



**ARCADIA FIRE DEPARTMENT
STANDARD OPERATING GUIDELINE**

CONFINED SPACE OPERATIONS

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PURPOSE

The purpose of this procedure is to establish guidelines for conducting confined space rescue operations. Confined spaces include caverns, tunnels, pipes, tanks, and any other locations where ventilation and access are restricted by the configuration of the space. These factors may also apply to basements or attics. Confined space incidents may involve injured persons, persons asphyxiated or overcome by toxic substances, cave-ins or fires occurring within the space.

PROCEDURE

PHASE I TACTICAL CONSIDERATIONS

I. THE PRIMARY ASSESSMENT

- A. Command should attempt to secure a reporting party (RP) or witness to the accident to determine exactly what happened.
- B. An immediate assessment of the hazards present to rescuers should be performed.
- C. An assessment of the victim(s) should be performed.
- D. Determine how many victims have been affected.
- E. Determine how long the victims have been down, the mechanism of injury, and the survivability profile of the victim(s).
- F. Establish communications with the victim(s) as soon as possible.
- G. Locate confined space permit and all other information about the space.

II. THE SECONDARY ASSESSMENT

A. The Confined Space

- 1. Determine what type of confined space this is.
- 2. What types of products are stored in the confined space?
- 3. What known hazards are present; mechanical, electrical, etc?
- 4. Location and number of victims affected.
- 5. Diagram of confined space, including entry and egress locations.

THE SECONDARY ASSESSMENT: The Confined Space (continued)

6. Structural stability of the confined space.
7. Hazardous material size-up.
8. Obtain copy of permit.

B. Personnel and Equipment

1. Determine if there is an adequate number of trained personnel on scene to manage the rescue/recovery; at least eight (8).
2. Consider the effect of temperature extremes on personnel, and consider early rotation of personnel operating on scene, approximately every 15 to 20 minutes, 30 minutes maximum.
3. Consider if the proper equipment is on-scene to complete the operation. This includes, but is not limited to:
 - a. Atmospheric monitoring equipment. At least one hazardous materials response unit to assist with atmospheric monitoring.
 - b. Explosion proof lighting.
 - c. Explosion proof communications.
 - d. Supplied air breathing apparatus or remote air.
 - e. Cascade system.
 - f. Victim removal systems/equipment.
 - g. Ventilation equipment with necessary duct work.

PHASE II PRE-ENTRY OPERATIONS

III. MAKE THE GENERAL AREA SAFE

- A. Establish a perimeter. The size of the perimeter should be dictated by the atmospheric conditions, wind direction, structural stability, etc.
- B. Stop all unnecessary traffic in the area.
- C. Assure running vehicles park downwind from incident.
- D. Establish ventilation to general area if necessary.
- E. Assign Safety Officer and establish Rehab.

IV. MAKE THE RESCUE AREA SAFE

- A. Determine exactly what hazards and products are within the confined space.
- B. Conduct atmospheric testing in the space to determine oxygen level, flammability, and toxicity. Based on readings, identify proper level of personal protective equipment. Any instruments used to monitor the confined space shall have:
 - 1. An audible alarm.
 - 2. Be calibrated to 10% of the LEL of the calibrant gas.
 - 3. Have the audible alarm set at:
 - Oxygen 19.5%, low and Oxygen enriched 23.5%
 - Flammability 10% alarm set
 - Toxicity carbon monoxide 25 ppm
 - Hydrogen sulfide 10 ppm
 - 4. Any Oxygen readings below 12%, recognize that the LEL reading may not be accurate.
 - 5. Provide atmosphere readings at least every 5 minutes
- C. Utilities, including electrical, gas and water should be secured and locked out. If it is not possible to lock/tag out/blank out, post a guard to assure the utilities are not turned on during the operation.
- D. Any product that is in, or flowing in, the confined space must be secured and blocked off if possible. It may be determined that the space must be drained of any product prior to entry.
- E. Any manufacturing or processing equipment must be shut down prior to entry. If possible, all equipment should be locked/tagged out and brought to a zero energy state.
- F. The structural stability of the confined space should be evaluated. If there is a potential for collapse, appropriate measures must be taken to assure the structural stability of the space.

V. VENTILATION

- A. Determine the proper type of ventilation for the space.
- B. Establish the proper ventilation of the confined space.

- C. Consider the effects on the atmosphere that positive or negative pressure ventilation will have (i.e., increase or decrease flammability of atmosphere). It could require both positive and negative ventilation (pushing and pulling). This will be based on the vapor density or molecular weight of the product.
- D. Consider negative pressure ventilation if there is only one entry point. Atmospheric monitoring will be required to ensure a non-explosive environment is present in the exhausted vapor area.
- E. Consider the effects the exhaust is having on the operation.

PHASE III ENTRY OPERATIONS VICTIM REMOVAL

VI. SELECTION OF PERSONNEL

- A. The proper personnel shall be selected to make entry into the confined space. A minimum of two persons should be assigned to make entry. All personnel on the entry team shall have vital signs taken and recorded prior to entry, if time permits.
 - 1. Assign a Rescue Group. Rescue Group shall provide a minimum 2:1 ratio of personnel outside the confined space to support personnel inside. This shall include a standby rescue team with a 1:1 ratio to provide immediate assistance to personnel in the confined space.
 - 2. All entry and back-up personnel should be properly trained in confined space rescue procedures and capable of carrying out the rescue/recovery.

VII. SELECTION OF PERSONAL PROTECTIVE EQUIPMENT

- A. The proper level of personal protective equipment should be worn by all entry and back-up personnel. This shall include helmet, gloves, proper footwear, goggles, turnouts, and appropriate harness, Class III is recommended.
- B. All entry and back-up personnel shall wear SABA or SCBA when making entry into the confined space. SABA (supplied air breathing apparatus) is recommended.
 - 1. Entry personnel shall use personal air monitoring devices that monitor flammability and oxygen as a minimum.

VIII. COMMUNICATION AND LIGHTING

- A. If the confined space has a flammable atmosphere, entry personnel should have intrinsically safe or explosion proof communication equipment. If this equipment is not available, a tag line for communication or a message relay person may be used.
- B. If the entry team is entering a dark confined space, ensure that the proper type of lighting is used. If explosion proof lighting is not available, then cyalume type lights must be used by the entry team.

IX. ORIENTATION OF CONFINED SPACE

- A. Prior to entry into the confined space, obtain a blue print or diagram of the space if possible. All entry and backup personnel should be made aware of the layout of the space to be entered.
- B. All entry and back-up personnel, Command Staff and Safety shall be made aware of the action plan and the back-up plan prior to entry.
- C. Rescuer tag lines may or may not be appropriate in the confined space, depending on the specific layout. Tag lines could become an entanglement hazard.

X. VICTIM REMOVAL EQUIPMENT

- A. If possible, the entry team should bring a supply of breathable air for the victim.
- B. Pure Oxygen shall not be used in a confined space that has a potentially flammable atmosphere. Rescuer's should not remove their breathing apparatus and give it to the victim.
- C. Entry team should consider the necessary victim retrieval equipment prior to entry. This includes respiratory protection for the victim.

XI. ASSESSING CONDITION OF VICTIM(S)

- A. Upon reaching the victim(s), entry personnel should do an immediate primary survey of the victim. If appropriate, treatment should be started immediately.
- B. A quick but thorough secondary assessment of the victim should be done. If time permits, entry personnel should attempt to treat serious injuries prior to removal.
- C. If indicated, complete C-spine precautions should be administered. NOTE: Because of the difficulty removing the victim from the space, optimum C-spine precautions may not be possible.

XII. VICTIM PACKAGING

- A. After treatment of immediate life threatening injuries, the victim(s) should be packaged for removal from the space. This may include using a backboard, stokes basket, ked board, LSP half back, or some other similar device designed for extrication.
- B. Prior to removal from the space, the entry team should secure any loose webbing, buckles, straps, or any other device that may hinder the extrication process.

XIII. VICTIM REMOVAL SYSTEM

- A. Determined the appropriate method of extrication prior to removal of victim. This may include a vertical or horizontal haul system constructed of ropes, pulleys, and other hardware, with a minimum of a 2:1 mechanical advantage.
- B. As a general rule, entry personnel should not allow the victim between the rescuer and the point of egress.
- C. Immediately after reaching the point of egress, entry personnel shall transfer the victim to treatment personnel.
- D. ALS level evaluation should be conducted on the victim.
- E. If the victim is contaminated from product inside the space, a Decontamination Group and corridor shall be established and used prior to transport of victim.

PHASE IV. TERMINATION

XIV. PREPARATION FOR TERMINATION

- A. Conduct personnel accountability.
- B. Remove tools and equipment used for rescue/recovery. If there has been a fatality, consider leaving tools and equipment in place for investigative purposes.
- C. If entry personnel and/or equipment have been contaminated during the rescue/recovery, proper decontamination procedures shall be followed prior to placing equipment back in service.
- D. Secure the scene.
- E. Evaluate personnel, CISD if the situation dictates it.
- F. Consider debriefing.
- G. Return to service.

XV. CONSIDERATIONS

A. Notifications:

- a. Fire Chief.
- b. Deputy Fire Chief.
- c. Battalion Chief to cover the City.

B. Weather:

- a. Heat. Consider rotation of crews.
- b. Cold. Consider effects of hypothermia on victim and rescuers.
- c. Rain. Consider the effects of rain on the hazard profile.

C. Time of Day. Is there sufficient lighting for operations extending into the night.

D. Consider the effect on family and friends; keep family informed.

E. Assign a P.I.O., consider news media.

F. OSHA notification, if there has been an injury or death.