



Lesson 4

REFERENCE MATERIAL

Structural Triage and the
INSARAG Marking System

The activation and mobilization of a CSSR team will usually occur when a calamitous, large-scale event has occurred that overwhelms the capabilities of local resources. Significant damage and disruption to the existing infrastructure would be expected following an event such as an earthquake or hurricane. At times, a CSSR team may be confronted with responsibility for a general area affected by the event that encompasses multiple buildings, with little or no search and reconnaissance information. The structure triage, assessment and marking system is designed to help identify, select and prioritize the building(s) with the highest probability of success of finding and rescuing live victims. As such, this may not be the building(s) with the largest number of potential victims or the building in the best structural condition. In addition, it is important that information related to building identification, conditions and hazards, and victim status are posted in a standardized fashion.

Initial Size-Up

Many factors must be dealt with when a CSSR team arrives on incident and attempts to size up the situation and begin operations. In general, it is anticipated that a CSSR team may need to perform the following activities prior to beginning search and rescue operations:

1. Identify buildings individually (i.e., by address, physical location, unique design, etc.)

2. Perform general area triage (e.g., to identify separate buildings, from many in a given area, that offer the highest potential for viable rescue opportunities)
3. Conduct hazard assessment and marking of any particular building prior to search or rescue operations.
4. Search and rescue marking of a particular building.

At least two possibilities exist when a CSSR team arrives at their assigned location within an affected jurisdiction. First, local emergency response personnel may have already identified viable search or rescue opportunities for the CSSR team. The location and/or identification of separate buildings may be clearly identified. This information would greatly reduce the number of considerations that the CSSR team leader must address. Essentially, information provided by local sources must be reviewed for validity.

Second, there may be little or no reconnaissance information when the CSSR team arrives. They may be faced with a geographic area (several buildings, part of a block, several block area, etc.) with no tangible information as to where to concentrate their efforts. In this case, the decision-making process and size up of the situation becomes much more complex.

The following rationale may be used by a CSSR leader, during the first hours of arrival at an assigned location within an affected jurisdiction, if faced with the second situation of little or no information:



Structural Triage

One or two CSSR structure triage teams may be deployed into the area in question. A team should be comprised of one (1) Structure Specialist and one (1) Hazardous Materials Specialist. Each team would conduct a short triage (approximately one hour or less in length) of the buildings in the area. The identification of structure location would be established during the triage process. Refer to the Structural Triage section for the requirements of this operation. (This assignment could be conducted simultaneously at the inception of the mission while the CSSR team leader deploys personnel to assess possible sites for locating the Base of Operations.)

Search and Reconnaissance

At the conclusion of the rapid structural triage, one or two CSSR search and reconnaissance teams should be deployed to evaluate each building deemed viable (as a result of the rapid triage) for continued search and/or rescue operations. Structure and search marking should be performed during this phase and prior to the initiation of rescue operations.

Basic Assumptions for the Use of Triage

- Triage will be necessary if there are three or more buildings assigned to a single CSSR team. Triage would initially be performed by a team of structure specialists and hazardous materials specialists (if available) as soon as possible upon arriving at the site, and should be accomplished within no more than two hours. The remainder of the task force would be involved in camp set-up, information gathering, etc. during this time period.
- No planned search operations would begin until initial triage was completed, in order to establish priority.
- The more detailed structure/hazards evaluation and building marking would take place (along with the initial search) after structures are initially prioritized. One or more teams of structure specialists and hazardous materials specialists would accomplish structure/hazards evaluation and building marking.
- Triage criteria would be re-evaluated after initial search in light of locating live victims.
- If many buildings were involved, triage would probably be done by two teams, each consisting of one structural specialist and one Haz-Mat Specialist. It would therefore, be imperative that the two teams compare assessment criteria, before and after they do the triage work, in order to assure that uniform evaluations are obtained.
- There will be some buildings that will have significant hazards so that search and rescue cannot proceed, until the hazards are mitigated. These buildings will be given “NO GO” assessments (structures on fire, significant Haz-Mat spills).
- Some buildings may require rescue operations beyond the capability of the rescue force (i.e., require heavy shoring, require heavy lifting equipment, etc.). These may be assigned “NO GO” status by the CSSR team Leader (at least until the required equipment is obtained).



- Triage assessments will be based on value judgments that are made on rapidly obtained information, and should always be subject to a common sense review and adjustment by the CSSR team leader and evaluation team.
- As in medical triage, difficult decisions will need to be made. The goal should always be to rescue the largest number of victims as possible within the first day or so (without causing team members to become additional victims).
- The natural tendency of the structure specialist will be to stop at each building and solve the problem”, and not leave a structure where people might be known to be trapped, etc. This tendency must be overcome by maintaining a predetermined schedule of 5 to 10 minutes maximum per building, and frequent check-in with CSSR team leadership.
- **Collapse mechanism:** how building failed in order to provide an indication of type of voids that might be available for victim survival.
- **Time of day:** refers to the time of the event which caused the collapse. This is a critical factor when combined with the occupancy type. For example, if an earthquake occurs at 2100 hours and collapses an office building and an apartment building, the apartment building would normally represent the higher potential for a success rescue than would the office building. If the event occurred at 1000 hours, the opposite would be true.
- **Prior intelligence:** information from the general public, local authorities, first responders, etc. relating to known trapped victims.
- **Search and rescue resources available:** does the particular building require resources beyond what is readily available to the CSSR team? (e.g., is heavy equipment required to gain access?)
- **Structural Condition of the Building:** generally, can search and rescue operations proceed with a minimum of stabilization effort.

Triage Criteria

The following information needs to be considered determining risk/benefit that will aid in prioritization.

- **Occupancy:** the type of activity done in the building, as well as the potential maximum number of occupants.
- **Structure type:** what type of materials are involved, in order to help identify difficulty of access, type of collapse, potential hazard mitigation needs, etc.

Triage Scoring Factors

The following factors will be used to obtain a numerical score for each structure in a group of buildings. The intent is, the higher the numerical score the better the risk/benefit ratio.



- **Zero occupants probable:** A notation of “ZERO” would be written in the score column if the earthquake occurred at a time of day when the type of occupancy contained in the structure was such that the building would have been normally unoccupied (school rooms on Sunday, retail shops at 6 A.M., etc.). The triage team would then proceed to the next building.
- **Total number of potentially trapped victims.** This will be assessed knowing the type of occupancy, the floor area of collapsed entrapping structure, the time of day the incident occurred, and the type of collapse.

The following data is suggested as average total number occupants for various occupancies in the United States. They should be adapted to local conditions as necessary:

Number of Occupants Based on Units Other Than Area	
Schools	25 to 35 per classroom
Hospitals	1.5 per bed
Residential	2.0 per bedroom
Other	1.5 per parking space

Number of Occupants Based on Area		
Location	m² per occupant	Variation (m²)
Schools, libraries	6.5	4.25–9.5
Hospitals	9.5	7.5–14.25
Multi-Residential	19	9.5–28.5
Commercial	9.5	4.25–19
Office, incl. Gov't.	14.25	9.5–19
Public assembly	2.5	0.9–4.25
EOC, Police/Fire Dept.	12	9.5–14.25
Industrial	19	9.5–28.5
Warehouse	28	38–85

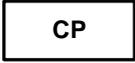
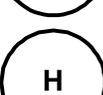
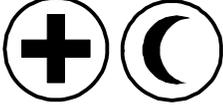


As discussed, the time of day that the incident occurred may indicate that there was very little possibility of a structure being occupied. The type of collapse (auto garage only, partial collapse) may also indicate that few occupants would remain entrapped even if many occupied the structure during the incident. The numerical value of this criteria will vary from 1 to 50 as the number of potentially trapped victims varies from 1 to more than 200. Between 5 and 250 the value is the total number of possible trapped victims divided by 5.

- **Condition of voids:** This criterion will attempt to assess the degree of survivability of the potentially trapped victims. Victims don't survive well in tightly compacted collapsed areas consisting of rubble masonry, badly broken cast in place concrete and precast concrete. Hollow, survivable voids are often found under wooden floor panels, that are collapsed into angular interlocking planes and in reinforced concrete structures, where floors have projecting beam elements, parts of columns/walls and furnishings that hold the slabs apart. Partly collapsed structures may have large triangular voids or entrapped victims in large voids due to blocked exits etc. These large voids have the best chance of having surviving entrapped victims. The numerical value of this criteria will vary from 1 to 20.
- **Time required to access victims:** This will be an estimate of the time required to get to the first victim. It should include the time required to cut through floors/roofs etc., and the time required to shore/brace the access route and appropriate adjacent structures. The numerical value will vary from 1, for more than one day, to 20 for taking only two hours.
- **Danger of additional collapse due to aftershock:** This criteria will be represented by a minus number between -1 for low probability to -20 for high probability of additional collapse, assuming the proposed shoring/bracing is installed from criteria 3.
- **Special occupancy information:** For this criteria one will add 25 points if the occupancy is a school, day care center, hospital, or other occupancy that could involve children. In addition 5 points should be added for each potential live victim that is confirmed by previous intelligence, search, etc.
- **"NO GO" conditions:** These would include structures that are on fire, have significant hazardous material spills or otherwise have conditions that would make search and rescue operations too risky. Buildings with "NO GO" conditions would be expected to be re-evaluated when those conditions were mitigated, and some comment would be made regarding this should be recorded on the form.



Other Marking Symbols

Command Post	
EOC	
Base of Operations	
OSOCC	
Reception Center	
Work Site	
Airport	
Landing Zone	
Hospital	
Hazards (write type and specify zone)	GASES
Fuel	
Medical care (Red Cross/Red Crescent)	
Reference point / Landmark (triangle, include description)	