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OPERATIONS – POLICY AND PROCEDURE

TOPIC:	Confined Space Emergencies
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INTRODUCTION

Confined space rescue represents one of the most challenging and dangerous rescue operations undertaken by fire protection agencies and industry today. Nearly 60% of all confined space deaths are would-be rescuers associated with secondary entries. There are various Federal and State laws governing confined space rescue. At the Federal level, the laws can be found in Vol. 58, No. 9 of the Federal Code of Regulations, Chapter 1910.146. At the State level, they are found under Title 8 of the California Code of Regulations, Article 108. By complying with the above confined space regulations, the District will be in compliance with another California State Regulation, SB 198, Injury Illness Prevention Program.

For many years fire departments considered Occupational Safety and Health Administration (OSHA) fines a cost of doing business. With the increased fine structure that has been enacted, this is no longer cost efficient. In some states, fire departments are allowed to conform to the intent of the regulation. Cal/OSHA has served notice that fire departments will conform to the letter of the law.

This document is a guideline. Please refer to California Code of Regulations Title 8, Article 108, for specifics. The California Department of Industrial Relations website is <http://www.dir.ca.gov>.

POLICY

The following procedures have been established to provide an outline of operations, processes, responsibilities, and minimum safety requirements to be followed while entering, exiting, and working in confined spaces.

DEFINITIONS

A. *CONFINED SPACE* is a space that:

1. Is large enough and so configured that a person can bodily enter and perform assigned work; and
2. Has limited or restricted means for entry or exit; and
3. Is not designed for continuous human occupancy.

B. *PERMIT-REQUIRED CONFINED SPACE* is defined as a confined space that has one or more of the following characteristics:

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1. Contains or has potential to contain a hazardous atmosphere;
2. Contains a material that has the potential for engulfing an entrant;
3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
4. Contains any other recognized serious safety or health hazards.

Examples: Tunnels, sewers, tanks, tank cars/trailers, ship holds, cofferdams, trenches, process vessel, reaction vessels, manholes, industrial spaces, storm drains, ovens, furnaces. Spaces that may not meet the definition but present the same dangers are: empty swimming pools, below grade loading docks and parking garages, to name a few.

C. CONFINED SPACE EMERGENCIES

A confined space emergency is defined as any action or event, whether inside or outside the confined space, which could endanger the persons working within the space. Emergencies include the failure of any hazard control or monitoring equipment used in the space, such as ventilators or atmospheric testers, and any unauthorized or illegal entries.

D. TRAINING

1. Awareness Level Training requires:

- a. Confined space recognition,
- b. Confined space hazard recognition,
- c. Confined space hazard exposure recognition,
- d. Confined space rescue operation overview,
- e. Incident support training,
- f. Familiarity with District specific equipment.

2. Operational Level Training requires that each member:

- a. Must be provided with and trained to properly use the personal protective equipment and rescue equipment necessary to perform rescues.
- b. Shall be trained to perform the assigned rescue duties and receive the training required of authorized entrants.

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- c. Shall practice making permit space rescues at least once every 12 months.
- d. Shall have training in basic first aid and CPR.
- e. Shall be able to perform the duties of the following positions as assigned: Attendant, Entrant, Back-Up, or Entry Supervisor, as presented below.

Note: State Fire Marshall Course, “Confined Space Operations,” meets the Operational Level Training requirements when taken in conjunction with “Equipment Specific” training with the District.

E. OPERATIONAL POSITIONS AND DUTIES

1. Attendant

The attendant is stationed outside the permit space to monitor the conditions and locations of authorized entrants.

Duties:

- a. Know the hazards that may be faced during the entry.
- b. Know the behavioral effects of exposure; attendant is given the judgment to order the evacuation of entrants, if any of the signs or symptoms are detected.
- c. Maintain accurate entrant identification.
- d. Remain outside the permit space.
- e. Communicate with the entrants.
- f. Monitor entry activities.
- g. Initiate on-site rescue procedures (rescue the rescuer).
- h. Prevent unauthorized entry.
- i. Perform non-entry rescues.
- j. Perform no conflicting duties.

2. Entrant

An authorized entrant is an employee who is designated by the employer to enter a permit space.

Duties:

- a. Know the hazards that may be faced during entry.
- b. Use equipment properly.

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- c. Communicate with the attendant.
- d. Alert the attendant of hazards that arise during the entry.
- e. Exit the permit space quickly, as needed.

3. Back-Up

Duties:

- a. Remain outside the space.
- b. Remain suited up for immediate entry, if the Entry Team needs rescue.

4. Entry Supervisor

An entry supervisor is anyone empowered by the employer to authorize or directly supervise entry operations in a permit space.

Duties:

- a. Know the hazards that may be faced during entry and work.
- b. Verify that the appropriate entries have been made on the permit; verify that all of the tests specified by the permit have been completed; and verify that all procedures and equipment required by the permit are in place before endorsing the permit and allowing entry to begin.
- c. Terminate entry as required.
- d. Remove unauthorized individuals.

Note: The Attendant, Entrant, Back-Up, and Entry Supervisor are Operational Positions with training which exceeds the Awareness Level.

F. CONFINED SPACE HAZARDS

There are many hazards associated with confined spaces, anyone of which can injure or kill entrants. These hazards fall into three categories: atmospheric, physical, and psychological.

1. Atmospheric Hazards

OSHA has found that 90% of employee injuries and deaths occur as a result of hazardous atmospheres. Therefore, OSHA standards require that the atmosphere is sampled and monitored before making entry into a confined space for work or rescue purposes. A hazardous atmosphere is an atmosphere that may expose employees to

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the risk of death, incapacitation, impairment of ability to self-rescue, injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10% of its Lower Flammable Limit (LFL);
- Airborne combustible dust at a concentration that meets or exceeds its LFL (Dust obscuring vision at 5 feet or less);
- Atmospheric oxygen concentration below 19.5% or above 23.5%;
- Atmospheric concentrations of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z.
- Any other atmospheric condition that is an “Immediately Dangerous to Life or Health” (IDLH) condition.

2. Physical Hazards

- Engulfment
- Mechanical
- Corrosive
- Temperature
- Biological
- Radiation

3. Psychological Hazards

- Claustrophobia
- Fatigue
- High Noise Levels

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PROCEDURE

A. Any confined space that is determined to be a “Confirmed” Confined Space Emergency will immediately receive a “Confined Space Response” that will include the following:

1. First due Engine Company
2. First due Truck Company
3. Urban Search and Rescue (USAR) 134, with Crew
4. Hazardous Material Unit
5. Battalion Chief
6. Advanced Life Support Unit
7. Contact Rescue Division Coordinator

Note: If incident will be extended or there are insufficient Operational Level trained personnel to mitigate the incident, mutual aid shall be requested.

B. OPERATIONAL PROCEDURES

1. Size-Up (Phase 1)

- a. Recognize the emergency as a confined space rescue incident. Confirm/Activate, “Confined Space Response.”
 - Location, Type & Size of Space
 - Number of Victim(s), and Location
 - Product Storage Hazards
 - Incident Name, and Location of I.C. Post
 - Staging/Check-in Location
 - Additional Resources

2. Considerations

- Body Recovery or Rescue
- Don’t cancel Confined Space Response until victim is completely removed to safety.

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3. **Pre-Entry Assessments** (Can be performed by Awareness Level Responder)

- Deny entry into space from spectators / first responders.
- Do not breach the opening of the space without proper atmospheric monitoring.
- Locate and secure the job site supervisor or a reliable witness.
- Obtain Confined Space Entry Permit.
- Initiate District Confined Space Entry Permit.
- Ensure Tag Out/Lock Out is done. Have a site representative go with firefighter to ensure it is done.
- Obtain blueprints, maps, or have on-site personnel draw sketch of site.
- Obtain Material Safety Data Sheets (MSDS's).
- Establish Zones with fire line tape.
 - 50 ft. Exclusion
 - 100 ft. beyond Exclusion for the Support
- Determine the mechanism of entrapment or nature of illness.
- Determine number of entry points and location.
- Eliminate all ignition sources. Conventional flood lights and radios are not intrinsically safe.

4. **Protective Clothing**

- a. Full turnouts, including helmet, gloves, boots, and Self Contained Breathing Apparatus (SCBA) shall be worn while monitoring the air and establishing a safe working area as conditions dictate.
- b. Limited work areas and warm weather may require the alteration of personnel protection which is worn. However, atmospheric monitoring results are the governing factor.

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5. Incident Command

- Incident Commander (IC) to make additional confined space assignments to fill critical Incident Command System (ICS) positions prior to entry
- “Base” in exclusion zone (Awareness Level),
- “Medical Supervisor,” triage and transportation of victims and rescuers, if needed (Awareness level),
- “Safety Officer,” (Operational Recommended),
- “Entry Supervisor,” (Operational Level),
- “Attendant,” (Operational Level),
- “Entrant,” (Operational Level),
- “Back-Up Team,” (Operational Level),
- “Air Supply,” one person to be assigned to air supply to continually monitor and ensure supplied air for entrants and back-up team (Awareness Level),
- “Ventilation,” (Awareness Level),
- “Rescue Riggers,” see Retrieval Systems, below (Awareness Level),
- Expand ICS as necessary.

6. Atmospheric Monitoring (Phase 2)

- a. Before an authorized entrant enters a confined space, the internal atmosphere shall be tested with a calibrated direct-reading instrument. Testing shall be for the following conditions: oxygen content, flammable gases and vapors, toxic air contaminates.
- b. Testing shall be performed at all levels of the confined space and shall continue periodically, with the results and time noted on the Entry Permit.

7. Retrieval Systems

- a. Retrieval systems or methods shall be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant.
- b. Each authorized entrant shall don a full body harness, with retrieval line attached.

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- c. The other end of the retrieval line shall be attached to a mechanical device or a fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer or attendant becomes aware that rescue is necessary.
A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet deep.
- d. Depending on the confined space configuration, high point attachments for rigging can include; aerial apparatus, ladder A-frame, ladder gin, tri-pod, or other acceptable anchors at the site.

8. Pre-Entry Briefing (Entry Supervisor)

- a. Each team shall be advised of their expected tasks during the entry.
- b. Each team shall be advised of emergency procedures within the space in the event of a rescue team problem.
- c. Each team should be provided a site briefing.
- d. During entry, the team should be aware of their surroundings and be ready to debrief when they exit the space.
- e. Each team should be advised of any time limits placed upon them.

9. Communications

- a. Entrants and standby team shall don the intrinsically safe “Con-Space” communication device.
- b. Alternative communications include:
 - Voice or eye contact
 - Rope signals (OATH Method =
 - 1 tug = OK. Can be to ask if OK and to answer
 - 2 tugs = Advance. ie give me rope
 - 3 tugs = Take up rope. I'm coming back
 - 4 tugs = HELP).

Note: Four pulls on the rope means Help! At least one Back-Up member should be dispatched to ascertain the situation.

- c. Portable radios can only be used when known to be intrinsically safe, and the confined space configuration will not hamper radio transmission.

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10. Air Supply

- a. Set-up on-site primary and secondary air supply systems that are ready to become operational. (Supplied Air with escape bottles are primary.)
- b. Establish a method to refill/replace bottles.
- c. Ensure adequate air-line is on-site.
- d. Ensure each air-line is laid out, in a large figure 8, and adequate air-line handlers and manifold operators are assigned to the air supply system.
- e. Ensure adequate accessories are present to perform emergency repairs to air system.
 - Duct tape
 - Teflon tape
 - Toolbox
 - Additional air fittings
 - Extra hose

11. Ventilation

- a. Ventilation of the confined space should commence as soon as possible. (When possible, atmospheric readings should be acquired prior to entry to establish a base line reading.)
- b. Ventilation will be maintained during the operation.
- c. Be aware that ventilation could cause the hazardous atmosphere to be within its lower or higher explosive range.
- d. When using mechanical ventilation, keep fans and ventilators away from vehicle and generator exhaust. Stage equipment down wind.
- e. If generators are used to power the ventilators, ensure that extra fuel is available to sustain constant operation.

12. Entry and Rescue Operations (Phase 3)

- a. Once the safest method and location for entry has been determined, teams shall begin entry and reconnaissance/rescue/recovery operations.
- b. Entry decisions shall be made based on known location of victims, safety of the opening, atmospheric conditions.

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- c. Time of entry shall be recorded on Entry Permit. Factors such as physical obstacles, temperature, and workload shall dictate entrant rotation. Thirty (30) minutes is a rule of thumb.
- d. Upon removal from confined space, each team shall be assigned to rehab for medical evaluation and rehydration.

13. Victim Removal (Phase 4)

- a. Provide air to victim as appropriate.
- b. If victim is injured, the entrant must weigh the options of taking the time to stabilize the injuries against permitting the victim to be further exposed to the conditions within the confined space.
- c. Administering oxygen is not recommended due to the possibility of creating an oxygen enriched atmosphere.
- d. Provide c-spine protection, if appropriate.
- e. When possible, appropriate harness shall be applied to victim, if exposed to a fall hazard.
- f. Place victim on appropriate extrication device.
- g. Attach haul line to extrication device and victim, when possible.
- h. Haul system from outside, when possible. Do not use electric winches to remove victims or rescuers.
- i. When moving patients through small openings, ensure that the rescuers are on the egress side of the victim, whenever possible. Avoid egress from being blocked.

14. Termination (Phase 5)

Once the victim(s) and the entry team have exited the space, ensure their exit time is documented and that all personnel are accounted for.

- a. All entry personnel should be sent to rehab.
- b. All entry personnel shall be debriefed for critical information discovered in the space. This may include:
 - Location and position of victim when found.
 - Condition in which the victim was found. Was he without breathing apparatus? Was there evidence of a fall, etc.?

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- Additional mapping information.
- Any specific problems encountered within the space regarding movement, hazards, air, etc.
- c. Inventory all equipment; ascertain if anything was left in the space.
- d. Account for all damaged equipment.
- e. Clean, do maintenance, log, repack and restock equipment.
- f. Have responsible party seal the space and secure the entry point.
- g. Consider Critical Incident Stress Debriefing.
- h. Critique the operation as soon as possible.
- i. If warranted, revise Policy and Operating Procedures, Entry Permit, and Training after the critique.

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