

<b>Campbell County Fire Department Standard Operating Procedure</b>		
Operations	Confined Space Rescue	<i>404.60</i>

**I. PURPOSE:**

To establish procedures for safely and effectively performing emergency operations at incidents involving Confined Spaces.

**II. SCOPE:**

This procedure applies to all Campbell County Fire Department (CCFD) personnel.

**III. PROCEDURE:**

## 1. Definitions:

1.1. Confined Space: A confined space (CS) is a space that:

- 1.1.1. Is large enough and so configured that a person can enter within.
- 1.1.2. Has limited or restricted means for entry or exit.
- 1.1.3. Is not designed for continuous human occupancy.

1.2. Permit Required Confined Space (PRCS): A confined space having one or more of the following characteristics:

- 1.2.1. So configured that adequate ventilation does not exist;
- 1.2.2. Contains or has potential to contain a hazardous atmosphere (flammable or toxic);
- 1.2.3. Contains a material that has the potential for engulfing an entrant.

1.3. Examples of PRCS

- 1.3.1. Man holes
- 1.3.2. Wet wells or dry wells
- 1.3.3. Grain bins and dryers
- 1.3.4. Storage Bins
- 1.3.5. Auger ways

2. Initial Alarm Response: Respond with one Engine, Hazmat, Rescue, and a Command Officer.

3. Command and Sectors:

3.1. Assign Safety Sector.

3.2. Assign Ventilation Sector.

3.3. Assign Entry Sector.

3.4. Assign Hazard Sector

3.5. Assign EMS Sector.

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3.6. Assign Staging Sector.

3.7. Assign Resource Sector.

4. Tactical Considerations

4.1. Phase I - Arrive On-Scene. Take Command. Size-Up

4.1.1. Primary Assessment:

4.1.1.1. Command should attempt to secure an PRCS or witness to the accident.

4.1.1.2. An immediate assessment of the hazards present to rescuers should be done. If no witness is present, Command may have to look for clues on the scene that may indicate what has happened.

4.1.1.3. An assessment of the victim(s) should be performed.

4.1.1.4. Command should determine how many victims have been affected.

4.1.1.5. Command should determine how long the victims have been down, the mechanism of injury, and the survivability profile of the victim.

4.1.1.6. An early decision must be made as to whether the operation will be run in the rescue or recovery mode. Ask alarm times, from Dispatch to first on-scene companies, plus reaction time.

4.1.1.7. Establish communications with the victim if possible.

4.1.1.8. Locate confined space permit and all other information about the space.

4.1.2. Secondary Assessment

4.1.2.1. The Confined Space

4.1.2.1.1. Determine what type of confined space this is.

4.1.2.1.2. What type of products are stored in this space.

4.1.2.1.3. What known hazards are present; mechanical, electrical, etc.

4.1.2.1.4. Location and number of victims affected.

4.1.2.1.5. Diagram of confined space, including entry and egress locations.

4.1.2.1.6. Structural stability of the confined space.

4.1.2.1.7. Hazardous material size-up.

4.1.2.2. On-Scene Personnel and Equipment

4.1.2.2.1. Command should determine if there is an adequate number of trained personnel on scene to do the rescue/recovery; at least eight (8).

4.1.2.2.2. Command should consider if the proper equipment is on-scene to complete the operation. This includes, but is not limited to:

4.1.2.2.2.1. Atmospheric monitoring equipment.

4.1.2.2.2.2. Have HazMat.-1 respond to provide atmospheric monitoring.

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- 4.1.2.2.2.3. Explosion proof lighting and communications.
- 4.1.2.2.2.4. Supplied air breathing apparatus or remote air.
- 4.1.2.2.2.5. Cascade system.
- 4.1.2.2.2.6. Victim removal systems/equipment.
- 4.1.2.2.2.7. Ventilation equipment with necessary duct work.

### 4.2. Phase II Pre-Entry Operations:

#### 4.2.1. Make the General Area Safe:

- 4.2.1.1. Establish a perimeter. The size of the perimeter should be dictated by the atmospheric conditions, wind direction, structural stability, etc.
- 4.2.1.2. Establish ventilation to general area if necessary.
- 4.2.1.3. Assign Hazard Sector.
- 4.2.1.4. Assign Safety Sector.
- 4.2.1.5. Assign Entry Sector.
- 4.2.1.6. Assign Rehab Sector.

#### 4.2.2. Make the Rescue Area Safe:

- 4.2.2.1. Command should assign a Hazard Sector to determine exactly what hazards and products are within the confined space.
- 4.2.2.2. Hazard Sector shall perform atmospheric testing in the space to determine oxygen level, flammability, and toxicity. Based on readings, **Hazard Sector** should advise Command of the proper level of personal protective equipment. Any instruments used to monitor the confined space shall have:
  - 4.2.2.2.1. An audio-alarm.
  - 4.2.2.2.2. Be calibrated to 10% of the LEL of the calibration gas.
  - 4.2.2.2.3. Have the audio-alarm set at: 19.5%, low and enriched 23.5% for O<sub>2</sub>.
  - 4.2.2.2.4. Flammability 10% alarm set.
  - 4.2.2.2.5. Toxicity carbon monoxide 35 ppm.
  - 4.2.2.2.6. Hydrogen sulfide 10 ppm.
- 4.2.2.3. For any O<sub>2</sub> readings below 12%, Command should recognize that the LEL reading will not be accurate.
- 4.2.2.4. Hazard Sector shall give Command atmosphere readings every 5 minutes.
- 4.2.2.5. The Hazard Sectors is an extremely important part of a confined space operation. They should be staffed by personnel with thorough knowledge of atmospheric monitoring and ventilation technique.
- 4.2.2.6. Utilities, including electrical, gas and water should be secured and locked out. If it is not possible to lockout/tagout the Safety

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Sector shall post a guard to assure the utilities are not turned on during the operation.

4.2.2.7. Any product that is in or flowing in the confined space must be secured and blanked off if possible. Determine if the space must be drained of any product prior to entry.

4.2.2.8. Any manufacturing or processing equipment must be shut down prior to entry. If possible, all equipment should be locked/tagged out and brought to zero energy state.

4.2.2.9. The structural stability of the space should be evaluated. If there is a potential for collapse, measures must be taken to assure the structural stability of the space.

4.2.3. Ventilation

4.2.3.1. Command should assign a Ventilation Sector to establish the proper ventilation of the confined space.

4.2.3.2. Ventilation Sector should consult with Safety Sector and Hazard Sector to determine the proper type of ventilation for the space.

4.2.3.3. Ventilation Sector must 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.

4.2.3.4. Ventilation Sector may 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.

5. Phase III Entry Operations: Victim Removal.

5.1. Selection of Personnel

5.1.1. 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.

5.1.2. Command shall assign a Rescue Sector. Rescue Sector 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.

5.1.3. All entry and back-up personnel should be properly trained in confined space rescue procedures and capable of carrying out the rescue/recovery.

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5.1.4. Entry Sector should be assigned to conduct the actual entry into the confined space.

5.1.5. Entry Sector should consider the size of entry and back-up personnel to make entry.

5.2. Personal Protective Equipment

5.2.1. 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 Class III harness.

5.2.2. All entry and back-up personnel shall wear SABA when making entry into the confined space. SABA (supplied air breathing apparatus)

5.2.3. Entry personnel shall use personal air monitoring devices that monitor flammability and O<sub>2</sub> as a minimum.

5.2.4. Entry personnel shall have a Class III harness on prior to entry.

5.3. Communication and Lighting

5.3.1. 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, Entry Sector may decide to use a tag line for communication.

5.3.2. If the entry team is entering a dark confined space, Entry Sector must 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.

5.4. Orientation of Confined Space

5.4.1. Prior to entry into the confined space, the Entry Sector, should obtain a blue print or diagram of the space. All entry and backup personnel should be made aware of the layout of the space to be entered.

5.4.2. All entry and back-up personnel, Command and Safety shall be made aware of the action plan and the back-up plan prior to entry.

5.4.3. Rescuer tag lines may or may not be appropriate in the confined space, depending on the specific layout. It could be an entanglement hazard.

5.5. Victim Removal Equipment

5.5.1. If possible, the entry team should bring a supply of breathable air for the victim.

5.5.2. Pure oxygen shall not be used in a confined space that has a potentially flammable atmosphere.

Rescuer should not remove their breathing apparatus and give it to the

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victim.

#### 5.6. Assessing Condition of Victim

- 5.6.1. Upon reaching the victim, entry personnel should do an immediate primary survey of the victim. If appropriate, treatment should be started immediately.
- 5.6.2. 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.
- 5.6.3. 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.
- 5.6.4. If the victim is conscious, they should wear the appropriate breathing apparatus.

#### 5.7. Patient Packaging

- 5.7.1. After treatment of immediate life threatening injuries, the victim(s) should be packaged up for removal from the space. This may include using a backboard, stokes basket, K.E.D. board, LSP half back, SKED stretcher or some other similar device designed for extrication.
- 5.7.2. 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.

#### 5.8. Victim Removal System

- 5.8.1. Prior to removal of victim, the entry team should have determined the appropriate method of extrication. 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.
- 5.8.2. As a general rule, entry personnel should never allow the victim between the rescuer and the point of egress.
- 5.8.3. At times, the situation may preclude the use of that procedure due to the fact that one rescuer may have to pull the victim while the other rescuer pushes the victim.

#### 5.9. Transfer to Treatment Sector

- 5.9.1. Immediately after reaching the point of egress, entry personnel shall transfer the victim to EMS personnel.
- 5.9.2. If the victim is contaminated from product inside the space, a Decontamination Sector shall be set up and used prior to transport of victim.

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6. Phase IV. Termination

6.1. Preparation for Termination

6.1.1. Personnel accountability.

6.1.2. Remove tools and equipment used for rescue/recovery. If there has been a fatality, Entry Sector may consider leaving tools and equipment in place for investigative purposes.

6.1.3. If entry personnel and/or equipment have been contaminated during the rescue/recovery, proper decontamination procedures shall be followed prior to putting the equipment back in service.

6.1.4. Secure the scene. Prior to turning the property back over to the Responsible Party, one final reading of atmospheres shall be taken and recorded.

6.1.5. Crew debriefing.

6.1.6. Return to service.

7. Consider Ambient Conditions

7.1. Heat: Consider rotation of crews.

7.2. Cold: Consider effects of hypothermia on victim and rescuers.

7.3. Rain: Consider the effects of rain on the hazard profile.

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

7.5. Consider the effect on family and friends: Keep family informed.

7.6. Consider news media: Assign a P.I.O.

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