



# Kitsap County Technical Rescue Team

Polices and Guidelines

**Title: 2.3, Structural Collapse, Version 1.2**

**Section/Topic: Operations**

**Effective Date: April 3rd, 2018**

**Classification: Operating Guideline**

## **Purpose**

To establish a common and standardized operational approach for Kitsap County Technical Rescue Team (KCTRT) members responding to a structural collapse rescue incident.

## **Scope and Applicability**

This guideline provides operational guidance for the safe and effective use of Kitsap County Technical Rescue Team (KCTRT) personnel and equipment at incidents that involve structural collapse rescue operations. This guideline is used in conjunction with WAC 296-305 and NFPA 1670, 1006 and 1983.

This guideline is intended to apply only to KCTRT personnel and while Kitsap county fire districts are welcome to adopt and use these guidelines, they are not intended to supersede individual department policy or guidelines, or to alleviate an individual agency's right and responsibility as the Authority Having Jurisdiction (AHJ).

## **Definitions**

**Rescue Group Supervisor:** A competent individual trained to the appropriate level, responsible for coordinating rescue operations and the associated activities within the rescue area. Serves as the on-site "competent person" and reports to the Incident Commander.

**Technical Rescue Safety Officer:** A competent individual trained to the appropriate level, responsible for monitoring safety in the Technical Rescue operational area. Reports to the Rescue Group Supervisor or Incident Safety Officer.

**Entry Team Leader:** A competent individual trained to the appropriate level, responsible for victim disentanglement and removal operations, as well as for controlling access into the collapsed structure. Responsible for completing (or delegating its completion) the Confined Space Entry Permit and recording atmospheric readings, if applicable. Reports to the Rescue Group Supervisor.

**Shore Team Leader:** A competent individual trained to the appropriate level, responsible for supervising the installation of shoring systems including wood, pneumatic, hydraulic or mechanical as required by the incident. Reports to the Rescue Entry Team Leader, when present.

**Search Team Leader:** A competent individual trained to the appropriate level, responsible for supervising reconnaissance and victim search including the operation of search cameras and listening devices. Reports to the Rescue Group Supervisor.

**Equipment Officer:** A competent individual trained to the appropriate level, responsible for supervising the organization and deployment of Technical Rescue equipment. Reports to Rescue Group Supervisor.

**Hazard Control:** A competent individual trained to the appropriate level, responsible for atmospheric monitoring, ventilation and control of utilities. Reports to the Rescue Group Supervisor.

**Extrication:** A competent individual trained to the appropriate level, responsible for planning and executing the extrication of the victim once accessed. Reports to the Entry Team Leader, when present.

**Cut Team (Station) Leader:** A competent individual trained to the appropriate level, responsible for set-up and operation of the cut station in preparing shoring materials. Reports to the Entry Team Leader.

**Rescue Squad Officer (Leader):** A competent individual trained to the appropriate level, responsible for providing direct supervision, general leadership, wellness, and safety of multiple Technical Rescue providers.

**Selective Debris Removal:** A systematic process of removing or delayering debris. Undertaken after all known survivable void spaces are searched. As upper layers of debris are removed, additional void-space, canine, or technical search operations are conducted to check newly accessible parts of the building or pile for survivors or human remains.

**General Debris Removal:** A complete demolition and removal of all remaining debris. Generally marks the end of the rescue phase. Fire service and KCTRT personnel may be required to assist in debris removal and human remains recovery.

## **General Guidelines and Safety**

When the KCTRT is utilized as a specialty resource, the Incident Commander shall assign a competent, appropriately qualified individual to serve as the Rescue Group Supervisor. The Rescue Group Supervisor will make position assignments in accordance with the Kitsap County TRT Guidelines and Mobilization Plan as required by the needs of the incident.

First arriving KCTRT members should evaluate every structural collapse incident to determine whether it meets the legal and standard definition(s) of a confined space. If so, the guidelines established in 2.2, *Confined Space Rescue* shall be followed.

Regardless of determination of the collapse area as a confined space, the Rescue Group Supervisor will assign a competent, qualified individual to perform atmospheric monitoring and coordinate actions with the Technical Rescue Safety Officer. Atmospheric monitoring shall occur before and during all collapsed structure entries. Air monitoring shall be done at 10 foot horizontal and 4 foot vertical intervals, beginning at the lip or edge of the space.

Should any of the following atmospheric readings be recorded, TRT members shall only enter the space with appropriate respiratory protection:

- + Oxygen levels of <19.5% or >23.0%
- + Hydrogen sulfide or other toxicity marker above PEL
- + Flammability at 10% of LEL

An appropriately trained and equipped two-person Back-up Team shall be established prior to entry. Back-up team members' level of respiratory protection shall meet or exceed the level of protection utilized by the entry team.

The Kitsap County Passport Accountability System shall be used by all TRT members on site.

KCTRT personnel are responsible for ensuring that rescue site security has been provided during all rescue operations.

KCTRT members should ensure that the following safety guidelines have been met or completed by first arriving units:

- + Provide rescue site security
- + Consider ventilating the general work area around the collapsed structure
- + Consider opening additional openings to the space to assist with the ventilation process if possible
- + Provide fire control measures as needed
- + Limit ignition sources

All rescue efforts should be directed to the victims who can be seen or heard. Rescue efforts should be directed to reach those victims whose location is known.

If multiple rescue personnel are operating at the incident, the RGS should consider dividing team members into Rescue Squads.

Personal protective equipment is required at all structural collapse incidents. Minimum equipment includes:

- + Helmet
- + Eye protection
- + Hearing protection
- + Gloves
- + Steel toed boots
- + Respiratory protection appropriate for the conditions

Hazard, Search, and Victim markings shall correspond with the established FEMA USAR marking system.

All personnel shall consistently monitor the structure for signs of secondary collapse. Such signs include:

- + Leaning walls
- + Smoke or water seeping through joints
- + Creaking or groaning sounds
- + Recurring aftershocks
- + Sagging floor or roof assembly
- + Missing, strained or damaged points of connection of structural elements
- + Excessive loading of structural elements
- + Sliding plaster and airborne dust
- + Separating walls
- + Lack of water runoff
- + Racked or twisted structure
- + Building vibration

Search operations should be prioritized based on the most likely areas of survival, including:

- + Under stairways and inside commercial stairwells
- + Basements
- + Near chimneys and fire places
- + Void spaces in partial collapses
- + Void spaces near furniture or equipment

## **Operating Guidelines**

### **First Arriving KCTRT Personnel**

1. Size up the incident and attempt to gather the following incident information:
  - a. General description of the incident and cause
  - b. Building construction and occupancy types
  - c. Type of collapse
  - d. Potential incident hazards including disrupted or exposed utilities, flowing or pooling water, mechanical hazards, atmospheric hazards, hazardous materials, and/or secondary explosive devices
  - e. Stability of adjacent structures
  - f. Number of known or potential victims
  - g. Location of potential void spaces
2. Initiate atmospheric monitoring and ventilation of the space if possible and if not already completed by first arriving units
3. Establish a safety zone at least 1 ½ times as wide as the height of the remaining damaged structure, if not already completed by first arriving units
4. Request the following personnel and equipment as needed:
  - a. Additional TRT resources
  - b. Law enforcement for scene control
  - c. Additional fire resources for manpower
  - d. Additional EMS resources for victim and rescuer treatment

### **Operations Personnel**

If the structure(s) involved are of light frame ordinary, reinforced masonry, or unreinforced masonry construction, KCTRT Operations level personnel may initiate the following activities:

- + Incident size up
- + Hazardous energy management
- + Hasty primary and secondary search operations using the following methods:
  - o Victim hailing
  - o Surface searching
  - o Visual inspection of void spaces immediately accessible from the exterior of the structure

- + Search and victim marking
  - o Victim access, including those trapped inside and beneath collapse debris, so long as the void spaces occupied by such victims are immediately accessible from the exterior of the structure
  - o Victim extrication, including those trapped inside and beneath collapse debris, so long as the void spaces occupied by such victims are immediately accessible from the exterior of the structure
- + Structural stabilization including the use of:
  - o T shores
  - o Double T shores
  - o Two post vertical shores
  - o Door and window shores
  - o Box cribbing
- + Vertical breaching in lightweight wood frame structures for the purpose of access to a known, live victim
  - o Note, horizontal breaching of any structure and vertical breaching of masonry structures is *expressly prohibited* for operations level personnel.

### Technician Level Personnel

1. First arriving Technician level KCTR members should conduct or repeat the technical rescue size-up. Upon completion of the size up and structural evaluation, Technician level personnel should make appropriate building hazard markings.
2. As soon as possible, technician level personnel, at the direction of the Rescue Group Supervisor should initiate search and exploration operations, using the following methods:
  - a. Physical void search
  - b. Canine search
    - i. Note: Disaster canines are highly trained and specialized assets. Wide area (wilderness) search canines are not equivalent and should not be relied on as a substitute. Request outside canine resources as early in the incident as possible
  - c. Technical search including visual, acoustic, infrared, and seismic victim location devices
3. Personnel should consider requesting Structures Specialists to provide additional information as to the structure's stability and best approaches for breaching and shoring operations.
4. Horizontal breaching should be avoided when possible and attempts should be made to access victims using vertical breaches in order to maintain the integrity of the structure.

5. Whenever possible, breaching operations should be preceded by inspection cuts and camera insertion to determine the location of any victim(s) or hazard(s).
6. Shoring to the extent required to stabilize access and egress points should be undertaken in a systematic, thoughtful way. The purpose of emergency shoring is not to restore the structural elements to their original position and no attempt to shift structural components to their original position should be made.
7. All shoring points must be evaluated for underlying structural integrity before shoring operations begin. When possible, all shoring should follow a straight path of weight transfer to the ground.
8. When conducting shoring operations:
  - a. No attempt will be made to restore structural elements to their original position
  - b. Shoring materials shall be kept as short as possible, and lengths shall not exceed the maximums listed in the US Army Corps of Engineers Field Operations Guidebook
  - c. Air shoring should be used when available
  - d. Once placed, wood shoring shall not be removed by rescue personnel unless necessary for life safety purposes.
  - e. Commercial shoring equipment may be removed once wood shoring has been placed
9. *Selected* debris removal will be conducted following the development of a corresponding incident action plan and will be targeted for areas where viable victims may be located.
10. Should heavy equipment be necessary for selective debris removal operations, such equipment shall only be operated by a qualified individual and such operations should be conducted with the support of a Structures Specialist, structural engineer, or similar qualified person.
11. Selective debris removal should always take place in a top down fashion.
12. *General* debris removal should be initiated only after it is determined that there exists no chance that live, viable victims will be located.
13. All general debris removal operations should be supervised a Structures Specialist, structural engineer, or similar qualified person.

## APPENDIX A: STRUCTURAL COLLAPSE RESCUE SUPERVISOR CHECKLIST

LOCATION \_\_\_\_\_  
DATE \_\_\_\_\_ TIME \_\_\_\_\_

- Size up the incident
- Secure the rescue area and establish access control points
- Remove non-essential personnel and by-standers
- Provide for air monitoring and ventilation as needed
- Provide for de-watering systems as necessary
- Ensure utilities are controlled and identified
- Develop building and site diagrams
- Establish and mark operational and safety zones
- Evaluate structural integrity
- Determine the likelihood of survivability
- Assign Technical Rescue incident management positions
- Develop a rescue or recovery plan
  - Consider assigning division based on the size and complexity of the event
- Consider a Technical Rescue 2<sup>nd</sup> alarm
- Consider requesting additional EMS resources for victim and rescuer care
- Consider requesting specialty resources
  - Disaster search canines; specify live vs. cadaver
  - Structure Specialists, structural engineers, architects
  - Technical search assets
  - Heavy equipment
- Relay the rescue or recovery plan to the Incident Commander
- Brief all personnel on plan of action
- Ensure proper PPE, to include respiratory systems, are available and appropriate for the operation
- Consider additional personnel and rehab resources for prolonged operations to provide for crew rotation and rehabilitation



## **APPENDIX B: KCTRT Structural Collapse Rescue Scope of Operations**

TRT members qualified at the Structural Collapse Operations level shall be trained in and may conduct the following operations:

- + Perform a size up of a structural collapse incident involving the collapse or failure of light ordinary, unreinforced masonry, or reinforced masonry construction structures.
- + Identify and manage hazardous energy
- + Complete hasty primary and secondary search operations using the following methods:
  - o Victim hailing
  - o Surface searching
  - o Visual inspection of void spaces immediately accessible from the exterior of the structure
- + Place search markings in accordance with FEMA standardized markings
- + Place victim markings in accordance with FEMA standardized markings
- + Access victims, including those trapped inside and beneath collapse debris
- + Extricate victims, including those trapped inside and beneath collapse debris
- + Complete vertical breaches in lightweight wood frame structures for the purpose of access to a known, live victim
  - o Note, horizontal breaching of any structure and vertical breaching of masonry structures is *expressly prohibited* for operations level personnel
- + Complete structural stabilization using any of the following methods:
  - o T shores
  - o Double T shores
  - o Two post vertical shores
  - o Door and window shores
  - o Box cribbing
- + Other operations directed and supervised by a technician level member

## **APPENDIX B: KCTRT Structural Collapse Rescue Scope of Operations (Cont'd)**

KCTRT members qualified at the Structural Collapse Rescue Technician level shall be trained in and may conduct the following operations:

- + All Operations level activities
- + Initiate search and rescue operations including those for deeply trapped or entombed victims using the following methods:
  - Physical void searches
  - Canine search
    - Note: Disaster canines are highly trained and specialized assets. Wide area (wilderness) search canines are not equivalent and should not be relied on as a substitute. Request outside canine resources as early in the incident as possible
  - Technical search including visual, acoustic, infrared, and seismic victim location devices
- + Operate in environments with known respiratory hazards using SCBA or SABA systems
- + Complete structural stabilization using any of the following methods:
  - Multiple post vertical shores
  - Horizontal shores
  - Flying raker shores
  - Split sole raker shores
  - Solid sole raker shores
  - Laced post shores
  - Sloped floor shores
  - Double raker shores
  - Other shores as identified by a Structures Specialist, structural engineer or equivalent.
- + Complete heavy concrete or metal breaching
- + Complete horizontal breaching
- + Complete clean and dirty vertical breaches of masonry structures