Massachusetts Firefighting Academy

Department of Fire Services

Confined Space Rescue Technician

Student Guide



01/01/2022



Objectives

Students will be able to define:

- What is a Confined Space?
- What is a Permitted Confined Space?
- Students will understand OSHA Regulations and NFPA Standards relating to Confined Space Rescue
- Students will recognize the hazards associated with Confined Space Rescue
- Students will be able to define and list the Priorities of Confined Space Rescue
- Students will be able to demonstrate the proper use of Confined Space PPE

- Students will be able to operate as a Confined Space Rescuer
- Students will be able to Preplan a Confined Space
- Students will be able to identify, control, and mitigate hazards

Regulations and Standards



OSHA 1910.146, Permit Required Confined Spaces

OSHA's standard for confined spaces (29 CFR 1910.146) contains the requirements for practices and procedures to protect employees in general industry from the hazards of entering permit spaces.

What is a Confined Space?

- Is large enough and so configured that an employee can bodily enter and perform assigned work
- Has limited or restricted means for entry and egress
- Is not designed for continuous employee occupancy

What is a Permitted Confined Space?

- Contains or has the potential to contain a hazardous atmosphere
- Contains a material that has the potential for engulfing an entrant

- 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

- Contains any other recognized serious safety or health hazard

OSHA 1910.146 outlines the following positions, roles, responsibilities regarding permitted confined spaces:

Entry Supervisor

- Person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required

- Know hazards that will be encountered

- Verifies by checking appropriate entries made on permit, all specified tests conducted, all specified equipment in place

- Determines, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with. The terms of the entry permit and that acceptable entry conditions are maintained

Attendant

- Individual stationed outside one or more permit spaces who monitors the authorized entrants and performs all attendant's duties assigned in the employer's permit space program

- Know hazards that might be encountered during entry

- Aware of behavioral effects of hazard exposure to authorized entrants

- Continuously maintains accountability
- Remains at space until relieved or entry terminated
- Performs non-entry rescues

Entrant

- An employee who is authorized by the employer to enter a space
- Familiar with hazards that could be encountered
- Proper use of all equipment
- Communicate with attendants
- Alert attendant of dangerous or prohibited conditions
- Exit permit space as quickly as possible when
  - Ordered to evacuate
  - Recognize warning signs or symptoms
  - Exposed to dangerous situations or prohibited conditions
  - Evacuation alarm activated

Permit

- A document signed by the entry supervisor and verifying that pre-entry preparations have been completed and that the space is safe to enter, must be posted at entrances or otherwise made available to entrants before they enter a permit space
- Must include the following:

- Name and signature of supervisor who authorizes entry
- Name of permit space to be entered, authorized entrants, eligible attendants, and individuals authorized to be entry supervisors
- Purpose of entry and known space hazards
- Test results
- Testers signatures or initials
- Measures to be taken to isolate permit spaces and to eliminate or control space hazards (lock-out/tag-out, purging, inerting, flushing, and ventilation)
- Names and numbers of Rescue and EMS
- Date and duration of entry
- Communication equipment and procedures
- Additional permits
- Special equipment and PPE
- Any other information needed to ensure safety

Stand-by Rescue Team

- The local Fire Department is usually listed as the stand-by rescue team; are you prepared to handle an incident?



NFPA 1006

NFPA 1006 outlines the minimum Job Performance Requirements (JPR's) of the individual.

7.1 Awareness Level. The job performance requirements defined in 7.1.1 through 7.1.6 shall be met prior to awareness- level qualification in confined space rescue.

7.1.1 Initiate isolation procedures for a specific confined space incident, given scene control barriers, personal protective equipment (PPE), requisite equipment, and available specialized resources, so that all hazards are identified; unauthorized entry to the confined space and adjacent areas are controlled; resource application fits the operational requirements; hazard isolation is considered; risks to rescuers, bystanders, and victims are minimized; and rescue time constraints are taken into account.

7.2 Operations Level. The job performance requirements defined in Section 5.2, Section 7.1, and 7.2.1 through 7.2.18 shall be met prior to operations-level qualification in confined space rescue.

7.2.1* Initiate a search inside a confined space in those areas immediately visible from the confined space entry portal, given hazard-specific PPE, equipment pertinent to search mission, a confined space, and victim investigative information, so that search parameters are established; the victim profile is established; the people in or around the search area are questioned and the information is updated and relayed to command; the personnel assignments match their expertise; all victims inside the space that are immediately visible from outside the portal are located and identified quickly; applicable technical rescue concerns are managed; risks to searchers are minimized; and all searchers are accounted for.

7.3 Technician Level. The job performance requirements defined in Section 7.2 and 7.3.1 through 7.3.6 shall be met prior to technician-level qualification in confined space rescue.

7.3.1 Initiate a search inside a confined space in those areas not immediately visible from the confined space entry portal, given hazard-specific PPE, confined space rescue entrant(s) to perform the search, equipment pertinent to search mission, a confined space,and victim investigative information, so that search parameters are established; the victim profile is established; search result information is acquired and relayed to command; the personnel assignments match their expertise; all victims inside the space are located and

identified quickly; applicable technical rescue concerns are managed; risks to searchers are minimized; and all searchers are accounted for.

NFPA 1670

NFPA 1670 outlines the minimum level requirements for team-based training and rescue operations. Fire Department Operations are laid out into 8 Priorities:

- Priority 1: Make the scene safe
- Priority 2: Victim contact by primary responder
- Priority 3: Size-up
- Priority 4: Preparation
- Priority 5: Access patient
- Priority 6: Stabilize and package patient
- Priority 7: Evacuate
- Priority 8: Response termination

In-depth look at Fire Department Operations

Priority 1: Make the scene safe

Approach the space/entrance

Hazard Mitigation:

Control or remove hazards

Lock-out/Tag-out:

De-energize and protect electricity, fluids, hydraulics, etc.

Metering

Most of our 4-Gas Meters check for: Oxygen; Carbon Monoxide; Hydrogen Sulfide; and Lower Explosive Limit.

Ranges of Oxygen

23.5% and above, oxygen enriched and extreme fire hazard

21% Normal concentration of atmosphere we live in

19.5% Minimum “safe level” set by NIOSH

15% Disorientation and impaired judgment and breathing

14% Faulty judgment and rapid fatigue

8% Mental failure, loss of consciousness

6% Difficulty breathing, rapid death

CO and H2S

Carbon Monoxide (CO) and Hydrogen Sulfide (H2S) are the most common toxins found in confined spaces. They are measured in parts per million (ppm); 10,000 ppm = 1%. Toxic levels are found at atmospheric concentration of any substance above the permissible exposure limit (PEL).

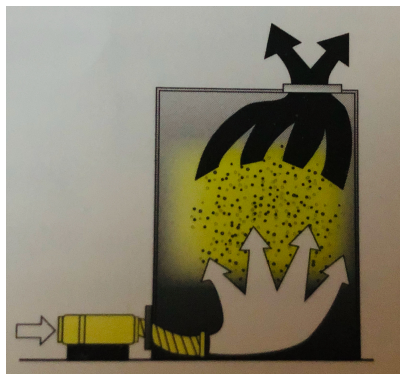
Lower Explosive Limit

The flammable range is the range between the LEL (Lower Explosive Limit) and UEL (Upper Explosive Limit). If a flammable gas reaches 10% of its Lower Explosive Limit it will set off the meter; if the LEL goes off it is time to drop everything and exit the space.

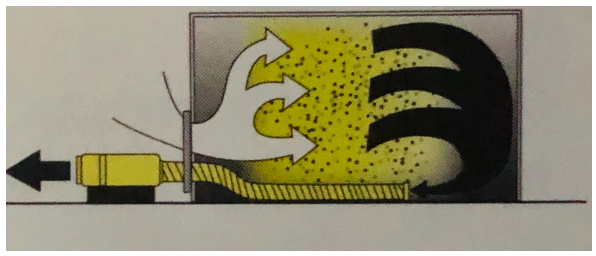
Ex. Methane: Explosive range = 5-15%; 10% of LEL = .5%

Ventilation

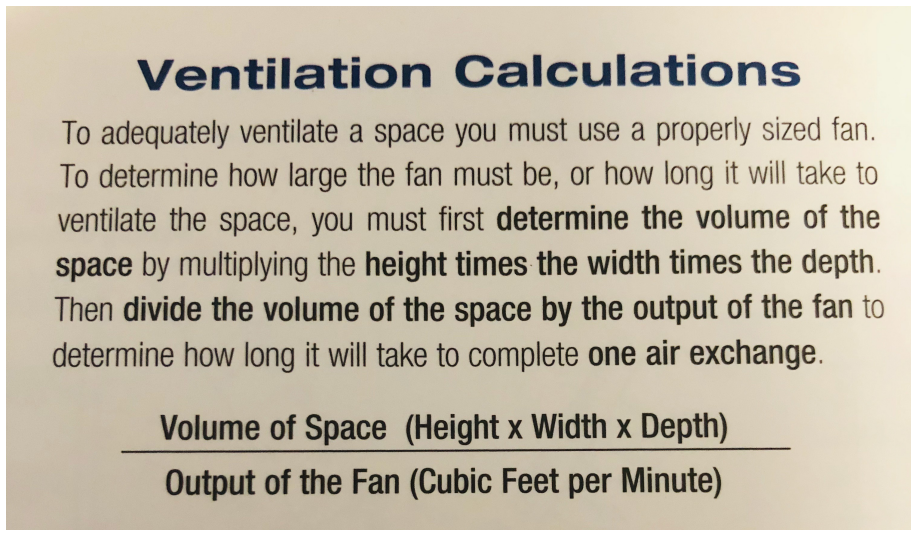
Positive Pressure



Negative Pressure



Purging



Lock out Tag out/Hazard Control

For each hazard identified, the employer must develop and implement appropriate control measure to protect authorized entrants. The specific control measures implemented will be dictated by the characteristics of each individual space. Examples include:

- Mechanical ventilation
- PPE
- Communication equipment
- Hot work policies
- Isolation of permit spaces

- Atmospheric testing
- Cleaning, purging, or inerting
- Lockout/tagout
- Blanking or blinding of pipes

Priority 2: Victim contact by primary responder

Establish victim location and conduct primary medical survey (if possible). Determine Mechanism of Injury and begin psychological first aid; talk to the victim if possible. Determine feasibility of non-entry rescue/retrieval.

Priority 3: Size-up

Information gathering

Resource identification

Mutual aid?

Primary responder report

Risk/Reward

Implement Incident Management System

Team member assignment

We arrive on scene to gather the scope and magnitude of the incident. We must begin gathering information on the location and number of victims. We must access the scene. We must begin to implement our Command System and assign people into roles/ responsibilities. We must figure out the separation, isolation, interviewing, security of witnesses. We must secure the hazards: utilities, mechanical, hazmat, etc. Are we calling for mutual aid, a tech team, or can we handle this locally? All while constantly performing our Risk Benefit Analysis.

Operations Level Confined Space

The internal configuration is clear, unobstructed and the victim can easily be seen from the entry point. The entry point is large enough for rescuers to easily pass through with PPE and is large enough for 2 or more rescuers and victim can freely move around. The entry point and/or configuration of the space will allow the use SCBA; SAR can be utilized if properly trained.

Technician Level Confined Space

The internal configuration of the space could create entanglement hazards and retrieval might not be effective as well as the victim cannot be seen from the entry point. The entry point and/or configuration of the space will not allow the use SCBA; SAR must be utilized.

Rescue vs. Recovery

Is based on our Risk vs. Benefit Analysis. Many things come into play here, a few to list include Duration of the operations. How long will an appropriate response take to arrive? How long will it take rescuers to reach, stabilize, and remove the victim, Mechanism of Injury. Is it a medical emergency in a confined space (ex. heart attack), is it a fall, is it due to IDLH conditions? Environmental conditions. Are we operating outside in New England in winter or inside a manufacturing plant in July? Victim access. Is the victim visible at the bottom of a manhole, trapped 200’ down in a maze of tunnels, or in an elevated water tank100’ in the air?

Priority 4: Preparation

Rescuer PPE

Determine and set-up rescue/retrieval equipment

SCBA; SAR; Tripods/AHD; Ventilation; 4-Gas meters; Extrication devices; Communications

Authorized Entrant Review

Safety check

Priority 5: Access patient

Designate team leader

One leader for each group of two or more

Utilize rescuer retrieval

Tag line or belay system

Designate backup team

2-in-2-out

Priority 6: Stabilize and package patient

Perform first-aid

Apply O2, C-Spine, control bleeding, etc.

Secure patient in extrication device

Patient Care

Always follow local protocol with EMS considerations. Conduct a thorough patient assessment to determine injuries, condition, and treatment. Provide Respiratory protection, C-Spine immobilization, bleeding control, PPE, etc. as the incident dictates. Ensure appropriate level of care is on-scene (ALS, BLS, Med-Flight, etc.) Be sure to use the appropriate means of extrication based upon patient assessment.

Rapid Removal: If the victim is found to be in cardiac arrest and the conditions inside the space dictate that the victim be removed as quickly as possible to prevent imminent death, what is our plan? Do we “cut corners”? What is the difference between normal operations and Rapid Removal? What steps would you take in handling the situation?

Priority 7: Evacuate

Move victim to safe area

Transfer victim to EMS

Remove rescuers from space

Emergency retrieval

If necessary

Priority 8: Response termination

Gather, and inventory equipment

Decontaminate (if necessary)

Get equipment in ready state

Field-evaluate personnel

CISD, medical evaluation, etc