Command and Control of Technical Rescue Incidents

Content: This course is designed to provide fire officers with an understanding of command operations at technical rescue incidents. Students completing this course will be able to:

• Describe the aspects of a technical rescue incident;
• Identify critical factors and issues that affect scene management;
• Describe all unique operational considerations used at a technical rescue incident;
• Describe all response operations phases associated with a structural collapse incident;
• Describe the technical rescue expertise and equipment required for safe operations and effective incident management.

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DEFINITION OF A US&R INCIDENT - TECHNICAL RESCUE

- STRUCTURAL COLLAPSE
- ROPE RESCUE
- CONFINED SPACE RESCUE
- VEHICLE AND MACHINERY EXTRICATION
- TRENCH AND EXCAVATION RESCUE

US&R INCIDENT COMMAND SYSTEM - INCIDENT COMMANDER

- CONSULT WITH US&R TECHNICAL SPECIALIST ON OPERATIONAL TACTICS
- USE COMMAND STAFF
  - MEDIA INTEREST
  - INCIDENT SAFETY OFFICER
- LONG INCIDENTS - CONSIDER LOGISTICS
- CONFINED SPACE ENTRY PERMIT HAS CHECKLIST THAT WILL ASSIST IN US&R RESOURCES
- CONSIDER A SECOND US&R TASK FORCE

RESCUE GROUP - PERIMETER CONTROL

- NON-US&R RESOURCE
- CONSULT WITH IC OR RESCUE GROUP SUPERVISOR REGARDING BOUNDARIES OF PERIMETER
- USE DOUBLE FIRELINE TAPE, CONES OR HAZ MAT TAPE AS INDICATOR TO CIVILIAN & FIREFIGHTERS
- CONSIDER HARD BARRIERS
- CONTROL THE SCENE
  - TRAFFIC
  - VIBRATION
  - MACHINERY

RESCUE TEAM

- HAZARD CONTROL MEASURES
  - EDGE PROTECTION
  - LOCK-OUT/TAG-OUT
  - MONITOR ATMOSPHERE
- ALL RESCUE, SHORING, EXTRICATION
  - PLACE SHORES
  - DIG OR REMOVE OBSTRUCTIONS
- PATIENT PACKAGING AND REMOVAL
  - “C” SPINE
  - IV ESTABLISHED
- BACK-UP RESCUE(R(S)
  - SAME PROTECTION AS RESCUE(R(S)
RESCUE TEAM LEADER

- OPERATIONAL TACTICS IN RESCUE SITE
- ESCAPE ROUTES AND SAFE ZONES FOR RESCUE(S) (LCES)
- ENSURE THAT ATMOSPHERIC MONITOR INFORMATION ID DOCUMENTED
- ENSURE THAT RESCUE(S) ENTRY TIMES ARE DOCUMENTED

IDENTIFY RESOURCES TO RESCUE GROUP SUPERVISOR

ATTENDANT

- DIRECT CONTROL OF RESCUE PERSONNEL AT ENTRY PORTALS FOR PERMIT REQUIRED CONFINED SPACE
- MAINTAINS COMMUNICATION WITH RESCUE(S) IN CONFINED SPACES
- MUST BE CERTIFIED TO CONFINED SPACE RESCUE OPERATIONS LEVEL
- USED FOR PERMIT REQUIRED CONFINED SPACE RESCUE

ATMOSPHERIC MONITOR

- DETERMINES ATMOSPHERIC CONDITION RELATIVE TO:
  - OXYGEN CONTENT
  - COMBUSTIBILITY
  - PRESENCE OF TOXINS
- ENSURE THAT ATMOSPHERE IS MONITORED PERIODICALLY (E.G. EVERY 15 MINUTES)
- DOCUMENTS READINGS FOR ENTRY PERMIT

TECHNICAL SUPPORT TEAM

- SUPPORT RESCUE TEAM OPERATIONS ON AN INCIDENT SPECIFIC BASIS
- PROVIDE SUPPLIED AIR RESPIRATORS WHEN NEEDED
- PROVIDE VENTILATION WHEN NECESSARY
- OVERSEE TECHNICAL SAFETY OF INCIDENT
- SOME RESOURCES ASSIGNED MAY BE NON-US&R

TECHNICAL SAFETY OFFICER (TSO)

- RESPONSIBLE FOR OVERSEEING ALL OPERATIONS AT RESCUE SITE IN REGARDS TO TECHNICAL SYSTEMS AND SAFETY
- CHECK ANCHORS AND RIGGING
- ASSIST WITH EQUIPMENT NEEDS
- ASSIST IN DIRECTION FOR NON-US&R RESOURCES

RIGGING CREW

- ASSIST IN OBTAINING ANCHORS AND ESTABLISHING RESCUE LINES UNDER THE DIRECTION OF TECHNICAL SUPPORT TEAM LEADER OR TSO
- STAFF RESCUE LINES FOR HAULING OR RAISING RESCUE(S) OR PATIENTS
- MAY BE NON-US&R RESOURCE
CUTTING CREW

• **ASSIST IN CUTTING SHORING UNDER THE DIRECTION OF TECHNICAL SUPPORT TEAM LEADER OR TSO FOR SHORING OPERATIONS**
• **MAY BE TWO OR MORE INDIVIDUALS OR AN ENTIRE COMPANY**
• **MAY BE NON-US&R RESOURCE**

BREATHING AIR MONITOR

• **SET UP AND MANAGE SUPPLIED AIR RESPIRATOR (SAR)**
• **DOCUMENT AIR USAGE BY RESCUER(S)**
• **TRAINED ON EQUIPMENT**

VENTILATION

• **PROVIDE VENTILATION BASED ON ATMOSPHERIC MONITORING**
• **VENTILATION MUST BE ACCOMPLISHED EARLY**
• **POWERED BLOWERS**
  - Gas
  - Electric
  • US&R Rig
  - Water Driven Blowers
    • 1 ½”
    • 2 ½”

FIRST RESPONDER

• **SCOPE OF INCIDENT**
• **SPOT APPARATUS**
  - VIBRATION
  - LEAVE ROOM FOR SPECIALIZED RIGS
    • **ESTABLISH CONTROL ZONES**
  - RESTRICT ENTRY
    • **ESTABLISH ICS**
    • **GATHER INFORMATION**
  - WHO, WHAT, WHERE, WHEN, WHY?
    • **STOP AND REMOVE CIVILIANS**
    • **PROVIDE EDGE PROTECTION**
  - 2 X 8 OR 2 X 10’S
    • **BELAY FOR MEMBERS NEAR EXCAVATIONS**
    • **COMPANY AND SELF-DISCIPLINE**

US&R INCIDENTS

• **STAFFING INTENSIVE**
• **MODERATE TO LONG DURATION**
• **CONSIDER LOGISTICAL SUPPORT EARLY**
—VACUUM TRUCKS, BSL CRANES
—LIGHT UTILITY
—REHAB UTILITY
  •  BEWARE OF “ALMOST HAVE VICTIM” SYNDROME
—ROTATE PERSONNEL

US&R TECHNICAL INCIDENT NOTIFICATIONS

• Command Officers
• US&R Unit
• Cal OSHA
• Coroner
• District Attorney
• Law Enforcement
• Outside Agencies
• Utility Agencies
• Crisis Intervention Teams

CONFINED SPACE DEFINITION

• LARGE ENOUGH SO EMPLOYEE CAN ENTER AND DO WORK
• LIMITED OR RESTRICTED MEANS FOR EXIT OR RESCUE
• NOT DESIGNED FOR CONTINUOUS EMPLOYEE OCCUPANCY
—EXAMPLES ARE SEWERS, MANHOLES, STORM DRAINS, OVENS, VESSELS, AND STORAGE BINS

“PERMIT REQUIRED” CONFINED SPACES

• MEETS DEFINITION OF CONFINED SPACE, AND
• CONTAIN ONE OR MORE OF THE FOLLOWING CHARACTERISTICS
  —CONTAINS HAZARDOUS ATMOSPHERE OR POTENTIAL
  —CONTAINS POTENTIAL FOR ENGULFMENT
  —INTERNAL CONFIGURATION THAT COULD TRAP OR ASPHYXIATE BY CONVERGING WALLS OR FLOOR
    THAT SLOPES AND TAPERS TO SMALL CROSS SECTION
  —CONTAINS OTHER RECOGNIZED SERIOUS SAFETY OR HEALTH HAZARD

• ALL CONFINED SPACES SHALL BE CONSIDERED “PERMIT REQUIRED” CONFINED SPACES UNTIL
  DETERMINED OTHERWISE
• ONLY MEMBERS TRAINED TO THE CONFINED SPACE OPERATIONS LEVEL SHALL ENTER “PERMIT
  REQUIRED” CONFINED SPACES
• “PERMIT REQUIRED” CONFINED SPACE ENTRY PERMIT SHALL BE COMPLETED BY FIRE DEPARTMENT
  WHEN AN ENTRY IS REQUIRED
• IC HAS RESPONSIBILITY TO ENSURE PERMIT IS COMPLETED
• ONLY MEMBER TRAINED TO THE CONFINED SPACE OPERATIONAL LEVEL MAY COMPLETE AND SIGN
  THE ENTRY PERMIT
CONSIDERATIONS FOR CONFINED SPACE RESCUES

• IDENTIFY HAZARDS
• HAZARD ASSESSMENT
• PROVIDE HAZARD CONTROL
• HAZARD CONTROL MONITORING
• DOCUMENT INCIDENT

HAZARDS IDENTIFIED BY NON-US&R TRAINED PERSONNEL

• NFPA 704 DIAMOND
• INTERVIEWS WITH (ASK QUESTIONS)
  — Co-Workers
  — Contractors
  — Machine Operators
  — Building Engineer
  — Plant Manager
• MSDS FOR PRODUCTS USED

HAZARD CONTROL

• Isolate Hazard
• Avoid Hazard
• Remove Hazard
• Lock-Out, Tag-Out, Block-Out
  — “Qualified Personnel”

ATMOSPHERIC HAZARDS

• 66% OF CONFINED SPACE INJURIES/DEATHS ARE ATMOSPHERIC
  — Leading cause of worker deaths in Confined Spaces
  • OXYGEN CONTENT
  • FLAMMABLE GAS
  • COMBUSTIBLE DUST
  • TOXINS
  • ANY ATMOSPHERE THAT CREATES IDLH ENVIRONMENT

• HAZARD CONTROL ACCOMPLISHED BY VENTILATION
  — VAPOR DENSITY
  — LEL

• VENTILATION DETERMINED BY MONITORING
  — Electric Gas or Water Driven Blowers
  — Equipment may be available on Site

MECHANICAL HAZARDS

• EQUIPMENT
• MOVING DEVICES
• MACHINERY
• BLOCK EQUIPMENT TO PREVENT MOVEMENT PRIOR TO DE-ENERGIZE DE-ENERGIZE AND LOCK-OUT/TAG-OUT
  –DE-ENERGIZING MAY RETURN EQUIPMENT TO START POSITION, CHECK
  • PLACEMENT OF LAFD PERSONNEL AT CONTROL POINTS

ENERGY HAZARDS

• ELECTRICAL HAZARDS
• ACTUAL OR POTENTIAL ENERGY
  –SPRING LOADED DEVICES
    • BLOCK EQUIPMENT TO PREVENT MOVEMENT PRIOR TO DE-ENERGIZE
    • DE-ENERGIZE AND LOCK-OUT/TAG-OUT
  –DE-ENERGIZING MAY RETURN EQUIPMENT TO START POSITION, CHECK
  • PLACEMENT OF LAFD PERSONNEL AT CONTROL POINTS

ENGULFMENT HAZARDS

• LIQUIDS OR FINELY POWERED OR GRANULAR SUBSTANCE THAT CAN
  –ASPIRATE BY FILLING OR PLUGGING RESPIRATORY SYSTEM
  –STRANGULATE
  –CRUSH
  –CONSTRIC
  • PREVENT MATERIAL RELEASE INTO CONFINED SPACE BY PHYSICALLY:
    –BLOCKING FLOW
    –MIS-ALIGNING PIPES OR LINES
    –DISCONNECTING PIPES OR LINES
    –REMOVING PIPES OR LINES

HEAT HAZARDS

BY NATURE, CONFINED SPACES HAVE ELEVATED TEMPERATURES

• SEASONAL TEMPERATURES ADD TO HAZARD
• VENTILATION
• HEAT PROBLEM RECOGNITION IN RESCUERS
• TIMELY RELIEF OR ROTATION OF RESCUERS

CONFINED SPACE RESCUE PROTECTIVE EQUIPMENT

• LIGHTS
  –INTRINSICALLY SAFE
  –HELMET LIGHT
  –FLASHLIGHT TAPED TO SLEEVES
  • AIR MONITORS
  • HARNESS - MIDPOINT ATTACHMENT
  • COMMUNICATIONS
  –HARDWIRE OR RADIO
  • TAG LINE
  • RESPIRATORY PROTECTION
  –SCBA
  –SUPPLIED AIR RESPIRATOR WITH ESCAPE BOTTLE
• **RETRIEVAL LINE**

**RETRIEVAL LINE**

• *To facilitate non-entry rescue, Retrieval Systems or methods SHALL be used whenever an authorized Entrant or Rescuer Enters a Permit Required Confined Space*  
  — Unless the Retrieval Equipment would increase the overall risk to entry or would not contribute to the rescue of the entrant or rescuer

**PREPARATION FOR CONFINED SPACE RESCUE**

• *Recognize “Permit Required” Confine Spaces*  
• *Designate Leaders*  
• *Fill Required Positions*  
• *Establish Staging*  
• *Consider Logistics*

**ASSESSMENT OF CONFINED SPACES**

• *What is the Problem?*  
• *What type of space is this?*  
• *What is the space used for?*  
• *Is the space currently in use?*  
• *Is this or was this a product storage area?*  
• *What is or what was the product?*  
• *Do you have a MSDS for the product?*  
• *What other hazards are in the space?*  
• *Do you have a Confined Space Entry Permit? (Business Specific)*  
• *Where are entrance and exit points?*  
• *Is there a Retrieval System in place?*

**PRE-ENTRY OPERATIONS**

• **MONITORING**  
• **VENTILATION**  
• **LOCK-OUT, TAG-OUT, BLOCK-OUT**

**PRE-ENTRY OPERATIONS – MONITORING**

• *General Site Monitoring*  
• *Perimeter Monitoring*  
• *Confined Space Monitoring*  
• *Personal Monitoring*  
• *Monitors may be on site – Use on site personnel qualified to operate monitors*
PRE-ENTRY OPERATIONS – VENTILATION

• Consider available equipment
• Consider Electric or Water Driven Blowers

PRE-ENTRY OPERATIONS - LOCK-OUT, TAG-OUT, BLOCK-OUT

ELECTRICAL

MECHANICAL

PIPES OR DUCTS

• THE KEY TO A SUCCESSFUL LOCK-OUT, TAG-OUT, BLOCK-OUT IS RETAINING SOMEONE INTIMATELY FAMILIAR WITH THE SYSTEMS IN THE AREA, PLANT, OR CONFINED SPACE

• ASK QUESTIONS, DON’T BE SATISFIED!

ENTRY AND RESCUE OPERATIONS

• LEAVE TO CONFINED SPACE OPERATIONAL TRAINED PERSONNEL

TRENCH RESCUE

• Staffing Intensive (Support & Runners)
• Communications is Difficult (Noise)
• No regulations for rescuers certifications
• There are OSHA requirements for Emergency Trench Shoring
• Confined Space Rescue Entry Permit

— Reference for Positions and Considerations Cheat Sheet test

ARRIVAL AT A TRENCH RESCUE - INTERVIEW WORKERS, WITNESSES

• What is the Problem?
• What is this excavation for?
• What was victim wearing?
• Where was the victim last seen?
• When was the victim last seen?
• Did the victim have a tag line?
• What specialized equipment does the contractor have on site?
• What other hazards are in the trench?

FIRST RESPONDER OPERATIONS AWAY FROM THE TRENCH RESCUE SITE

• This is a Construction Site at it’s worst
• Ensure proper assignment is en route
• Establish a Staging area (remote)
• Leave room at Incident for Specialized Apparatus
• Medical Component
FIRST RESPONDER OPERATIONS NEAR THE TRENCH RESCUE SITE

- Approach the Excavation/Trench from the Head/Ends to Size-up
- Check for Surface Cracks or Cantilever Hazards
- Stop potential additional victims (Co-Workers)
- Stop Heavy Equipment
- Establish Perimeter Control
  - Limit access by non-essential people
  - Eliminate Vibration Hazards
  - Near by Street Traffic, Railroad
- Provide Route of Travel for Rescuers and Equipment (One Way In – One Way out)
- Gather available material on-site
- Other Resources (Order Early)
  - Vacuum Trucks
  - Cranes
- Provide Edge/Lip Protection – 2 X 8 or Larger  Avoid Plywood because it hides cracks near excavation
- Provide Access Ladders
- Mark Bottom of Trench
- Mark Potential Location of Victim
- Start to Move Spoils Pile if Necessary
- Provide Initial Shoring if Available from Above the Trench
- Provide High Point
- Fall Protection for anyone near edge of Excavation/Trench
- Render Utilities in and around Excavation/Trench Safe
  - Tie off water & gas lines that may have become exposed by placing ground ladder perpendicular to trench and strapping and supporting exposed pipes
  - Provide clearance to overhead power lines above Excavation/Trench

RESCUE OPERATIONS AT EXCAVATION/TRENCH INCIDENT

- Meet with Technical Rescue Personnel to Develop IAP
- Assign Positions for US&R Trained and Non-US&R Trained personnel
- Leave Rescue Operations to Rescue Experts
- Provide Additional Personnel & Equipment as Required by Rescue Group Supervisor

COLLAPSED STRUCTURE SIZE-UP

- Interview Witness, Contractors
- Catalyst for Collapse
- Potential for Secondary Collapse
- Collateral Hazards
  - Utilities
  - Cantilever or other suspended hazards
- Ensure proper assignment is en route
- Use Confined Space Permit as “Cheat Sheet’ for resources
- Establish a Staging Area (Remote)
• Leave room near Incident for Specialized Apparatus
• Send your best people with knowledge of building construction on Recon (Safely out of impact area) to spot potential problems
• Medical Component
• Provide Immediate Rescue/Evacuation for civilians not trapped
• Perimeter Search
• Surface Rescue of Victims (In Non-Hazardous Areas)
• Maintain Control of Civilians Removed from Structure for Accountability
• Establish Perimeter Control

US&R OPERATIONS IN COLLAPSED STRUCTURES

• Notifications
• Our State US&R Equipment Cache
• Structure Specialist from Building Department
  • Construction Liaison
• FEMA USAR IST & TF’s
Activity 2 – Technical Rescue at an Earthquake

Purpose:

1. Conduct a Scene Assessment at a Technical Rescue incident.
2. Develop Incident Objectives for this activity.
3. Develop Strategies and Rescue Requirements, which provides you with an action plan to mitigate the activity.

Directions:

1. You will be divided into groups for this activity.
2. You will be shown a series of slides related to the activity.
3. You are provided with a series of handouts to assist you in completing this activity.
   a. A diagram of the collapsed complex is provided.
   b. A Structural Assessment Worksheet is attached.
   c. A Structure Collapse Organizational Checklist is provided.
   d. An ICS 201 Form is provided.
4. The instructor will review the activity scenario with the class:
   • It is January 4, 2007, at 0700 hours. Weather conditions are 50°F, light rain, wind at 8-10 mph from the NW.
   • The occupancy is a three-story wood framed garden style apartment complex. The apartment complex measures 150’ x 325’. There are 163 units in this complex, On the Division B, C, and some of the D sides there is also under unit parking (this is noted on the diagram by a lack of a first story apartments).
   • At 0431 hours a magnitude 7.1 earthquake struck this region of your City. This occupancy is 12 miles to the SW of the earthquakes epicenter.
   • You have just left your fire station and our in the process of conducting an assessment of your fire station’s district.
   • You stop in front of this apartment complex realizing that the normal three story apartment complex is now two-stories.
   • On Scene with you are: 1-Engine Company (4), 1-Truck Company (4) and 1-Technical Rescue (2) & 1-Battalion Chief (1).
   • You will be given messages that depict conditions found at the scene. These messages will also provide input into your answers for the activity.
5. You will be provided with a list of questions you are to answer regarding this scenario.
   a. What are the incident conditions upon your arrival?
   b. What are the hazards?
   c. Where may the victims be located?
   d. What factors will you use to determine victim location?
   e. What are your incident objectives?
   f. What are your strategies?
   g. What does your ICS Organization look like?
6. The attached forms will assist you in answering the questions, as well as determining your objectives, strategies and rescue requirements.
7. You will have 60 minutes to complete this activity.
   (REMEMBER, you would have a lot less in an actual incident!!!)
8. You are to select a spokesperson to report your findings.
Activity 2 – Technical Rescue at an Earthquake

MESSAGE UPDATES

- An estimated 40 units on the first floor are heavily damaged under a pancake collapse.
- An estimated 80-100 victims are trapped on the first floor and require extrication.
- There are also 180-200 victims trapped on the second and third floors.
- There have been two large aftershocks (magnitude 4.5 and 4.8) causing additional collapse.
- Approximately 15 cars in the under-apartment garage are leaking gasoline.
- The apartment floor construction is determined to be lightweight concrete over plywood.
- There is a large crowd of media gathering at the scene.