then advance as safety permits. This ensures the entire structure is covered in an extensive grid-pattern search.

***Figure 11*** ▼
*Hailing method using a line search.*




**Instructor Activity**



## 8

## Physical Search Patterns for Interior Spaces

Occasionally you will encounter structures that have not totally collapsed and contain large, open areas or a building with many intact rooms, in which live victims, unable to remove themselves or communicate, will be found. An organized approach will yield the best opportunity to locate a victim, and to declare the area searched.

▶ Explain that search patterns described allow a given area to be covered, such that if a victim is calling for help, the chances are high that he or she will be detected.

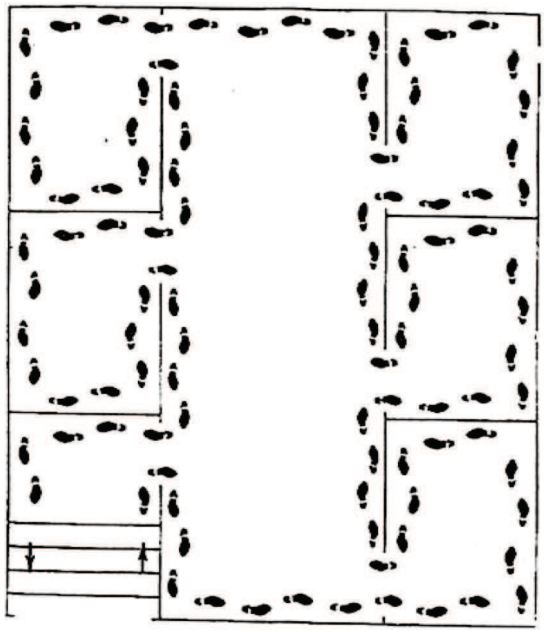
This course describes the most widely used patterns. There may be several others and adaptations or combinations of these.

## 8 Physical Search Patterns for Interior Spaces (Cont.)

### 8.1 Multiple Rooms

The basic instruction for searching multiple rooms is **"go right, stay right."**

*Figure 12* ▼
*"Go right, stay right" method for multiple room search*



8.1.1 After entering the structure, turn to the right, stay in contact with the right wall, either visually or physically, until the entire accessible area has been searched and the team returns to the starting point.

8.1.2 If the search team needs to exit and cannot remember the direction they entered, simply turn around and stay in contact with the same wall, either physically or visually, keeping it on your left.

▶ *PPT 6-31*
Explain and describe the **multiple room** and **line search** patterns.

Remind participants to continue filling the blank spaces in their workbooks.

## 8 Physical Search Patterns for Interior Spaces (Cont.)

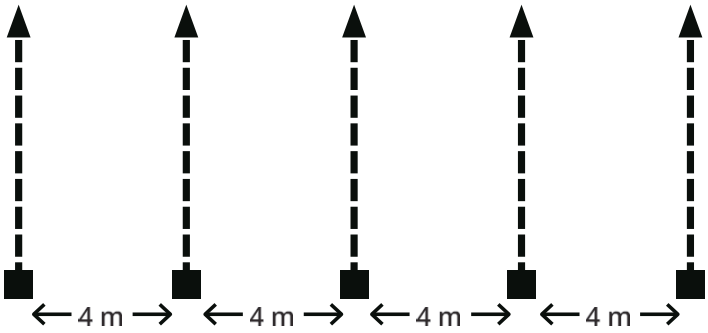
### 8.2 Large Open Areas (Line Search)

Use the line search method in auditoriums, cafeterias, and offices with multiple partitions.

8.2.1 Spread search team members in a straight line across the open area, **3 to 4** metres apart.

8.2.2 Slowly walk through the entire open area to the other side.

*Figure 13* ▼
*Line search method*




8.2.3 Team members on the ends of the line search perimeter rooms using the go right-stay right method.

8.2.4 The procedure may be repeated in the opposite direction.

**Instructor Activity**

▶ *PPT 6-32*
Complete the steps for the **line search** pattern.

Explain to participants that they will be practicing two of the patterns later in the lesson.

▶ *FC 6-5*
Sample of Sketch Map

9

## Victim Management

The following concepts and procedures should be applied the moment the search is initiated until the last victim is found.

### 9.1 Precautions during a search

- Never make inappropriate comments the victim should not hear. Keep your comments on a positive note. Always assume someone is **listening** to you.
- The victim is in the worst possible position and fighting to stay alive, and you can enhance their **chances of survival** by being positive about the possibility of finding and extricating them.
- You may be the first person the victim is able to communicate with; therefore it is important to project a sense of confidence and hope.

### 9.2 Steps for initial contact with a located victim

9.2.1 Identify and overcome language barriers.

9.2.2 Identify yourself as a rescuer, projecting confidence and calm in your voice and choice of words.

9.2.3 Obtain the following information:

- Name
- Adult or child (approximate age)
- Type and **extent** of **injury**
- Hydration status
- Warmth
- Degree of **confinement**

**Instructor Activity**

Instruct participants to close their workbooks for a moment.

▶ *PPT 6-33*

Have participants engage in a discussion to produce on their own the precautions and the steps for initial contact.

▶ *PPT 6-34*

Discuss steps for initial contact with a victim.

Ask participants to open their workbooks and complete the blank spaces.

## 9 Victim Management (Cont.)

9.2.4 Provide emergency medical treatment as quickly as possible.

9.2.5 Ask about other potential **victims** and their condition.

9.2.6 Inform the victim of rescue operations.

9.2.7 Inform the victim if you have to leave for short periods.

9.2.8 Provide protection from the environment as much as possible.

9.2.9 Consider direct or indirect intervention of a **relative** or **friend** , etc.

**Instructor Activity**

▶ Complete steps for initial contact with a victim.

## 10 Improvised Search Equipment

### 10.1 Acoustic detection (use to amplify sound through a crack or opening in a building)

- Stethoscope
- Recorder with microphone mounted on a pole

### 10.2 Visual detection

- Telescopic mirror with illumination
- Common video camera

### 10.3 Sound transmission

- Loudspeaker mounted on an extension, with microphone
- Portable radios

### 10.4 Other

▶ Ask participants to suggest new ideas and help them devise new methods for improvised search equipment.

Take notes of the participants' ideas to introduce into lesson materials.

▶ Refer to RM-6-14

## Instructor Activity

***PRACTICAL EXERCISE***

Review the EG for Safety Briefing.

Ask participants to complete Lesson Evaluation Form. Allow several minutes and collect.

See Exercise Guide 6.

***REVIEW***

Lesson objectives and other main points.

Ensure that lesson objectives have been met.

***EVALUATION***

Remind participants to study the RM in preparation for Post-Test.

***CLOSING***

Thank class for their participation and announce the coming lesson.

— INSTRUCTOR'S COPY

# POST-TEST | LESSON 6

## Search and Location Techniques

ID #

**1. Complete the following definition for searching and locating:**

A set of techniques and procedures whose purpose is to obtain a **response** or indication of the presence of **live** victims in a **void** space within the collapsed structure.

**2. Describe the different functions of the members of a CSSR squad:**

Searchers: **Physically carry out the search operation as outlined by the team leader.**

Safety: **Performs the duties of the Safety Officer and is responsible for monitoring security during the search operations.**

Leader: **Responsible for developing the search plan, drawing diagrams, keeping documentation and making recommendations to the incident commande**

**3. From the following list of basic search and rescue equipment, identify those needed for structure marking:**

| | |
|---|---|
| _____ Binoculars | __✓__ Spray paint |
| __✓__ Flags | __✓__ Cones |
| _____ Flashlight | _____ Hammer |
| _____ Periscope | _____ Gloves |

**4. Number the following steps in proper order for a search and location operation:**

_9_ Conduct an appropriate search pattern and place INSARAG markings where potential victims are detected, both on the structure and on the diagram.

_1_ Compile and analyse available information.

_11_ Initial pre-hospital treatment of the victim.

_4_ Rescue victims with easy access on or near the surface, if this has not already been done.

_10_ Continually analyse the results and re-evaluate the search plan (make necessary adjustments).

_8_ Select a search method.

_12_ Confirm the presence and location of potential victims with the resources and equipment available.

_2_ Secure the scene.

_6_ Create a diagram of the structure.

_3_ Inspect and evaluate the structure.

_5_ Make INSARAG markings on the structure as needed, if not already done.

_7_ Select the area to be searched.

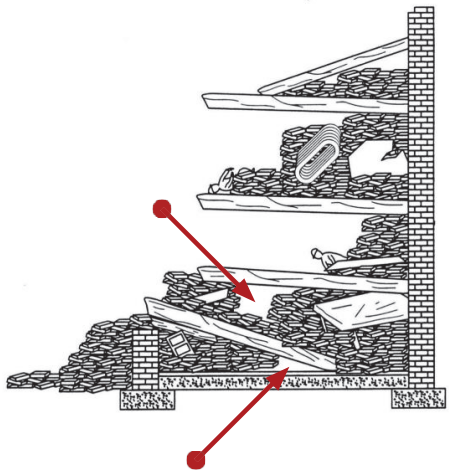
**5. Define void space.**

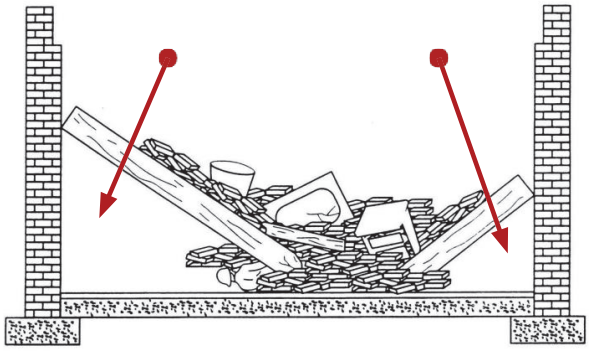
**A physical space in a collapsed structure where a person trapped within the space could remain alive for a short period.**

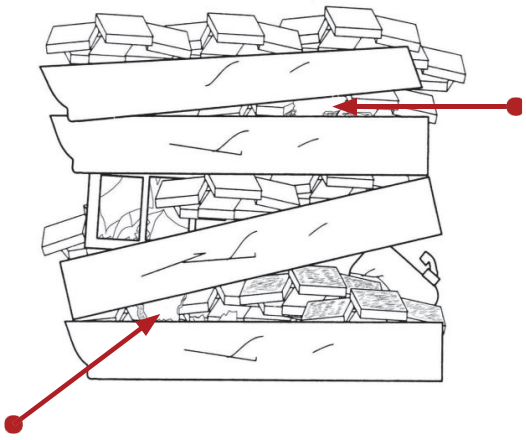
6. **List and describe the characteristics of the two search modalities:**

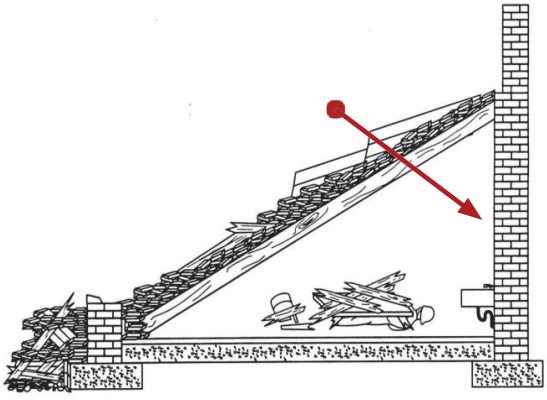
| Hasty Search | Extensive/Grid Search |
|---|---|
| • Rapid detection of victims<br>• Scene assessment<br>• Sets priorities | • A thorough, systematic search<br>• Redundant checks<br>• Allows for use of alternate search resources |

7. **Identify the void spaces in the following four drawings, using arrows to indicate their locations:**





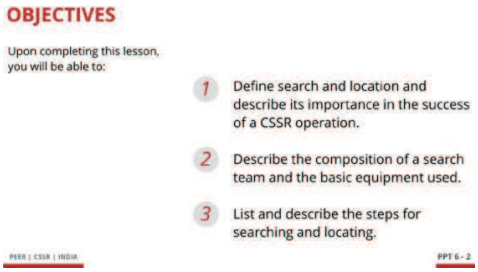




# LESSON 6
# — PPT's

## 6-1


## 6-2

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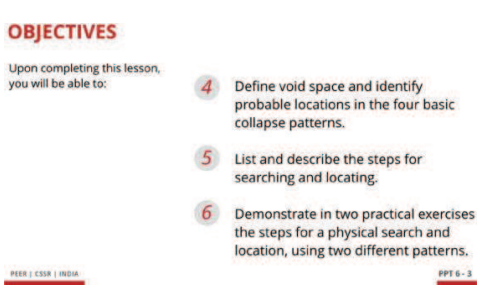


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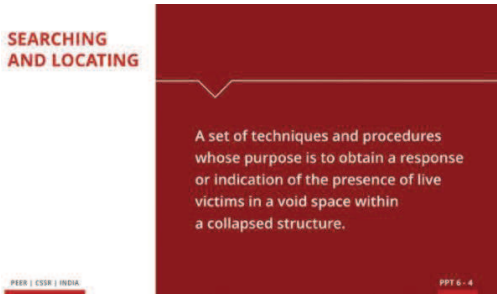
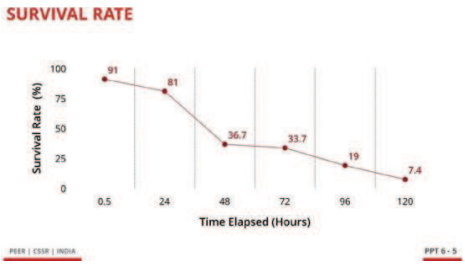
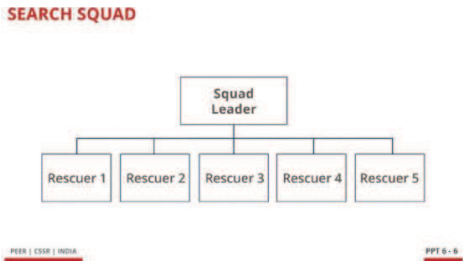



## 6-5




## 6-6



# LESSON 6
# — PPT's

## 6-7

**BASIC EQUIPMENT FOR PHYSICAL SEARCH**

- Personal protective equipment
- Personal supplies (unassisted for 12 hours)
- Marking supplies
- Communication devices
- Warning and alert devices
- Reconnaissance and vision

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PPT 6 - 7

## 6-8

**STEPS TO SEARCH AND LOCATE**

1) Compile and analyse information.
2) Secure the scene.
3) Inspect and evaluate the structure.
4) Rescue surface victims.

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PPT 6 - 8

## 6-9

15% victims trapped in void spaces

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PPT 6 - 9

## 6-10

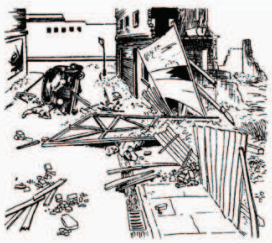
35% victims lightly trapped

PEER | CSSR | INDIA

PPT 6 - 10

## 6-11

50% victims on surface



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PPT 6 - 11

## 6-12

**STEPS TO SEARCH AND LOCATE**

5) Make markings on the structure.
6) Create a diagram.
7) Select search area.
8) Select search method.

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PPT 6 - 12

# LESSON 6
# — PPT's

## 6-13

**STEPS TO SEARCH AND LOCATE**

9) Conduct search and place INSARAG markings on structure and diagram.
10) Analyse results and re-evaluate.
11) Pre-hospital treatment.
12) Confirm potential victim location.

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## 6-14

Void Spaces

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## 6-15

**POSSIBLE LOCATION OF VOID SPACES**

Structurally resistant areas:
1) Basements
2) Elevator shafts
3) Bathrooms
4) Inside hallways
5) Concrete walls

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## 6-16

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## 6-17

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## 6-18

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# LESSON 6
# — PPT's

**6-19**

**6-20**

**6-21**

**6-22**

**6-23**

**6-24**

# LESSON 6
# — PPT's

## 6-25

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## 6-26

SEARCH MODALITIES

1 Hasty search

2 Extensive search

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## 6-27

SEARCH METHODS

1 Physical search

2 Canine search

3 Technical search

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## 6-28

Physical Search

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## 6-29

Void Search

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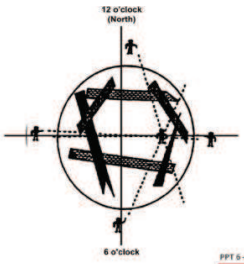
## 6-30

HAILING METHOD

"We are rescuers – make some noise so we can hear you!!"

SILENCE IS ESSENTIAL

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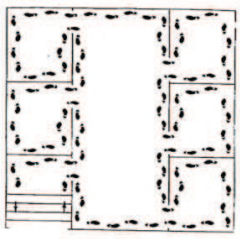
# LESSON 6
# — PPT's

## 6-31

SEARCH PATTERNS:
MULTIPLE ROOMS

"GO RIGHT,
STAY RIGHT."



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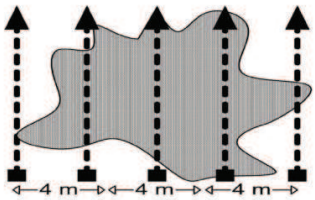
PPT 6-31

## 6-32

SEARCH PATTERNS:
LINE SEARCH

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PPT 6-32

## 6-33

VICTIM
MANAGEMENT

1. Precautions during a search
2. Steps for initial contact with a located victim

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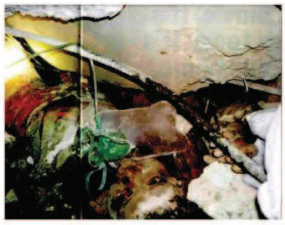
PPT 6-33

## 6-34

VICTIM CONTACT



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PPT 6-34

## LESSON 6

# — FLIP CHARTS

**FC6-1**

CSSR

### STEPS FOR SEARCH AND LOCATION

1. Compile and analyse information.
2. Secure the scene.
3. Inspect and evaluate the structure.
4. Rescue surface victims.

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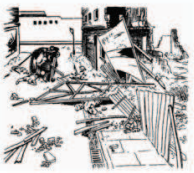
More > FC 6-1

**FC6-2**

CSSR

**50%** victims on surface



**35%** victims lightly trapped

**15%** victims trapped in void spaces

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FC 6-2

**FC6-3**

CSSR

« continued

### STEPS FOR SEARCH AND LOCATION

5. Make markings on the structure.
6. Create a diagram.
7. Select search area.
8. Select search method.

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More > FC 6-3

**FC6-4**

CSSR

« continued

### STEPS FOR SEARCH AND LOCATION

9. Conduct search and place victim markings, both on the structure and on the diagram.
10. Analyse results/ re-evaluate
11. Pre-hospital treatment.
12. Confirm potential victims with available resources and equipment.

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FC 6-4

## Search Area/Site Sketch

Team # _____ Date: _____ Time:_____ Location/GPS _____ Page: ____ of _____

| | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |

### Legend / Required Symbols

- North arrow
- Scale
- Sides 1, 2, 3 and 4
- Access points: 1st → 2st →

Chemical ◇

Structural ▭

Environmental △

Potential victim V

Confirmed victim V L - 3 7m →

Dead victim V D - 3 2m →

### Resources Utilized

Physical/ Hailing ☐ Acoustic ☐

Canine ☐ Other ☐ Optical ☐

Service Symbols

E Electricity G Gas W Water

Cut services: When services are cut, a cross is placed on top of the symbol. E Electricity

Command Post ◔

Staging Area S

Emergency vehicles ▭

Trucks ▭

Heavy equipment ◯▭