

INCIDENT COMMAND SYSTEM

URBAN SEARCH & RESCUE OPERATIONAL SYSTEM DESCRIPTION

ICS-US&R-120-1

November 2014

This document contains information relative to the Incident Command System (ICS) component of the National Interagency Incident Management System (NIIMS). This is

the same Incident Command System developed by FIRESCOPE. Knowledge of the Incident Command System is required to understand the terminology and variety of ways in which the management of resources can be applied.

Additional information and documentation can be obtained from the following sources:

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INTRODUCTION

The Urban Search and Rescue (US&R) organizational module is designed to provide supervision and control of essential functions at incidents where technical rescue expertise and equipment are required for safe and effective rescue operations. US&R operations are unique in that specialized training and equipment are required to mitigate the incident in the safest and most efficient manner possible.

Initial US&R operations will be directed by the first arriving public safety officer who will assume command as the Incident Commander. Subsequent changes in the incident command structure will be based on the resource and management needs of the incident following established ICS procedures.

Additional resources may include US&R Companies and US&R Crews or modular component of other US&R assets specifically trained and equipped for urban search and rescue operations. The US&R Company is capable of conducting search and rescue operations at incidents where technical expertise and equipment are required. US&R Crews are trained urban search and rescue personnel dispatched to the incident without rescue equipment. US&R Companies and Crews can be assigned as a single resource, grouped to form US&R Strike Teams or added to other resources to form a Task Force. US&R Single Resources, Strike Teams, and Task Forces are managed the same as other incident resources.

Due to the unique hazards and complexity of urban search and rescue incidents, the Incident Commander may need to request a wide variety and amount of multi-disciplinary resources.

US&R Companies and Crews are "typed" based on an identified operational capability. Four levels of US&R operational capability have been identified to assist the Incident Commander in requesting appropriate resources for the incident. These levels are based on five general construction categories and an increasing capability of conducting a rescue at specified emergency situations with an identified minimum amount of training and equipment.

The US&R Type-4 Company (3 personnel minimum) Operational Level represents the minimum capability to conduct safe and effective search and rescue operations at incidents involving non-structural entrapment in non-collapsed structures.

The US&R Type-3 Company (3 personnel minimum) Operational Level represents the minimum capability to conduct safe and effective search and rescue operations at structure collapse incidents involving the collapse or failure of Light Frame Construction and low angle or one-person load rope rescue.

The US&R Type-2 Company (6 personnel minimum) Operational Level represents the minimum capability to conduct safe and effective search and rescue operations at

structure collapse incidents involving the collapse or failure of heavy wall construction, high angle rope rescue (not including highline systems), and trench and excavation rescue.

The US&R Type-1 Company (6 personnel minimum) Operational Level represents the minimum capability to conduct safe and effective search and rescue operations at structure collapse incidents involving the collapse or failure of heavy floor, pre-cast concrete and steel frame construction, high angle rope rescue (including highline systems), permit required confined space rescue, and mass transportation rescue.

The Regional US&R Task Force is comprised of 29 people specially trained and equipped for large and/or complex US&R operations. The multi-disciplinary organization provides five functional elements that include Supervision, Search, Rescue, Medical, and Logistics. The Regional US&R Task Force is totally self-sufficient for the first 24 hours. Transportation and logistical support is provided by the sponsoring agency and may be supported by the requesting agency.

State/National US&R Task Force is comprised of 70 people when configured as a Type I Task Force specially trained and equipped for large or complex US&R operations. The multi-disciplinary organization provides eight functional elements that include Supervision, Search, Rescue, Haz-Mat, WMD, Medical, Logistics and Planning. The State/National US&R Task Force is designed to be used as a "single resource." However, each element of the Task Force is modularized into functional components and can be independently requested and utilized. The State/National US&R Task Force may also be configured as a Type III Task Force with 28 members.

ICS MODULAR DEVELOPMENT

US&R incidents may occur that will require rescue operations that exceed a resource's identified capability. When the magnitude or type of incident is not commensurate with a capability level, the Incident Commander will have the flexibility to conduct rescue operations in a safe and appropriate manner using existing resources within the scope of their training and equipment until adequate resources can be obtained or the incident is terminated.

The flexibility and modular expansion capabilities of the Incident Command System provides a number of ways US&R resources can be arranged and managed. A series of modular development examples are included to illustrate several possible methods of expanding the incident organization based on existing emergency conditions, available resources, and incident objectives.

The ICS Modular Development examples shown are not meant to be restrictive, nor imply these are the only ways to build an ICS organizational structure to manage US&R resources at an incident. To the contrary, the ICS Modular Development examples are provided only to show conceptually how one can arrange and manage resources at an

US&R incident that builds from an initial response to a Multi-Branch organization.

ICS MODULAR DEVELOPMENT EXAMPLES

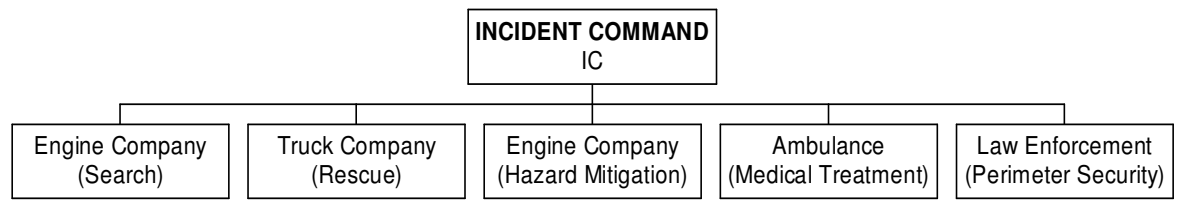
Initial Response Organization (Example Page 5): The first arriving Public Safety Officer will assume command of the incident as the Incident Commander (IC). The IC will assume all Command and General Staff functions and responsibilities and manage initial response resources. If the potential for escalation is low, then no specific ICS functional positions are established. If the incident requires an upgraded response, then the IC should consider the early establishment of ICS positions. The following examples illustrate this modular growth of the ICS structure to keep pace with increased resource response.

Reinforced Response Organization (Example Page 6): In addition to the initial response, more Law Enforcement, local Engine and Truck Companies and Mutual Aid resources have arrived. The IC forms a Unified Command with the senior ranking Law Enforcement official on scene and has established a Safety Officer to assure personnel safety. A Public Information Officer has been assigned to manage the large media presence. An Operations Section has been assigned to manage the tactical assignments and responsibilities. A Staging Area is established to check-in arriving resources. A US&R Group has been established to better coordinate the search and rescue efforts. Public Works is removing debris from the street to improve access and egress routes.

Multi-Group/Division Response Organization (Example Page 7): The IC has added a Liaison Officer to the Command Staff to coordinate assisting agencies participation and assigned a Planning and Logistics Section. One US&R Technical Specialist who understands the unique complexities and resource requirements at US&R incidents is assigned to the Planning Section. The Operations Section has established several Groups and Divisions to better coordinate the large volume of diverse resources at the incident. A Law Group and Medical Group have been formed. One State/National US&R Task Force has arrived and is assigned to Division "A". One Structural Engineer Technical Specialist from the Planning Section is assigned to Division "B" to conduct structural damage assessment. A Hand Crew Strike Team is assisting with debris removal.

Multi-Branch Response Organization (Example Page 8): The Incident Commander has assigned a Finance/Admin Section. The Operations Section has established five branches with similar functions to better coordinate and manage resources. The Planning, Logistics and Finance/Admin Section have several Units operational to support the large amount of resources at the incident.

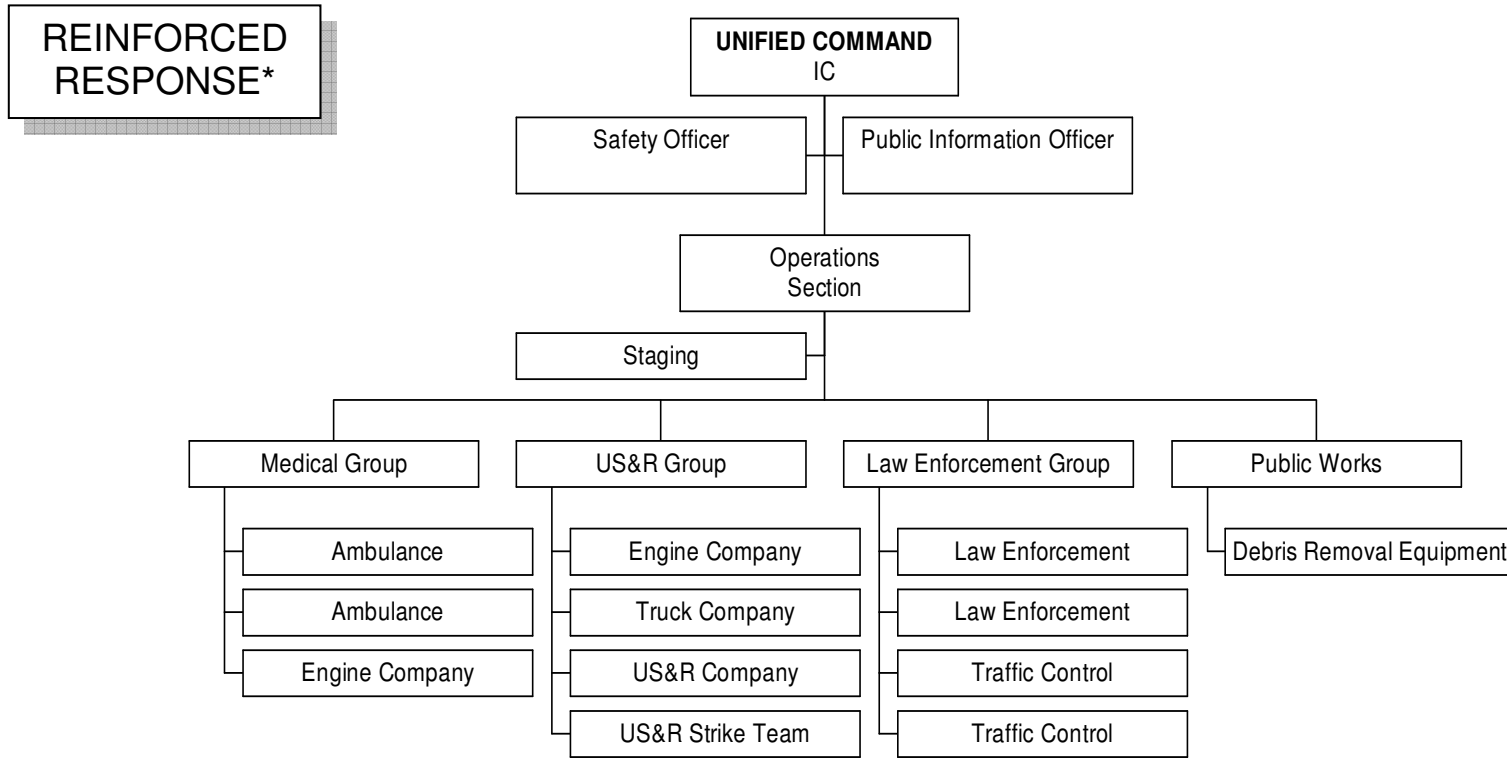
**INITIAL
RESPONSE***



* INITIAL RESPONSE ORGANIZATION (EXAMPLE)

Initial Response Organization (Example Page 5)

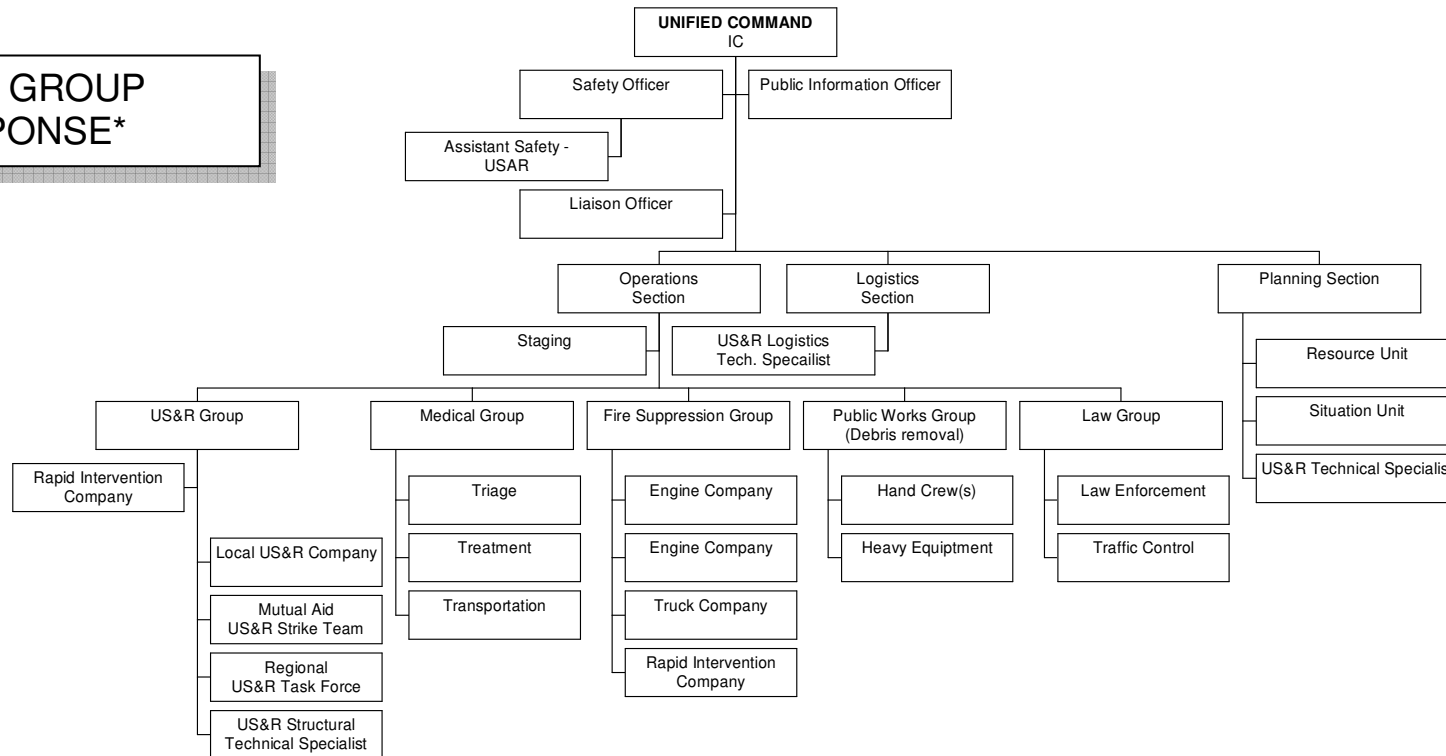
The first arriving Public Safety Officer will assume command of the incident as the Incident Commander (IC). The IC will assume all Command and General Staff functions and responsibilities and manage initial response resources. If the potential for escalation is low, then no specific ICS functional positions are established. If the incident requires an upgraded response, then the IC should consider the early establishment of ICS positions. The following examples illustrate this modular growth of the ICS structure to keep pace with increased resource response.



* REINFORCED RESPONSE ORGANIZATION (EXAMPLE)

In addition to the initial response, more Law Enforcement, local Engine and Truck Companies and Mutual Aid resources have arrived. The IC forms a Unified Command with the senior ranking Law Enforcement official on scene and has established a Safety Officer to assure personnel safety. A Public Information Officer has been assigned to manage the large media presence. An Operations Section has been assigned to manage the tactical assignments and responsibilities. A Staging Area is established to check-in arriving resources. A US&R Group has been established to better coordinate the search and rescue efforts. Public Works is removing debris from the street to improve access and egress routes.

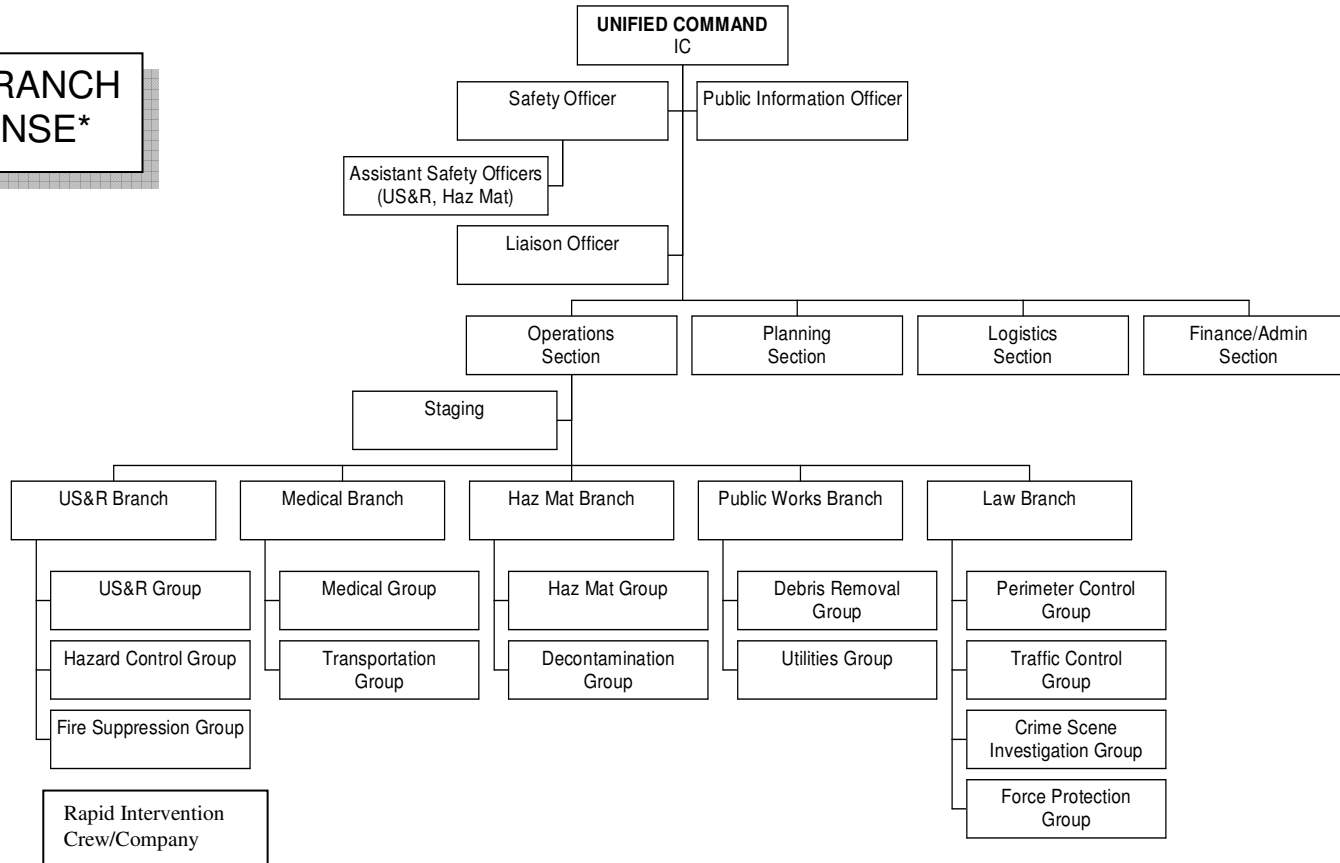
MULTI GROUP RESPONSE*



*** MULTI-GROUP RESPONSE ORGANIZATION (EXAMPLE)**

The IC has added a Liaison Officer to the Command Staff to coordinate assisting agencies participation and assigned a Planning and Logistics Section. One US&R Technical Specialist who understands the unique complexities and resource requirements at US&R incidents is assigned to the Planning Section. The Operations Section has established several Groups and Divisions to better coordinate the large volume of diverse resources at the incident. A Law Group and Medical Group have been formed. A Regional US&R Task Force has been assigned to the US&R Group. One State/National US&R Task Force has arrived and is assigned to Division "A". One Structural Engineer Technical Specialist from the Planning Section is assigned to Division "B" to conduct structural damage assessment. A Hand Crew Strike Team is assisting with debris removal.

**MULTI-BRANCH
RESPONSE***



*** MULTI-BRANCH RESPONSE ORGANIZATION (EXAMPLE)**

The Incident Commander has assigned a Finance/Admin Section. The Operations Section has established five branches with similar functions to better coordinate and manage resources. The Planning, Logistics and Finance/Admin Section have several Units operational to support the large amount of resources at the incident.

Position Checklist

*Disclaimer – Some US&R position titles are inconsistent with the ICS/NIMS framework. The independent development of the Federal US&R functions prior to the NIMS adoption of ICS created such inconsistencies.

US&R BRANCH DIRECTOR – US&R OPBDs are under the direction of the Operations Section Chief. US&R OPBDs may have a variety of organized resources under their command to include US&R, Hazard Control, Fire Suppression, and Rapid Intervention Groups/Divisions. US&R OPBDs are responsible for the implementation of the portion of the Incident Action Plan appropriate to the geographical and functional US&R Branches.

- a. Review Common Responsibilities (Page 1-2)
- b. Develop with subordinates alternatives for US&R Branch control operations.
- c. Attend planning meetings at the request of the Operations Section Chief.
- d. Review Division/Group Assignment Lists (ICS Form 204) for Divisions/Groups within the US&R Branch. Modify lists based on effectiveness of current operations.
- e. Assign specific work tasks to Division and Group Supervisors.
- f. Supervise Branch operations.
- g. Resolve logistical problems reported by subordinates.
- h. Report to Operations Section Chief when the Incident Action Plan is to be modified, additional resources are needed, surplus resources are available, or when hazardous situations or significant events occur.
- i. Approve accident and medical reports (home agency forms) originating within the US&R Branch.
- j. Maintain Unit/Activity Log (ICS Form 214).

US&R DIVISION OR GROUP SUPERVISOR - US&R Division and Group Supervisors report to the Operations Section Chief (or Branch Director when activated). The US&R Division/Group Supervisor is responsible for the implementation of the assigned portion of the Incident Action Plan addressing US&R operations. The US&R Division/Group Supervisor may have a variety of organized resources under their command to include Engine Companies, Truck Companies, US&R Crews, US&R Companies, US&R Strike Teams, US&R Regional Task Forces, and State/National Task Forces. They are responsible for the assignment of US&R resources within the US&R Division or Group, reporting on the progress of control operations, and the status of US&R resources within the Division or Group. Division Supervisors are assigned to a specific geographical area of an incident. Group Supervisors are assigned to accomplish specific functions within the incident (i.e. Recon, Search, Rescue, Medical Specialists, Rapid Intervention, etc.). The US&R Division/Group Supervisor is responsible for performing the following functions at an incident:

- a. Review common responsibilities (Page 1-2)
- b. Implement Incident Action Plan for the US&R Division or Group.
- c. Provide Incident Action Plan to Task Force/Strike Team Leaders when available.
- d. Identify resources assigned to the US&R Division or Group.
- e. Review assignments and incident activities with subordinates and assign tasks.

- f. Establish personnel accountability for resources within the US&R Division or Group.
- g. Brief subordinates on appropriate provisions of the incident Site Safety and Control Plan (ICS Form 208) and deployment / activation plans for the Rapid Intervention Crew/Company.
- h. Ensure that Incident Communications and/or Resources Unit are advised of all changes in status of resources assigned to the US&R Division or Group.
- i. Coordinate activities with adjacent Divisions or Groups.
- j. Determine need for assistance on assigned tasks.
- k. Submit situation and resource status information to Operations Branch Director or Operations Section Chief.
- l. Report hazardous situations, special occurrences, or significant events (e.g. accidents, sickness) to immediate supervisor.
- m. Ensure that assigned personnel and equipment get to and from assignments in a timely manner.
- n. Resolve logistics problems within the US&R Division or Group.
- o. Participate in the development of tactical plans for the next operational period.
- p. Maintain Unit/Activity Log (ICS Form 214)

ASSISTANT SAFETY OFFICER – US&R- Reports to the Incident Safety Officer as an Assistant Safety Officer and coordinates with the appropriate supervisor. The Assistant Safety Officer-US&R must possess the appropriate training to coordinate safety related activities for US&R operations. This position advises the appropriate supervisor on all aspects of health and safety and has the authority to stop or prevent unsafe acts.

- a. Review Common Responsibilities (Page 1-2).
- b. Obtain briefing from the appropriate supervisor.
 - c. Participate in the preparation of and implement the incident Site Safety and Control Plan (ICS Form 208 and Form 215A) to include appropriate mitigation measures, such as Personnel accountability and Rapid Intervention Crew / Company.
 - d. Advise their immediate supervisor of deviations from the incident Site Safety and Control Plan (ICS Form 208) or any dangerous situations.
 - e. Has authority to alter, suspend, or terminate any activity that may be judged to be unsafe.
 - f. Work with US&R Task Force Team Managers to establish acceptable entry conditions and appropriate personal protective equipment to be worn by personnel entering the hazard zone.
 - g. Ensure the protection of personnel from physical, environmental, and chemical hazards/exposures.
 - h. Conduct incident/accident investigations with appropriate Task Force personnel under the direction of the Incident Safety Officer and Task Force Leader.
 - i. Ensure the provision of required emergency medical services for assigned personnel and coordinate with medical personnel.
 - j. Maintain unit records, including Unit/Activity Log (ICS Form 214).

RESCUE MANAGER – Reports directly to the US&R Task Force Leader. Is responsible for managing US&R Rescue Operations and supervising assigned resources:

- a. Review Common Responsibilities (Page 1-2).
- b. Coordinate, manage, and supervise assigned rescue activities.
- c. Assist in the development and implementation of the Task Force Tactical Action Plan.
- d. Provide a mission specific Rapid Intervention Plan including personnel & equipment needs.
- e. Adhere to all safety procedures including accountability of personnel.
- f. Determine rescue logistical needs.
- g. Receive briefings and situation reports and ensuring that all rescue personnel are kept informed of mission objectives and status changes.
- h. Provide situation updates and maintain records and reports.
- i. Provide accountability, maintenance, and minor repairs for all issued equipment.
- j. Maintain unit records, including Unit/Activity Log (ICS Form 214)

SEARCH MANAGER – Reports directly to the US&R Task Force Leader. The Search Manager is responsible for managing US&R Search Operations and supervising assigned resources:

- a. Review Common Responsibilities (Page 1-2).
- b. Develop and implement the search component of the US&R Task Force Tactical Action Plan
- c. Adhere to all safety procedures including accountability of personnel.
- d. Coordinate and supervise all assigned search and Recon activities
- e. Determine search and reconnaissance operational, organizational and logistical needs.
- f. Land navigation and site mapping (GPS).
- g. Receive briefing and situation reports and ensure that all search personnel are kept informed of status changes.
- h. Maintain unit records, including Unit/Activity Log (ICS Form 214).

US&R TECHNICAL SEARCH SPECIALIST – Reports directly to the Search Manager. The US&R Technical Search Specialist is responsible for performing the technical search function of the US&R Task Force incident operations:

- a. Review Common Responsibilities (Page 1-2).
- b. Search areas as assigned using appropriate electronic search equipment and techniques.
- c. Document locations of possible finds and if possible, estimate the status of the victim(s).
- d. Cooperate with and assist other US&R Resources.
- e. Land navigation and site mapping (GPS)
- f. Provide accountability for all issued equipment.
- g. Perform additional tasks or duties as assigned during an incident.
- h. Maintain unit records, including Unit/Activity Log (ICS Form 214).

US&R MEDICAL SPECIALIST - Reports directly to their immediate supervisor as determined by the incident organization. The Medical Specialist is responsible for providing advanced life support medical care to responders, victims, and US&R canines in environments that require special US&R training:

- a. Review Common Responsibilities (Page 1-2).
- b. Provide emergency medical care to Task Force personnel, incident victims, and US&R canines in environments requiring specialized US&R training.
- c. Develop and implement a Medical Action Plan as specified by the US&R Task Force Leader.
- d. Adhere to all safety procedures.
- e. Provide accountability, maintenance and minor repairs of assigned medical equipment.
- f. Perform additional tasks or duties as assigned during an incident.
- g. Maintain unit records, including Unit/Activity Log (ICS Form 214).

US&R STRUCTURES SPECIALIST - Reports directly to their immediate supervisor as determined by the incident organization. The Structures Specialist - US&R is responsible for performing the various structure assessments during incident operations:

- a. Review Common Responsibilities (Page 1-2).
- b. Assess the structural condition within the area of US&R operations. This includes identification of structure types, specific damage and structural hazards.
- c. Recommend the appropriate type and amount of structural hazard mitigation required to minimize the risks to task force personnel.
- d. Adhere to all safety procedures.
- e. Cooperate with and assist other US&R Resources.
- f. Provide accountability, maintenance, and minor repairs for all issued equipment.
- g. Perform additional tasks of duties as assigned during an incident.
- h. Monitor assigned structures for changes in condition during incident operations.
- i. Actively participate in implementation of approved structure hazard mitigation as a designer and/or supervisor.
- j. Coordinate and communicate structure hazard mitigation measures with the Search Manager.
- k. Maintain unit records, including Unit/Activity Log (ICS Form 214).

US&R CANINE SEARCH SPECIALIST – Reports directly to the Search Manager. The US&R Canine Search Specialist is responsible for performing the canine search function of the incident. Responsibilities include searching collapsed structures, water, debris piles, land and mudslides, or fire areas as assigned, using appropriate search techniques and dog handler skills. The US&R Canine Search Specialist is responsible for documenting locations of alerts and estimating the status of victims and cooperating with and assisting other search and rescue resources:

- a. Review Common Responsibilities (Page 1-2).
- b. Obtain briefing from appropriate supervisor.
- c. Accountable for all issued equipment.
- d. Care and welfare of their canine, including assisting medical personnel with the canine's care.
- e. Performs additional tasks or duties as assigned during the incident.
- f. Maintain unit records, including Unit/Activity Log (ICS Form 214).

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Cal EMA - LAW ENFORCEMENT US&R CANINE SEARCH HANDLER*

Resource best used in area searches with minor damage and rubble.	
Resource	Usage and Capabilities
US&R Canine (Type 3)	<ul style="list-style-type: none"> • Area Search • Non-structural entrapment in non-collapsed structures • US&R Awareness
US&R Canine (Type 4)	<ul style="list-style-type: none"> • Area Search with light to minor structural entrapment Exposure • US&R Awareness

*Canine US&R Search Handler is the law enforcement equivalent to the Fire & Rescue term US&R Canine Search Specialist.

Cal EMA LAW ENFORCEMENT CANINE RECOVERY TEAMS

Search element qualifications and equipment are equivalent on all Canine Types. The differentiating factor is based on the training and certification levels of the canine component. Canine Search Teams will have met all of the capabilities of the preceding types.			
Resource	Type 1 Cadaver Basic	Type 2 Live or Deceased	Type 3 Water
Law Enforcement Canine	<ul style="list-style-type: none"> • Body above ground • Sub-surface disarticulated • Hanging • Simple structure 	<ul style="list-style-type: none"> • Body above ground • Hanging • Live person, must be area certified • Status of subject unknown 	<ul style="list-style-type: none"> • Submerged • Floating • Shoreline

US&R SEARCH TYPES

Reconnaissance Search – Recon is the preliminary survey for the purpose of determining the scope and magnitude of the incident and identifying the resources needed to manage the incident. Other considerations for Recon include;

- Initial visual check of damaged area and/or assigned area of operation
- May be conducted on foot, by vehicle, by watercraft, or by air
- For isolated structure collapse incidents the primary purpose of this action is structural assessment and hazardous materials assessment
- Known locations of live or deceased victims will be recorded and appropriate rescue or recovery resources will be requested
- Size and make up of recon teams are incident driven and flexible
- Recon teams should not engage in rescue operations
- Timely reporting of recon information is critical to the health and safety of responders, survivability of victims, and effective management of the incident

Rapid Search (Hasty Search) - is a fast paced and methodical search in an attempt to locate victims that are in immediate need of rescue. Other considerations for Rapid Search include;

- May be conducted on foot, by vehicle, by watercraft, or by air
- Size and make up of Hasty Search teams are incident driven and flexible
- If live victims are located and can be easily evacuated they will be immediately removed and moved to the identified casualty collection point
- Known locations of live or deceased victims will be recorded and appropriate rescue or recovery resources will be requested
- Documentation of areas searched must be recorded and reported
- Rapid Search may be accomplished simultaneously with Recon

Primary Search - is a quick search of structures likely to contain survivors. Primary searches are ground or waterborne operations conducted by walking or boating around every structure looking for victims. This is accomplished by looking into every window/opening, knocking on doors and hailing for live victims. If there are signs of victims (dead or alive) appropriate action will be taken based on the incident objectives. Other considerations for Primary Search are;

- Fast paced, quick scan of surface debris in and around structures and selected voids
- Size and makeup of the search team is incident driven and flexible
- Detection resources may include physical, canine and technical
- Known locations of live or deceased victims will be recorded and appropriate rescue or recovery resources will be requested
- Actions necessary to immediately correct life threatening injuries may be performed by this team
- Searched structures will be marked utilizing the Search Marking System (pg 63-66)
- Victim locations will be marked utilizing the Victim Marking System (pg 63-66)

Secondary Search - is the systematic search of every room of every structure in the assigned area of operation. Forced entry of structures may need to occur in order to accomplish this objective but will only be done with the authority of the Incident

Commander. This may involve extensive debris removal of building materials depending on the desired level of coverage and thoroughness.

- Slow and methodical search of structures, debris, and voids
- Size and makeup of the search team is incident driven and flexible
- Detection resources may include physical, canine and technical
- Known locations of live or deceased victims will be recorded and appropriate rescue or recovery resources will be requested
- Actions necessary to immediately correct life threatening injuries may be performed by this team
- Searched structures will be marked utilizing the Search Marking System (pg 63-66)
- Victim locations will be marked utilizing the Victim Marking System (pg 63-66)

Special Response Search - SRS is a search implemented to gather information regarding the need for evacuation or rescue of pre-identified special needs populations. SRS may be conducted pre or post incident at these pre-identified locations. .

Search Modes

DETECTION MODE - A search mode to determine if victims are present.

LOCATION MODE - Following detection, a search mode to confirm victim's location and pinpoint for rescue.

HEAVY EQUIPMENT RESOURCE TYPING

RESOURCE	COMPONENT	TYPE			
		Type 1	Type 2	Type 3	Type 4
Hydraulic Truck Crane	Rating (Tons) Radius (Feet)	100 ton+ Up to 275 feet	50-100 ton Up to 200 feet	Up to 50 ton Up to 150 feet	
Hydraulic Rough Terrain Crane	Rating (Tons) Radius (Feet)	Up to 50 ton Up to 100 feet			
Conventional Truck Crane	Rating (Tons) Radius (Feet)	150 ton+ Up to 300 feet	75-150 ton Up to 250 feet	Up to 75 ton Up to 150 feet	
Conventional Crawler Crane	Rating (Tons) Radius (Feet)	350 ton+ Up to 350+ feet	100-350 ton Up to 275 feet	Up to 100 ton Up to 160 feet	
Excavator Crawler	Rating (Lbs.) Reach	80k lbs.+ Up to 70 feet	40-80k lbs. Up to 50 feet	Up to 40k lbs. Up to 40 feet	Mini
Loader Rubber Tire	Rating (Cubic Yards)	5 cubic yards	3-5 cubic yards	1-3 cubic yards	Backhoe Skid Steer Mini
Forklift Conventional	Rating (Tons)	25 ton+	10-25 ton	5-10 ton	
Forklift All-Terrain Extendable	Rating (Lbs.)	3-6 tons (6-12k lbs.)			

GLOSSARY OF TERMS

Chemical Light and Flagging Tape Plan. A standardized marking system using chemical lights and colored flagging tape in conjunction with search, building and victim marking for low light and night operations.

Confined Space Rescue. Rescue operations in an enclosed area, with limited access/egress, not designed for human occupancy and has the potential for physical, chemical or atmospheric injury.

Emergency Signaling System. Loud, identifiable and prearranged signals sounded to alert personnel at the incident site of hazardous conditions or information that requires immediate attention.

Heavy Floor Construction. Structures in this general construction category are typically built utilizing Cast-in-Place (CIP) concrete construction consisting of heavy, concrete floors. Steel reinforcing bars (rebar) are most commonly used to provide the tension resistance within each concrete member, but post-tensioned steel cables may also be employed. These structures may be built utilizing concrete beam/column frame to provide "Moment Frame" resistance or concrete shear walls to provide "Box Type" resistance to earthquake forces and strong winds. Heavy Floor Construction may include any occupancy type. Occupancies most often found are offices, schools, apartments, hospitals, hotels, parking structures and multi-purpose facilities. Highway bridges and overpasses are a special form of very heavy floor construction.

Heavy Wall Construction. Structures in this general construction category are "Box Type" structures typically built with heavy, fire resistant exterior walls and lightweight wood floors and roof. The exterior walls are constructed of Reinforced Masonry (RM), Unreinforced Masonry (URM), or Tilt-up Concrete (TU). The adequacy of the interconnection of the walls and floors plus roof usually determines how well these structures resist the effects of earthquake forces and strong winds. State law in California requires URM structures be strengthened to reduce the collapse potential of these vulnerable walls in major earthquakes. Heavy Wall Construction occupancies may include office, commercial, educational (gymnasiums), industrial and warehouse buildings as well as multi-family residential and institutional structures.

High Angle Rope Rescue. An environment in which the load is predominately supported by the rope rescue system.

Highline System. A system using rope suspended between two points for movement of persons or equipment over an area that is a barrier to the rescue operation, including systems capable of movement between points of equal or unequal height.

Light Frame Construction. Structures in this general construction category are typically built with a vertical load resisting system of closely spaced wood or light gauge metal studs for bearing walls and joists for floors and rafters for roof. The lateral resistance is provided by wall and floor sheathing, which enables these "Box Type" structures to remain square and plumb providing a high degree of structural flexibility to applied lateral forces from earthquakes and strong winds. Light Frame Construction

occupancies may include single family and multi-unit residential buildings, low-rise commercial, institutional, and light industrial.

Low Angle Rope Rescue. An environment in which the load is predominately supported by itself and not the rope rescue system (e.g., flat land or mild sloping surface).

Pre-cast Concrete Construction. Structures in this general construction category are typically built utilizing modular pre-cast concrete components that include floors, walls, beams, columns and other sub-components that are field connected upon placement on site. Floor and roof components are normally reinforced using pre-tensioned steel cables that are bonded to the concrete as it is cast around the cables in the pre-casting factory. Individual concrete components utilize imbedded steel weldments and cast-in-place, topping slabs for the interconnection that provides for structural stability. These interconnections are very critical, since inadequate ones have led to widespread collapse problems during past earthquakes. These structures are usually built using a regular grid of columns and beams and most often have concrete or masonry shear walls to provide "Box Type" resistance to earthquake forces and strong winds. Pre-cast Concrete Construction occupancies may include commercial, office and multi-use or multi-function structures including parking structures and other large facilities. Highway bridges and overpasses may be constructed using pre-cast concrete segments, or using pre-cast beams in combination with cast-in-place concrete slabs.

Protective system. A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching, shield systems, and other systems that provide the necessary protection as per California Code of Regulations, Title 8, Section 1540. Excavation

Regional US&R Task Force. A 29-person team specially trained and equipped for large or complex US&R operations. The multi-disciplinary organization provides five functional elements that include Supervision, Search, Rescue, Medical, and Logistics. The make up of the Regional US&R Task Force consists of technically trained personnel based around a single Type I US&R Company. The Regional US&R Task Force is totally self-sufficient for the first 24 hours. Transportation and logistical support is provided by the sponsoring agency and may be supported by the requesting agency.

Search Marking System. A standardized marking system employed during and after the search of a structure for potential victims.

State/National US&R Task Force. A 70-person team specially trained and equipped for large or complex US&R operations. The multi-disciplinary organization provides seven functional elements that include Supervision, Search, Rescue, Haz-Mat, Medical, Logistics and Planning. The State/National US&R Task Force is designed to be used as a "single resource". However, each element of the Task Force is modularized into functional components and can be independently requested and utilized. A State/National US&R Task Force is accompanied by an Incident Support Team (IST) when deployed out of state. The IST provides overhead management and logistical

support to the US&R Task Force while on deployment. State/National US&R Task Forces responding from other states will work with the local incident command structure through the IST.

Steel Frame Construction. Structures in this general construction category are typically built using some type of steel beam and column system that is configured in a grid pattern. Lateral resistance against earthquake and severe wind forces is provided either by specially designed frames or diagonal bracing. Steel Frame Construction occupancies may include Prefabricated Metal buildings mostly one story, light industrial buildings; Low Rise, non-fireproofed buildings and other structures that include one and two story commercial, office, large industrial facilities, institutional structures, and convention and sports arenas with high, exposed roof systems; and High Rise, multi-story fireproofed buildings configured with fire sprinklers, standpipes, smoke proof stairs, and other fire protection systems. Fireproofing may consist of sprayed on fiber, layers of gypsum board, or in older buildings, concrete and masonry encasement.

Structure/Hazards Marking System. A standardized marking system to identify structures in a specific area and any hazards found within or near the structure.

US&R Company. Any ground vehicle(s) providing a specified level of US&R operational capability, rescue equipment and personnel.

US&R Crew. A predetermined number of individuals with common communications and a leader, organized and trained for a specified level of US&R operational capability. They respond with no rescue equipment and are used to relieve or increase the number of US&R personnel at an incident.

The US&R Type-4 Company (Basic: 3 personnel minimum) Operational Level represents the minimum capability to conduct safe and effective search and rescue operations at incidents involving non-structural entrapment in non-collapsed structures.

The US&R Type-3 Company (Light: 3 personnel minimum) Operational Level represents the minimum capability to conduct safe and effective search and rescue operations at structure collapse incidents involving the collapse or failure of Light Frame Construction and low angle or one-person load rope rescue.

The US&R Type-2 Company (Medium: 6 personnel minimum) Operational Level represents the minimum capability to conduct safe and effective search and rescue operations at structure collapse incidents involving the collapse or failure of Heavy Wall Construction, high angle rope rescue (not including highline systems), and trench and excavation rescue.

The US&R Type-1 Company (Heavy: 6 personnel minimum) Operational Level represents the minimum capability to conduct safe and effective search and rescue operations at structure collapse incidents involving the collapse or failure of Heavy Floor, Pre-cast Concrete and Steel Frame Construction, high angle rope rescue (including highline systems), confined space rescue (permit required), and mass transportation rescue.

Victim Marking System. A standardized marking system employed to identify the confirmed or potential location of a victim not readily visible and/or not immediately removed.

APPENDIX-A

FIVE GENERAL CONSTRUCTION CATEGORIES

Identifying the general construction category of a structure that has experienced a collapse or failure will help determine the appropriate US&R operational capability required to mitigate the incident. The five general construction categories the rescuer will most likely encounter in collapse or failure situations are light frame, heavy wall, heavy floor, pre-cast concrete, and steel frame. Several common structures are built utilizing a combination of these general construction categories such as light frame multi-unit residential structures built on top of a one or more story concrete parking garage, reinforced with steel reinforcing bars (rebar) or post-tensioned cables and steel frame buildings constructed on top of concrete commercial and/or parking structures.

Light Frame Construction (Wood and Light Metal Stud)

Structures in this general construction category are typically built with a vertical load resisting system of closely spaced wood or light gauge metal studs for bearing walls and joists for floors and rafters for roof. The lateral resistance is provided by wall and floor sheathing, which enables these “Box Type” structures to remain square and plumb providing a high degree of structural flexibility to applied lateral forces from earthquakes and strong winds.

These buildings are configured as follows:

Roof:	Wood or metal rafters or trusses spaced 16” to 32”o.c. Sheathing may be spaced or solid boards laid straight or diagonally, or plywood.
Floors:	Wood or metal joists or flat trusses spaced 12” to 24”o.c. Sheathing may be wood boards laid straight or diagonally, or plywood. Floors of newer construction may have 1” or 2” concrete topping over plywood sheathing.
Exterior Walls:	Wood or metal studs spaced 16” to 24”o.c. Sheathing may consist of wood boards laid straight or diagonally, or plywood. For smaller and older buildings, lath and plaster, or gypsum board is used for sheathing.
Interior Walls and Columns:	Most have walls with wood or metal studs spaced 16” to 24”o.c. that are sheathed with any of the types listed for exterior walls. Wood lath and gypsum plaster were used in older wood buildings. Larger buildings of this type may include column and beam framing in addition to the stud bearing walls.
Number of Stories:	Up to 4 stories for wood stud multi-unit residential buildings. Up to 6 stories for metal stud multi-unit residential and mixed-use buildings.
Occupancy Types:	May include single family and multi-unit residential buildings; plus low-rise commercial, institutional, and light industrial.

Heavy Wall Construction

(Exterior walls of Reinforced Masonry (RM), Unreinforced Masonry (URM), and Tilt-up Concrete (TU))

Structures in this general construction category are “Box Type” structures typically built with heavy, fire resistant exterior walls and lightweight wood floors and roof. The exterior walls are constructed of Reinforced Masonry (RM), Unreinforced Masonry (URM), or Tilt-up Concrete (TU). The adequacy of the interconnection of the walls and floors plus roof usually determines how well these structures resist the effects of earthquake forces and strong winds. State law in California requires URM structures be strengthened to reduce the collapse potential of these vulnerable walls in major earthquakes.

These buildings are configured as follows:

Roof:	URM usually has wood rafters or nailed wood trusses made from 2x, and 1x members that are sheathed with straight 1x wood sheathing. Bowstring (curved top with flat bottom) and other trusses were also used for main roof supports, with 2x joist, and 1x straight sheathing. Tilt-Up usually built with panelized system with long span glued-laminated (glulam) wood beams, 4x purlins, 2x sub-purlins and plywood sheathing or other lightweight roof systems.
Floors:	URM usually has 2x or 3x wood joist with straight 1x wood sheathing Tilt-Up usually built using large wood joist or flat wood trusses with plywood sheathing.
Exterior Walls:	URM walls usually have 9” thick parapet walls, and 4” is added to the thickness for each story in height. A typical two story URM building will have 13” thick walls and a 9” thick parapet wall. Tilt-Up walls are reinforced concrete, 6” or greater in thickness. They are cast flat on site in approximately 24’ widths and tilted into position.
Interior Columns and Walls:	URM may have wood stud walls. Large wood columns and beams may also be used. There may or may not be a uniform grid layout. Tilt-Up usually has steel pipe/tube columns spaced in a 24’ on center by 50’ or similar spacing. They most always have a uniform structural grid. Buildings with long-span trusses may have no interior columns.
Number of Stories:	URM up to 8 stories high, but most are 2 stories or less Tilt-Ups are mostly one story, up to 24’ high. Some may be 2 or 3 story with up to 40’ high walls.
Occupancy Types:	URM may include occupancies as in Tilt-Ups as well as multi-family residential and institutional structures. Tilt-Ups may include office, commercial, educational (gymnasiums), or industrial and warehouse buildings.

Pre-cast Concrete Construction

Structures in this general construction category are typically built utilizing modular pre-cast concrete components that include floors, walls, beams, columns and other sub-components that are field connected upon placement on site. Floor and roof components are normally reinforced using pre-tensioned steel cables that are bonded to the concrete as it is cast around the cables in the pre-casting factory. Individual concrete components utilize imbedded steel weldments and cast-in-place, topping slabs for the interconnection that provides for structural stability. These interconnections are very critical, since inadequate ones have led to widespread collapse problems during past earthquakes. These structures are usually built using a regular grid of columns and beams, and most often have concrete or masonry shear walls to provide “Box Type” resistance to earthquake forces and strong winds.

These buildings are configured as follows:

Roof and Floors:	Single and double “T” components are used in longer span systems to span between pre-cast beams. Hollow core or solid concrete planks are used to span shorter distances between beams or walls. Cast-in-place (rebar or post-tensioned) concrete slabs over pre-tensioned pre-cast concrete girders are often used in garages and office buildings.
Exterior Columns and Walls:	Pre-cast concrete columns are often used as the main exterior supports. The spaces between columns may be enclosed with infill or panel walls of glass in metal frames, metal studs and plaster, reinforced masonry shear walls, brick or stone veneer on metal studs, and pre-cast concrete panels. Combinations of these materials may also be used. Pre-cast concrete frames, as well as cast-in-place concrete shear walls, have been used as the main exterior supports for these structures.
Interior Columns and Walls:	A grid of pre-cast concrete, or steel columns is usually used to support the beams and girders. Interior spaces may be divided using non-structural walls constructed using metal studs and gypsum board, or concrete masonry unit (CMU) blocks. Non-structural walls in non-west coast types may employ URM.
Number of Stories:	Heights vary from single story to high-rise structures.
Occupancy Types:	May include commercial, office and multi-use or multi-function structures including parking structures and large occupancy facilities. Highway bridges and overpasses may be constructed using pre-cast concrete segments, or using pre-cast beams in combination with cast-in-place concrete slabs.

URBAN SEARCH & RESCUE RESOURCE TYPES

Always use the prefix US&R for Urban Search and Rescue (US&R) resources.
 Order Single Resource or Strike Team by Type (Capability – Type 1, Type 2, Type 3, OR Type 4)

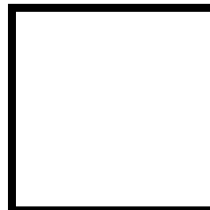
	Type 1 (Heavy)	Type 2 (Medium)	Type 3 (Light)	Type 4 (Basic)
Type	<ul style="list-style-type: none"> • Heavy Floor Construction • Pre-cast Concrete Construction • Steel Frame Construction • High Angle Rope Rescue (including highline systems) • Confined Space Rescue (permit required) • Mass Transportation Rescue 	<ul style="list-style-type: none"> • Heavy Wall Construction • High Angle Rope Rescue (not including highline systems) • Confined Space Rescue (no permit required) • Trench and Excavation Rescue 	<ul style="list-style-type: none"> • Light Frame Construction • Low Angle Rope Rescue • Single Person Load Rope Rescue 	<ul style="list-style-type: none"> • Surface Rescue • Non-Structural Entrapment in Non-Collapsed Structures

RESOURCE	RADIO	COMPONENT	TYPES			
			1	2	3	4
US&R Company	Agency Identifier US&R (phonetic) Number Identifier (VNC US&R 54)	Equipment Personnel Transportation	Type 1 Inventory 6 *	Type 2 Inventory 6 *	Type 3 Inventory 3 *	Type 4 Inventory 3 *
US&R Crew **	Agency Identifier Type Identifier Number Identifier (KRN-US&R Crew 2)	Personnel Trained To Appropriate Level Supervision Transportation	6	6	3	3
Regional US&R Task Force	Region Identifier Task Force Number Identifier (LOB US&R RTF-3)	Equipment Personnel Transportation	A Regional US&R Task Force is comprised of 29 persons specially trained and equipped for extended US&R Operations. Regional US&R Task Forces are self sufficient for 24 hours.			

US&R TOOL INFO SHEET (TIS)		
QTY	UNIT	DESCRIPTION
		Air Bag Kit (High Pressure, 50 ton)
2	Ea	Air Bag Hose (color coded)
1	Ea	Controller
3	Ea	HP Air Bags (50 ton minimum, total capability)
2	Ea	Inline Control Valve (shut off adapter)
1	Ea	Pressure Reducer Regulator
2	Ea	SCBA Bottle (Air Bag Kit Supply)
1	Ea	Supply Hose
		Air Bag Kit (High Pressure, 195 ton)
2	Ea	Air Bag Hose (color coded)
1	Ea	Controller
1	Set	HP Air Bag (125 ton minimum capability, any combination)
1	Ea	HP Air Bag (70 ton minimum, capability)
2	Ea	Inline Control Valve (shut off adaptor)
1	Ea	Pressure Reducer Regulator
1	Ea	Supply Hose
		Air Bag Kit (Low Pressure, 10 ton, not to exceed 14.5 psi)
2	Ea	Air Bag Hose (color coded)
1	Ea	Controller
2	Ea	LP Air Bags (minimum 5 ton capability, each bag)
1	Ea	Patch Kit
1	Ea	Pressure Reducer Regulator
1	Ea	Supply Hose
		Air Chisel Kit
1	Ea	Air Chisel
2	Ea	Bull Point Tips
2	Ea	Flat Chisel Tips
1	Ea	Hose (with couplings)
2	Ea	Panel Cutter Tips (double bladed)
1	Ea	Pressure Reducer Regulator
		Anchor Kit
25	Ea	Concrete Wedge Anchors (1/2"x 5 1/2")
25	Ea	Female Drop Forged H/D Eye Nuts (1/2"x course)
25	Ea	Bolt Hangers (rock climbing type, 1/2")
1	Ea	Torque Wrench (per manufactures specifications)

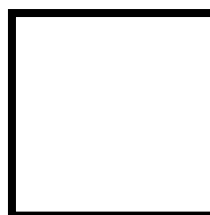
STRUCTURE/HAZARDS MARKINGS

Make a large (2' x2') square box with orange spray paint on the outside of the main entrance to the structure. Put the date, time, hazardous material conditions and team or company identifier outside the box on the right hand side. This information can be made with a lumber marking device.



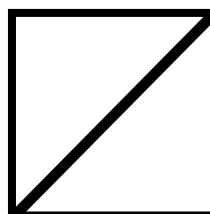
9/12/93
1310 hrs.
HM - nat.
gas
SMA - E-1

Structure is accessible and safe for search and rescue operations. Damage is minor with little danger of further collapse.



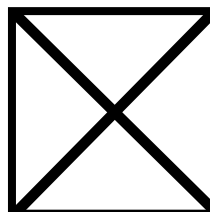
9/12/93
1310 hrs.
HM - none
SMA - E-1

Structure is significantly damaged. Some areas are relatively safe, but other areas may need shoring, bracing, or removal of falling and collapse hazards.



9/12/93
1310 hrs.
HM - nat. gas
SMA - E-1

Structure is not safe for search or rescue operations. May be subject to sudden additional collapse. Remote search ops may proceed at significant risk. If rescue ops are undertaken, safe haven areas and rapid evacuation routes should be created.



9/12/93
1310 hrs.
HM - nat. gas
SMA - E-1

Arrow located next to a marking box indicates the direction to a safe entrance into the structure, should the marking box need to be made remote from the indicated entrance.



APPENDIX-H

SEARCH MARKING SYSTEM

Search Markings must be easy to make, easy to read and easy to understand. To be easily seen the search mark must be large and of a contrasting color to the background surface. Orange spray paint seems to be the most easily seen color on most backgrounds and line marking or downward spray cans apply the best paint marks. A lumber marking device may be used to write additional information inside the search mark itself when it would be difficult to write the additional information with spray paint.

A large distinct marking will be made outside the main entrance of each building, structure or area to be searched. This "Main Entrance" search marking will be completed in two steps. First, a large single slash (approximately two feet) shall be made starting at the upper left moving to the lower right near the main entrance at the start of the search. The Search Team identifier and time that the structure was entered shall be marked to the left of the mid point of the slash and the date shall be marked near the top of the slash on the opposite side.

When the search of the entire structure is complete and the Search Team exits the building, a second large slash shall be made in the opposite direction forming an "X" on the Main Entrance search marking. Additional information summarizing the entire search of the structure will be placed in three quadrants of the "X". The left quadrant will already contain the Search Team identifier and time when the team first entered the structure. In the top quadrant enter the time the Search Team exited the structure under the date. Change the date if different from date the structure was entered. The right quadrant is for any significant hazards located inside the structure. The bottom quadrant is for the number of live "V" or dead "∇" victims still inside the structure. Use a small "X" in the bottom quadrant if no victims are inside the structure.

If the search of the entire structure is incomplete, make a circle (approximately 1' diameter) in the middle of the single slash. The left side will already contain the Search Team identifier and time when the team first entered the structure. At the top end of the slash enter the time the Search Team exited the structure under the date. Change the date if different from date the structure was entered. On the right side, mid point of the slash, is for any significant hazards located inside the structure. The bottom end of the slash is for the number of live "V" or dead "∇" victims still inside the structure. Use a small "X" at the bottom if no victims are inside the structure.

During the search function while inside the structure a large single slash shall be made upon entry of each room, area or floor. After the search of the room or area has been completed, a second large slash shall be drawn in the opposite direction forming an "X". The only additional information placed in any of the "X" quadrants while inside the structure shall be that pertaining to any significant hazards and the number of live "V" or dead "∇" victims, as indicated by "V" for live and "∇" for dead.

APPENDIX-J

EMERGENCY SIGNALING SYSTEM

Because of the high potential of secondary collapse, dangerous conditions, and the need to communicate other important information, an emergency signaling system should be adopted and in use by all personnel at the incident site. Emergency signals must be a loud and identifiable and sounded when conditions require immediate attention. Emergency signals can be made using devices such as a whistle, air horn, vehicle horn or bell. Each structure or larger area of operations may need to have its own distinct emergency signal device when multiple rescue operations are taking place in the same area to reduce confusion.

Supervisors should identify and inform assigned personnel of a designated place of assembly and/or safe zone for a Personal Accountability Report (PAR) to be conducted should an evacuation signal be sounded. A place of assembly is usually a safe location outside the evacuation area. A safe zone is usually a safe location within a building or disaster site that can be entered within the evacuation area. When an evacuation signal is sounded, all supervisors must conduct a roll call of their assigned personnel and communicate the results of the PAR to their supervisor.

Evacuate the area

Short signals repeated for 10 seconds, pause for 10 seconds, and repeat for 3 repetitions. Total signal time – 50 seconds.

Cease Operations / All quite

One long signal (8 to 10 seconds)

Resume Operations

One long and one short signal.

