RDMD Operations & Maintenance
Permit Required Confined Spaces

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I. INTRODUCTION

Californians die in confined space accidents every year. Not only is the original victim at high risk, but sixty percent of the fatalities are would-be rescuers who enter the space attempting to retrieve the fallen individual(s), only to be overcome by the hazardous atmosphere and perish themselves.

County of Orange employees entering confined spaces may encounter extremely hazardous atmospheric conditions and/or access difficulties, which could become life-threatening. Such locations include tanks, crawl spaces, electrical vaults, storm drains, pipelines, pump station lines, ducts and dams which must be entered for repairs, inspection and maintenance. Insufficient ventilation may allow for the accumulation of toxic or flammable gases or the critical depletion of oxygen necessary to sustain life. Limited access into and exit from these spaces greatly hampers rescue procedures.

A. California Regulatory Requirements

Work performed in confined spaces and/or work requiring the wearing and use of respiratory equipment is regulated by **The California General Industry Safety Order: Article 108, Section 5144 *governs respiratory protection*, *and sections* 5156 – 5158 *governs work in confined space.* (These are enforced by Cal/OSHA)** This program policy was developed by the RDMD/Operations & Maintenance Confined Space Team for County employees & private contractors with critical information about these regulations to insure there safety whenever engaged in confined space operations within County facilities.

B. RDMD/Operations & Maintenance policy concerning work in confined space is intended too:

1. Reduce the number of employees exposed to hazardous situations.
2. Maintain continuous communications with workers inside confined spaces.
3. Require a “two-man buddy” system for personnel through:

    - Underground Storm Drains
    - Underground Public Water Systems
    - Underground and above ground storage tanks, tunnels and vaults

4. Provide safety, emergency equipment and training to its employees.

CONFINED SPACE – means a space that has all of the following characteristics:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work.

2. Has limited or restricted means for entry or exit (for example: storm drains, sewers, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.)
3. "Not Designed for Continuous Human Occupancy".

II. COMMUNICATION SYSTEM

A. Proper Communication

- Verifies that the work and the situation are proceeding normal.
- Alerts the entrant to any change, including those in surroundings or atmospheres, and allows the attendant to order immediate evacuation in the event of imminent danger.
- Reduces the effects of claustrophobia.

B. Effective Methods of Communication

- Verbal/Audible
- Hand Signals
- Two way radios
- Light signals

III. HAZARDS

A. Hazardous Atmospheric Conditions

The unfavorable ventilation of a confined space can cause the atmosphere in the area to become life-threatening, not life-supporting.

- Processes of biological activity
- Decomposition of natural materials
- Oxidation
- Percolation of vapors and structural leaks can cause the production and accumulation of toxic gases and/or flammable gases.
- Combustible dust suspended in air, which obscures vision at a distance of five feet or less
- Vapors
- Flammable or Explosive gas
- Atmospheric oxygen concentration levels below 19.5% or above 23.5%

Available oxygen levels may become seriously depleted or displaced through these same processes. When the atmosphere becomes contaminated with harmful gases or lack of oxygen, the effects may not be immediately felt by the exposed worker. A false feeling of euphoria or well-being is a common side effect to such exposure. ***A number of the gases have no odor or color detectable by the body's senses.*** Many who die in confined space accidents simply slip into unconsciousness quietly, never realizing what is happening and never awakening.

One cardinal rule prevails in working in confined spaces: **"Never Trust Your Senses."** Only through using appropriate monitoring instruments that are capable of analyzing gases in the parts-per-million range can employees be certain that the atmosphere is safe to enter.

The following section discusses the harmful effects of exposure to varying toxic gases and oxygen levels commonly found in confined space atmospheres.

B. Oxygen Depletion/ Deficiency

Life ceases quickly without enough oxygen. Common sources of oxygen depletion in confined spaces include:

- Aerobic bacterial growth
- Oxidation or rusting of metals
- Combustion and displacement by other gases
- Decomposition of organic matter

Oxygen comprises only a small percentage (20.9%) of the air we breathe. When levels of oxygen are reduced below 19.5% (minimal acceptable level), serious health problems begin to occur very quickly. The following provides an overview of those effects at various oxygen levels:

- **20.9%** - Percent oxygen found in normal air.
- **19.5%** - Minimum permissible oxygen level.
- **15-19%** - Decreased ability to work strenuously. May impair coordination and may induce early symptoms in persons with coronary, pulmonary or circulatory problems.
- **12-15%** - Respiration and pulse increase; impaired coordination, perception and judgment.
- **10-12%** - Respiration further increases in rate and depth, poor judgment and bluish lips.
- **8%-10%** - Mental failure, fainting, unconsciousness, ashen-face, blueness of lips, nausea and vomiting.
- **6-8%** - 8 minutes - 100% fatalities; 6 minutes - 50% fatalities; 4-5 minutes - recovery with treatment.
- **4-6%** - Coma in 40 seconds, convulsions, respiration ceases - death.

As well as being consumed by organisms, fire or decay processes, oxygen may be depleted because other gases have displaced it. Some gases are heavier than air and move downward; others being lighter than air travel upward, displacing the available oxygen as they fill the space.

C. Oxygen Enrichment

Oxygen enrichment refers to air containing more that **23.5%** oxygen. This dangerous condition is an extreme fire hazard in which static electricity from materials such as

hair or clothing can provide the ignition source needed to start a fire. This environment also allows any fire to burn more readily. *Oxygen enrichment does not occur naturally and should be investigated.*

D. Toxic Gases

There are many different types of toxic gases that can be found in confined spaces. Their sources and physical characteristics vary, but they all share one common thread - *potential harm to individuals who come in contact with them in enclosed areas*.

- There are two categories of toxic gases: **Irritants and Asphyxiates.**

Irritants – Many gases, existing in low concentrations in the air, are irritating to the body's respiratory and nervous system. When breathed, they cause swelling of mucous linings of the lungs and sinuses, sometimes so severe that complete closure of the respiratory tract occurs causing strangulation. Except under extreme conditions, the body does recover after exposure to gases has stopped. In higher concentrations, irritants can become asphyxiating gases.

Asphyxiates – Any gas which, when present in high enough concentration, causes displacement of oxygen in the body.

Carbon Monoxide is one of the most common asphyxiates. It is produced by incomplete combustion of carbon fuels. Carbon monoxide kills by chemically combining with the hemoglobin in red blood cells. This greatly reduces the ability of the blood to carry oxygen to the body tissues and brain cells.

CARBON MONOXIDE EXPOSURE EFFECTS

- **35 ppm** Permissible Exposure Limit over 8 hour shift
- **500 ppm** Slight headache
- **1000 ppm** Confusion, nausea, discomfort
- **2000 ppm** Tendency to stagger
- **2500 ppm** Unconsciousness after 30 minute exposure
- **4000 ppm** Fatal in less than one hour

Hydrogen Sulfide is even more toxic than carbon monoxide. It is produced through the decay of organisms and natural materials. This colorless gas has a characteristic rotten-egg odor at first smell; however, after a short time the gas renders the olfactory nerve (which controls the sense of smell) ineffective. *A worker may be lulled into a false sense of security because he/she no longer smells the substance*, and yet it causes serious bodily harm in higher concentrations.

HYDROGEN SULFIDE EXPOSURE EFFECTS

- **10 ppm** Permissible Exposure Limit over 8 hours
- **50-100 ppm** Mild eye and respiratory irritation

- **200-300 ppm** Marked increase in eye and lung irritation
- **500-700 ppm** Unconsciousness/death after 30 minute exposure
- **1000 or more** Death within minutes

Methane is a natural gas produced from the decay of organic matter. It is a flammable, explosive, colorless and odorless gas. It can displace oxygen to the point of oxygen deficiency in a confined space, causing dizziness, unconsciousness and asphyxiation.

1. **LEL = 5%**
2. **UEL = 15%**

The lowest concentration (air-fuel mixture) at which a gas can ignite is called its **Lower Explosive Limit (LEL)**. Concentrations below this level are too lean to burn. The highest concentration that can be ignited is its **Upper Explosive Limit (UEL)**. Above that concentration, the mixture is too rich to burn. *A gas is flammable in concentrations between its LEL and UEL.*

E. Flammable Gases

Many of the gases routinely found in confined spaces are combustible under the right combination of conditions (including hydrogen sulfide, carbon monoxide, acetylene, and methane). Three ingredients are necessary for an atmosphere to become flammable or explosive:

1. **Fuel** (Combustible Gas or Vapors)
2. **Oxygen**
3. **Source of Ignition** (heat, flame or electrical)

When these are present at the same time and in the correct proportions, a serious explosion or fire can result. If a combustible gas and air are trapped in a confined space, only a source of ignition is needed to create an explosion. Welding, sparking tools, smoking or static electricity can easily satisfy this requirement.

The **Flammable Range** is when overly rich mixtures can collect in an area and reach combustible concentrations when fresh air is introduced (ventilation) and quickly changing its proportions to levels between the LEL and UEL. Confined space atmospheres containing an enriched oxygen level above **23.5%** increase the flammability ranges of many gases, as well as support violent flammable reactions when combustion occurs. Oils and grease may unexpectedly burst into flames under such atmospheric conditions.

F. Physical Hazards

Confined space areas may also have the following physical hazards which employees may come in contact with:

- Possibility of **Engulfment or Entrapment** by flooding while working in a Storm drain or Underground Flood Facility.
- Pipes, valves and lines carrying harmful substances (steam, natural gas and electricity) should they rupture while being worked on or activated if not locked out.
- Electrical shock.
- Loud noise reverberating from the use of hammers, hydraulic equipment.
- Slips and falls on wet surfaces or resulting from broken or oxidized ladder rungs.
- Exposure to corrosive substances which could cause irritation to unprotected skin.
- Exposure to snakes, bats, spiders and other rodents and insects living in the area.
- Poor or inadequate illumination.
- Poor communication.

G. Thermal Hazards

A thermal hazard is a dangerous condition caused by excessive heat or cold, or a hot/cold surface.

- Employees engaged in continuous heavy work while wearing **PPE** (Body Suit & Respirator) in warm surroundings.
- Heat stress may lead to heat exhaustion, heat cramps, heat stroke & loss of consciousness or death.

IV. CONTROL OF HAZARDS

A. Atmospheric Monitoring

There are unseen and odorless contaminants that kill or incapacitate workers. Of these contaminants that have odor, some can be detected by our senses only at low concentration. Because of this employers might assume that a confined space is safe when it is not.

Atmospheric monitoring is necessary whenever:

- A safe atmosphere cannot be ensured.
- An existing hazardous atmosphere cannot be removed.
- The confined space cannot be physically isolated from the penetration of the hazardous materials.
- There is reason to suspect the development of a hazardous atmosphere during work activity.

B. Air Monitoring Instrumentation

It is critical that an atmospheric monitoring instrument is used before and during confined space entry. There are several types of atmospheric monitoring instruments

being used by the **RDMD/ Confined Space Section**. Each instrument monitors air samples for four categories of hazardous conditions simultaneously:

1. Percent of available Oxygen.
2. Presence of Hydrogen Sulfide (Toxic Gas)
3. Percent of Flammable Gases.
4. Presence of Carbon Monoxide in the air.

The Confined Space team has the capability to analyze the sample for more than one type of contaminant at once. Every Confined Space employee performing atmospheric monitoring has the ability to retrieve sampling information about the oxygen level, as well as presence of both toxic and flammable gases. This may only be possible by utilizing several different instruments.

Each gas monitor requires periodic maintenance and calibration. Specific manufacturer's instructions must be followed to ensure that each instrument provides reliable service. Replacement parts, including extended probes and carrying cases, will be purchased directly from the manufacturer as needed.

Each of these appliances is a highly sophisticated scientific instrument that must be handled carefully and maintained sufficiently to provide critical, lifesaving information to the user.

C. Ventilation

Once it has been determined that the confined space contains a harmful atmosphere, the next step is to *clear it.* Ventilation blows out oxygen-deficient or contaminated atmospheres and replaces harmful vapors with clean, fresh air. Make sure to ventilate the space thoroughly so that there are no contaminated pockets left, and then test the atmosphere again. *Ventilation helps to*:

- Provides adequate oxygen to the air in the space.
- Controls atmospheric contaminants.
- Prevents fires and explosion hazards.
- Control heat and humidity.

1. **Initially Determine:**
   a) Number and size of openings.
   b) Volume and configuration of the space entered.
   c) Capacity and positioning of the ventilation equipment to be used.

2. **After Beginning Ventilation:**
   a) Routinely test the confined space until levels stabilize at acceptable entry conditions.

3. **Once Entry and Work Start:**
   a) Continue ventilation and frequent atmospheric testing for the

duration of entry.
b) Consider atmospheric hazards created by work in the space.

D. Physical Hazards

1. Isolation of equipment includes:
   a) Identifying potential mechanical hazards.
   b) Completing the de-energizing of all (*electrical, mechanical, pneumatic and all other energy sources*).
   c) Locking out and tagging out all electrical circuits and valves.
   d) Guarding or removing equipment from the area.
   e) Ensuring isolation procedures are fully implemented.

Lockout of a machine refers to the installation of a lock that prevents another employee from turning on the machine.

Tag out refers to the attaching of a sign or label to the isolated machine, which warns others that not to operate it.

E. Electrical Hazards

1. Inspect all electrical equipment and circuits for proper classification (wet locations or areas otherwise classified as being hazardous).
2. Use ground fault circuit interrupters where required and ensure proper grounding for all
3. De-energize circuits and implement ***lockout/tag out*** programs where required.
4. Use only explosion proof equipment and spark proof tools where required.

V. PERMIT SYSTEMS

A. Permit Required Confined Space

Fits the definition of a confined space and has one or more of the following characteristics:

1. Contains or has a potential to contain a hazardous atmosphere
2. Contains a material that has a potential for engulfing the entrant
3. Contains inwardly converging walls or a floor that slopes downward and tapers to a smaller cross-section where an entrant could be trapped or asphyxiated
4. Contains any other recognized serious safety or health hazard (e.g. unsafe temperature, unsecured energy sources, corrosive chemicals, engulfment, entrapment)

B. Non-Permit Required Confined Space

Fits the definition of a confined space, but does not contain or have the potential to contain any atmospheric hazard capable of causing death or serious physical harm.

All identified Confined Spaces for the County of Orange & the Flood Control District, as well as other outside agencies when requested, are considered as **"Permit-Required Confined Space"**, and require a supervisor's authorization before entry and full compliance of the Permit-Required Confined Space Inspection Program, unless the space has been de-classified to a non-permit confined space.

C. Reclassification

If the permit poses no actual or potential atmospheric hazard and if all hazards within the space are eliminated without entry, the space may be reclassified as a **NPCS** for as long as the non-atmospheric hazards and hazards remain eliminated.

If hazards arise:

1. All employees must *immediately* leave the confined space.
2. The space shall be evaluated to determine how the hazardous atmosphere developed.
3. Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

D. Alternate Procedures

Alternate procedures can be used to enter the space when:

- No other hazards exist.
- Atmospheric hazards can be effectively removed and controlled by forced ventilation.
- All testing results and monitoring data are documented, retained and made available to each employee who enters the space.

Remember that under alternate procedures, permit space safety is maintained solely by continuous forced air ventilation. It is important to prevent the atmosphere inside the confine space from reaching hazardous concentrations to ensure that, in the event of ventilation failure (such as fan break down), the employees will still have enough time to recognize the hazards and leave the space.

E. Confined Space Entry Permit

The purpose of the entry permit is to ensure that necessary precautions are taken *before entry is made*. The following action items are included on the County of Orange Confined Space Entry Permit forms:

1. The location of the permit space to be entered
2. The purpose of the entry.
3. The date and the authorized duration of the entry.
4. The names of the *entrants, attendants, and entry supervisors.*

5. The hazards of the permit space.
6. The measures used to eliminate, isolate, or control permit space hazards before entry.
7. The acceptable entry conditions.
8. The results of the initial and periodic tests performed, along with the names of the testers and when these tests were performed.
9. The verified rescue and emergency services to be summoned.
10. The communication system.
11. The equipment to be used during entry.
12. Any additional information necessary to ensure employee safety.
13. Any additional permits issued to authorize special work in the space (Such as **Hot Work Permit** because the operations at hand could provide a source of of ignition).

F. Develop and Implement procedures to ensure:

A In- house and off-site rescue service availability
B. Emergency services for rescued employees.
C. Pre-entry preparations are completed, where applicable.

- **Purge**
- **Flush**
- **Wash**
- **Inert**
- **Drain**
- **Ventilate**
- **Isolate (Lock out & Tag out**)

D. Acceptable entry conditions and monitoring are attained and maintained *throughout* entry operation.
E. If a hazardous condition develops will evacuate, entry will be terminated, permit will be voided, and program will be re-evaluated.
F. At least one attendant is posted outside the space to ensure entrants are protected from internal and external hazards.
G. Coordination between host and contractor's employees when working simultaneously.
H. Employee training for safe entry and duty proficiency on hazard recognition and control & on-site rescue, etc.
I. Train employees on the proper procedures for testing and monitoring, ventilation, communication, lighting, rescue and emergency, and use of other equipment, including personal protective equipment necessary for safe entry into and rescue from permit spaces.
J. Provide and maintain all necessary tools and equipment at no cost to employees. Be sure to keep training records.
K. Entry permits address all hazards and controls necessary for safe entry.

L. Entry permits must be signed prior to issuance, canceled once entry concludes, and filed for ***one year***. These permits are used to review the confined space program.

M. Confined space entry/ rescue programs are reviewed annually, and if necessary, revised to correct any deficiencies in order to ensure that employees entering permit spaces are protected from permit space hazards.

The **Confined Space Entry Permit** shall be used when entering a Permit-Required confined space. Copies of the Entry Permits and forms are available through the Confined Space section of RDMD/Operations & Maintenance at Katella Yard 1750 South Douglass Road in Anaheim.

All permits are to be kept at the job site until the operation is completed.

All measurement data from the sampling activities are to be recorded on the permit**. All permits are issued and kept for 1 year thru the RDMD/Operations and Maintenance Confined Space Section Supervisor.** Such records shall be opened to periodic inspection by applicable employees, their representatives, county staff & Cal/OSHA Inspectors.

The annual review of canceled permits allows employers to assess and revise, if needed, their permit space program to ensure that confined space workers are protected from space hazards.

VI. PRE ENTRY

A. Pre Entry Procedures

The following four steps must be taken before entry is made into any known or suspected confined space area.

STEP 1 – Determine whether Entry Permit or Log is required

1. If special hazards are present, as discussed above, obtain supervisors written approval on the Confined Space Entry Permit form and comply with the safety protocols before entering the space.

STEP 2 - Organize the equipment and obtain the following items:

1. Entry Log or Permit.
2. Air monitoring equipment (check the battery and current calibration status).
3. Ventilation equipment and its power supply.
4. Personal Protective Equipment (**PPE**) such as:

    - Full Body Harness
    - 1 Hour Escape Pack
    - Boots
    - Flash Light
    - Gloves

5. Arrange for qualified attendant, rescuer & communication equipment.
6. Tripod, winch &/or fall block & full harness (for vertical entry, deeper than 5 feet in a permit space).
7. Only devices designed by the manufacturer and approved for moving humans should be used.
8. Barricades, if needed.

STEP 3 - Securing the Environment

1. **Steam Vaults**
   Before entry into a vault the valve connection or source must closed and blinded. Blow-down valves and other valves on lines through which harmful material might accidentally flow back to the vaults shall be closed, locked and tagged. The key must be kept by the employee entering the vault. This is not necessary if lines are blinded.

2. **Utility Corridors**
   Before entry, the pilot light, fuel & steam lines must be blinded, disconnected or have two closed block-valves with open bleeder etween them

3. **Spaces with potentially Harmful Electrical Equipment**
   This equipment must be disconnected with the disconnect switch locked and tagged. The key must be in the possession of the employee entering the space. (Seven Oaks Dam, Poche Beach & Facility Operations)

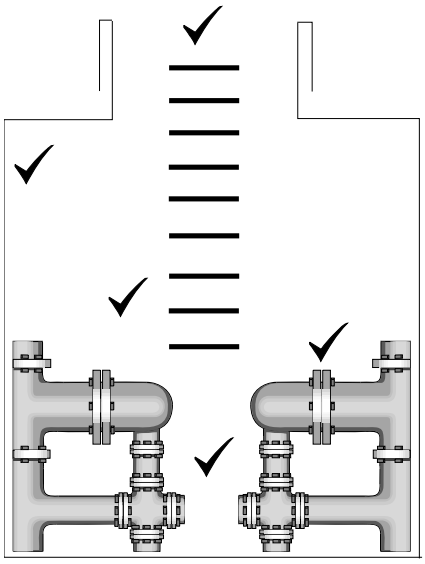
4. **Spaces pedestrians** could fall into must have appropriate barricades.

5. Spaces where employees could fall use a harness and winch setup/ anchor point to prevent falls.

STEP 4 - Initial Atmospheric Monitoring

1. Use approved atmosphere monitors that have been recently field calibrated with sensors in operation. Meters are available in the Confined Space Sections office.
2. Activate the meter and allow it to warm-up. Check its operation condition and charge status of battery.
3. Perform the initial monitoring evaluation to determine potential hazards in the confined space atmosphere. Follow the manufacturer's operational and sampling instructions exactly to obtain the best results.
4. Insert the probe into the opening of the manhole lid or other access point and allow the monitor to sample for the manufacturer's prescribed time period.

5. If the readings for available oxygen, hydrogen sulfide and flammable gases are within acceptable levels, continue to sample the atmosphere by lowering the probe through the lid opening until it reaches near the floor. Allow adequate time for the instrument to draw the sample up the extended hose and conduct the analysis. This sample will analyze for heavier-than-air gases, which would be found near the bottom of the space.



Using an extension cable, air samples should be done in* 4' increments *vertically and horizontally, including corners and low spots, testing for the presence of contaminated atmosphere.

*** All monitor readings must be recorded on the Entry Log/Permit form.**

If unacceptable readings and/or alarms are activated during any monitoring tests, it is an indication that the atmosphere is contaminated and unsafe for employee entry. Ventilate for at least five minutes. Conduct second round of air

monitoring. If the atmosphere does not clear, ***DO NOT ENTER THE SPACE!*** Contact your supervisor. The source of the contamination will be investigated and eliminated before any work is performed.

Locations identified as permit-required confined spaces shall be *clearly communicated, either by signage or other effective methods*, to employees who are likely to enter these spaces. These areas shall be secured to prevent unauthorized entry.

VII. ENTRY

A. Entry Procedures for Permit-Required Space

Once the initial tests are completed and determined to be within acceptable limits, work may proceed utilizing the following precautions:

- **Two employees (Buddy System) will be needed for a "Permit-Required" confined space operation.** One attendant and one rescuer will remain outside of the space to be available in case of an emergency. The attendant must be in direct communication with the other worker(s) in the confined space, as well as have the capability to reach emergency response personnel by dialing **911** or by having radio contact with someone who can make or place the emergency call. **(Control One)**

- **A portable blower is used** during confined space work to purge the area t hat has contaminated air. The blower intake must be located outside of the confined space and away from any operating internal combustion engine to ensure that fresh air is being supplied. The blower should be activated before employees enter the space for a minimum of five minutes or as determined from the purge chart. It must remain on the entire time work is being performed in the contaminated area.

- **Arrange for quick means of entry and exit** from the space. Use of tripod, winch, fall block and body harness is required for vertical entry in permit spaces of five feet or greater of depth.

- **Personnel using the atmospheric meter shall leave the instrument operating the entire time work is being performed, to provide constant atmospheric monitoring.** The entrant shall have the meter with them at all times during confined space entry and results must be recorded accurately on the entry permit. ***If at any time, atmospheric conditions change and monitoring devices indicate the presence of toxic or flammable gases, or a decreased level of oxygen, employees are to evacuate the space at once*.** Workers are to remain outside of

the area until the cause of the problem can be determined by supervisory personnel.

VIII. RESCUES

Policy and Procedures
Fatalities can occur when the rescuers: are overcome by emotions, take unnecessary chances, do not know the hazards involved, do not have a plan of action, and/or lack confined space rescue training.

A. Types of Rescues

1. **Self-Rescue -** The self-rescue plan provides entrants with the best chance of escaping a *permit-required* space when hazards are present. Whenever authorized entrants recognize their own symptoms of exposure to a dangerous atmosphere, or when a prohibited condition is detected, entrants are still able to escape from the space unaided and as quickly as possible. The advantages to this type of rescue are: rapid evacuation from the hazardous space, able to alert fellow workers, and not endangering anyone else.

2. **Non-Entry Rescue** – When self-rescue is not possible, non-entry rescue can be started right away and prevents additional personnel from being exposed to unidentified and/or uncontrolled confined space hazards. Usually, equipment and other rescue aids are employed to assist in removing endangered entrants. Ensure that entrant(s) of a "Permit Required" space can be retrieved immediately (i.e. s/he wears a harness attached to a retrieval line that can be winched out by the attendant operating the tripod/winch outside).

3. **Entry Rescue –** It is the most dangerous form of rescue and an entry rescue plan shall be developed prior to assuming this type of rescue responsibility. ***County of Orange personnel are currently trained and qualified as an emergency entry rescuer and have the equipment to provide emergency rescues in confined spaces.*** Emergency confined space entry rescue personnel shall have current certification and knowledge on: first aid/CPR, Self-Contained Breathing Apparatus/Supplied Air Respirator, use of rescue equipment, and necessary rescue training.

B. A thorough Rescue Plan shall include:

- A barricade area for crowd control
- Additional ventilation options
- Protective clothing and equipment
- Appropriate lighting equipment (explosion proof)
- Method of communication

- A standby rescue team
- Victim removal procedures and devices
- Available emergency vehicles
- Medically trained personnel (CPR & Basic First Aid)
- Employee Training

IX. TRAINING

A. County of Orange RDMD/Operations & Maintenance Program:

As directed by:

- Each employee working in or with confined space has a right to clearly understand the hazardous properties of the toxic and flammable contaminants which they may encounter in any confined space.
- They also are entitled to information on methods by which they can protect themselves while working in such areas.

B. Responsibility of the Departmental Supervisors

To ensure that appropriate training resources are made available to all employees before assigning confined space entry tasks:

- That each employee has available to them all necessary protective equipment needed to conduct the job safely.
- That each individual clearly understands how to use such equipment correctly. This includes basis understanding on the operation of appropriated confined space gas meters.

C. Responsibility of each Employee engaged in confined space activities

To follow all procedures and instructions outlined in this policy. The core training shall include, but not limited to:

- Characteristics of confined space and permit-required confined space.
- Specific duties of the entrant, attendant, supervisor, and non-entry rescuer; atmospheric monitoring and ventilation. Communication.
- Self-rescue non-entry rescue, and emergency operations and policy.
- Hazard communication.
- Hazard recognition and control.
- Injury and illness prevention program.
- Entry-permit system.
- Personal protective equipment.
- First aid, and CPR, symptoms and consequences of exposures.

Employees should receive training in confined space operations at least once per year. *Additionally,* **all new employees assigned to work in the Confined Space section should receive this information as part of their initial orientation.**

If employees are assigned to respond as a entry rescuer, training on: use and operation of retrieval systems, first aid/CPR, communication equipment and respirator fit test shall be provided by the department.

- **Documents of such training should be kept on file with the Confined Space sections supervisor.**

X. ENTRY TEAM

A. Responsibilities of the Entry Team

The entry team is the group of employees assigned to complete a task within a confined space. The entry team consists of an **entrant**, **attendant, rescuer and supervisor**.

1. Pre-entry work.
2. Entry & Egress.
3. Work to be accomplished on site.
4. Tools used.
5. Potential Hazards.
6. Personal Protective Equipment.
7. Recognition of symptoms following exposure and what to do when it occurs.
8. Communication.
9. Emergency procedures and equipment.

B. Role of an Employee

An individual who is likely to work in and around confined spaces.

1. Ensures that he/she attends a class on Permit-Entry Confined Space Class before performing confined space work.
2. Informs supervisor if he/she needs to enter a confined space to perform work.
3. Obtains necessary air monitoring instrument, safety equipment, entry log/permit, and additional resources before entering a confined space.
4. Follows safety procedures as covered in this booklet.
5. Ensures that all equipment is in proper condition after an entry is completed. If not notify the supervisor.
6. Turns in the confined space entry log or permit to the supervisor.

C. Role of an Entry Supervisor

A person involved in assigning employees to conduct work in confined spaces and has a good understanding of the hazards and liability of tasks completed in confined spaces.

1. Knows confined space hazards.

2. Verifies that safe conditions have been attained & entry conditions are maintained.
3. Ensures that atmospheric testing and proper confined space preparations have been done prior to entry.
4. Make sure that it is clear of all unauthorized personnel.
5. Verifies emergency plan & confirms rescue teams availability.
6. Ensures that employees assigned to confined space entry tasks receive necessary training on health and safety concerns and safe entry procedures outlined in this booklet and other operational procedures, before entering a confined space,
7. Ensures that employees are provided with air monitoring instrument and other equipment needed to work safety in a confined space.
8. Ensures that employees fill out the confined space entry log or permit and the supervisor signs the permit for authorization before a confined space entry.
9. Ensures that all confined space entry logs and permits are collected from the employees and retained in the department record for two years.
10. Communicates to contractors of jobs involving confined space work and discloses known hazards associated with the jobs.

D. Role of an Authorized Entrant

An entrant is an employee who has attended a confined space training class and is authorized by their supervisor to enter a confined space.

1. Knows confined space hazards, exposure routes, signs, symptoms, and adverse health effects that could result from exposure.
2. Uses proper personal protective equipment **(PPE)**.
3. Uses proper entry equipment.
4. Follows proper entry procedures.
5. Performs assigned job.
6. Is alert to any prohibited condition.
7. Communicates with attendant.
8. Evacuates immediately, if necessary.

E. Role of an Attendant

The person stationed outside the permit space who monitors the authorized entrants inside and performs all the attendants duties required in the permit space program.

1. Does not enter the confined spaces.
2. Is prepared to perform non-entry rescue or call for a rescue team.
3. Knows the hazards or potential hazards of the space.
4. Maintains accurate count of authorized entrant in the space
5. Stays alert to possible behavioral changes of entrants
6. Monitors activities inside and outside the space to ensure that it is safe for entrants to remain in the area.

7. Remains outside the confined space until relieved by another attendant and prevents entry of unauthorized personnel.
8. Communicates with entrants (**Visual, Voice or Signals**).
9. Contact emergency rescue services.
10. Orders evacuation if prohibited or hazardous conditions arise.

F. Role of Rescuer

An employee who has attended a confined space class and is fully trained and qualified to act as a rescuer.

1. Has knowledge of and experience working with hazards associated with rescue and confined space rescue operations.
2. Knows confined space hazards, exposure routes, signs & symptoms and adverse health conditions that could result from exposure.
3. Uses proper personal protective equipment **(PPE)**.
4. Number of victims and location of emergency.
5. Length of time victims have been exposed to hazard.
6. Suspected cause of accident.
7. All entry information on entry permit.

XI. IDENTIFIED CONFINED SPACES IN ORANGE COUNTY

A. The following are examples of Permit-entry confined spaces in the County of Orange & Flood Control District.

- Manhole Shafts & enclosed Storm Drains, Pipes & Boxes
- Underground Flood Facilities not equipped with forced air ventilation.
- Seven Oaks Dam, (Portions of), Gate Chamber, outlet works tunnel
- Bridge Corridors, Utility Vaults & Equipment Pits
- Chemical Tanks (Spray Rigs)
- Any confined spaces with machinery, or equipment, that could harm workers if it suddenly turned on: (Seven Oak Dam, Pump Stations & Poche Beach)
- Any facility that could suddenly become engulfed by water or other products

If you are asked to enter a space which you believe may be hazardous to your health, please discuss the location with your supervisor to determine whether it is classified as a confined space, or contact the Confined Space Team or the Department Safety Coordinator.

XII. CONTRACTOR PROCEDURES

- When an employer hires a contractor to work in a confined space, both the employer and contractor have certain responsibilities which help to ensure acceptable conditions while work is being carried out

in the confined space.

A. Employer Responsibilities

1. Inform the contractor that the work place has a permit space and that they must comply with a permit space program that meets the requirements of the standard.
2. Tell the contractor why the space is a permit space. This includes notifying the contractor of the hazards identified and the host employers experiences with the space.
3. Inform the contractor of any special precautions or procedures used to protect employees who work in or near the permit space where contractor personnel will be working.
4. Coordinate entry operations when employer and contractor personnel will be working in or near permit spaces.
5. At the end of the job, conduct a debriefing session with the contractor to discuss the permit space program followed and hazards confronted or created during the entry.

B. Contractor Responsibilities

1. Get from the county all available information about permit required confined space hazards and entry operations.
2. Coordinate entry operations with the county when both the county's and contractor's employees will be working in or near a permit required confined space.
3. Inform the county of the permit space program that will be followed.
4. Notify the county of any hazards confronted or created in permit spaces. This should be done during entry or in a debriefing session.

XIII. ATTACHMENTS

Attachment A – Confined Space Entry Permit
Attachment B – Confined Space Hot-Work Permit
Attachment C – Confined Space Field Inspection Log
Attachment D – Confined Space Decision Flow Chart
Attachment E – Ventilation Purge Chart

SAFETY MANUAL REVISION
OCTOBER 2004

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Bill Tidwell, Manager
RDMD/ P.W./ Ops