HINDUSTAN ZINC
Zinc & Silver of India

Sustainability Framework

SAFETY STANDARD

Confined Space Entry Standard

Hindustan Zinc Limited

Document Control Details

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Abbreviations

- HZL – Hindustan Zinc Limited
- HSE – Health, Safety and Environment
- CSC – Corporate Safety Council
- SRPSC – Standards, Rules & Procedure Subcommittee
- PPE - Personal Protective Equipment
- OHS - Occupational Health& Safety
- CS – Confined Space
- GN – Guidance Note
- IDLH – Immediately Dangerous to Life or Health
- ELCB – Earth leakage Circuit Breakers
- RCCB – Residual Current Circuit Breakers
- SCBA – Self Contained Breathing Apparatus
- LFL – Lower Flammability Limit
- CPR – Cardiopulmonary Resuscitation

Table of Contents

1. Scope and Field of Application

1.1. Scope

This standard describes the principles used to protect employees from the hazards of confined- space entry. It provides helpful information to user as they implement procedures to control the hazards associated with confined-space entry in keeping with the Hindustan Zinc Limited (HZL) Commitment.

Units should be aware that local regulations might impose conditions not reflected in this standard, same must be followed.

Mandatory requirements in this standard are noted in italics.

1.2 Field of Application : This Standard is applicable to all locations/sites of HZL.**-**

2. References

Corporate Policy

HZL Health, Safety and Environment Guiding Principles and Policies

Corporate Standards

GN 20 Lockout/Tag out

HZL/SRPSC/02 Rev XX Scaffolding Standard GN 18 Machine guarding

GN 21 & HZL/SRPSC/01 Rev xx Working at Height

HZL PTW Standard

HZL PPE Standard

HZL Excavation Standard

ERCP (as per applicable on all the site requirements)

Factories act 1948

3. Management Responsibilities

Line management in businesses, regions, and functions has the responsibility to implement this standard.

4. Definitions

Attendant—a person outside the confined space who is assigned the role of monitoring and communicating with the authorized entrants, controlling access to the space, maintaining designated entry conditions as specified on the permit, and initiating the rescue plan.

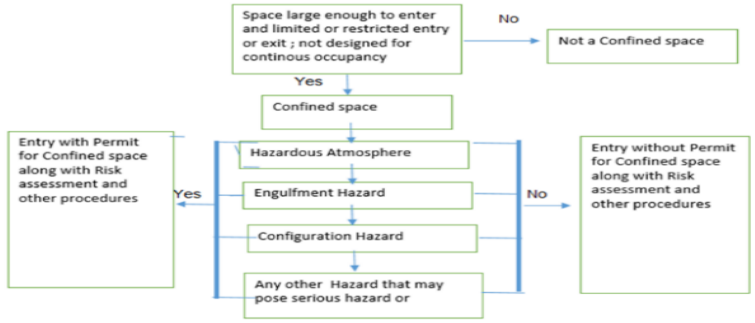
Certification—a verification process that documents that a person has the necessary training, skill, or experience and the ability to perform designated roles and tasks.

Confined space—the definition for this term includes two elements: the physical quality of the space and the actual or potential hazards that are present.

Areas or locations that meet all of the following three conditions are considered as the Confined Space and are covered by this standard:

- They are large enough to allow full-body entry.
- They have a restricted means of entry and exit.
- They are not designed for continuous human occupancy.
- If any of the four conditions below is present in an area or location, the full scope of this standard applies:
- The atmosphere is hazardous, either because of its normal contents or because of the nature of the work to be done.
- Contents that has the potential to engulf a person
- The walls are inwardly converging such that an entrant could be trapped or asphyxiated by the internal configuration.
- Any other known or readily identifiable safety or health hazard is present.

If none of these conditions is present, then the space may be considered a “special case” in keeping with Section 5.6.



Confined space identification

- **Confined-space entry program**—the overall program for controlling and protecting personnel from confined-space hazards and for regulating entry.
- **Entrant**—a person who is authorized to enter a confined space; who understands the potential hazards, the precautions to be taken, the scope and limits of the specified work, and the evacuation and communication procedures; and who knows the other people involved in the entry.
- **Entry supervisor—**a person who is authorized to verify that all conditions for entry into a confined space have been met, to define ongoing precautions to maintain safe working conditions during the entry, to authorize the entry to occur, and to cancel the permit allowing entry; also known as proprietor, work group supervisor, or authorizing person.
- **Excavation— i**n addition to the existing Confined Spaces at the Site, excavation activity is conducted at Sites from time to time especially for Project activity. Wherever, the depth of excavation is more than 4 ft (1.22 m) or more deep, are made from other-than-clean materials, or involve work in which the workers' heads are below surface level. It shall be treated as confined space because of restricted means of ingress & egress and that is also not designed for normal occupancy. Also, the surrounding soil, which may contain organic material, substances from old toxic dumps or fuel leaks from old gas stations, can produce toxic atmospheres. Some of these gases, like nitrogen dioxide, are heavier than air and will sink into the excavation where they may endanger workers. Hazardous vapours can also come from sewers and from equipment and vehicles common in excavations, such as excavators, generators and plate packers.
- **IDLH (immediately dangerous to life or health) —** any atmosphere that poses an immediate hazard to life; poses immediate, irreversible debilitating effects on health; or would impair a person's ability to escape from a dangerous atmosphere. This includes oxygen-deficient atmospheres.

5. Standards/Guidelines

. Principles of confined-space entry

The following principles provide the basis for managing confined spaces at Company locations.

Each Unit where people enter confined spaces shall develop and implement a written confined- space entry program that applies the principles of confined-space entry described in this standard, incorporates the mandatory requirements of this standard, and is compliant with local legislation.

All confined spaces must have a permit for entry unless exempted by the mandatory requirements in Section 5.6.

Confined spaces shall only be entered if no other approach to task completion is practical. Prior to entry, all possible controls shall be applied to prevent personal exposure to potential hazards.

The principles below shall be followed for all confined-space entries.

When confined-space entry is essential, a system that addresses the hazards and precautions associated with the entry must be developed. This system must include the following actions:

- Evaluating each space to identify potential hazards before and during entry
- Developing procedures that eliminate, control, or isolate the hazards faced prior to and during entry

- *Preparing confined spaces for entry*
- Monitoring the space's atmosphere before and during entry
- Maintaining safe entry conditions
- Anticipating potential hazards that the activity within the confined space could create
- Anticipating potential effects of activities outside the space on the conditions within the space. Controls shall address individual hazards and contaminants and be used in the following order of effectiveness:
  - Eliminate the hazards.

5.1. Reduce the risks to an acceptable level.

- Use personal protective equipment (PPE).

Before entry into a confined space starts, appropriate rescue plans and the essential resources must be available (see **Appendix A**).

Entry to a confined space must be authorized.

Personnel acting in roles associated with confined-space entry shall be trained to perform the activities defined in the unit's confined-space entry procedures (see **Appendix B**).

5.2. Applying the Principles

5.2.1. Developing and implementing a confined-space entry program

Each unit where people enter confined spaces shall develop and implement a written confined- space entry program that applies the principles of confined-space entry described in this standard, incorporates the mandatory requirements of this standard, and is compliant with local legislation.

The written program shall be available in the units to all people who may enter confined spaces and their authorized representatives. These units shall have written procedures that address eliminating, controlling, or isolating the hazards faced prior to and during entry.

The unit confined-space entry program shall be reviewed annually. This review should include cancelled permits, changes to confined spaces, new potential hazards, and incidents.

Appendix C lists items that might be included in the annual review of the confined-space entry program. The record of the review should be kept until the next annual review. Review outcomes and recommendations for any upgrades to the confined-space program should be communicated to all concerned.

5.2.2. Identifying confined spaces

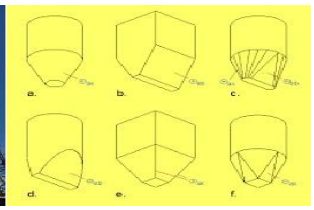
The first step towards development of confined space entry program is to Identify Confined spaces in all locations of work.

Each unit shall conduct a unit review to determine the location of confined spaces. It is good practice to develop a list and keep it current.

Examples:







To determine whether a space qualifies as a confined space, apply the definition as provided in Section 4 and ask questions as illustrated in example questionnaire table below

Following table is Example of a typical template that may be used for applying Confined space criteria for Identifying Confined space:

Description Of Space	**Confined Space Criteria**						Confined Space ?
	A	B	C	D			If the answers to A, B, C and at least one of D is Yes, Then the space is a confined Space
	Is the space enclosed or partially enclosed ?	Is it likely to be entered ?#	Does it have a restricted entry or exit?	Does the space contain, is intended to contain, or is it likely to contain:			
				harmful level of atmospheric contaminants ? *	An unsafe level of oxygen? $	Material that has potential to engulf the entrant?	
Leaching Reactor	Yes	Yes	Yes	Yes	No	Yes	Yes
Boiler Drum	Yes	Yes	Yes	No	Yes	Yes	Yes
Storage Tank under fabrication	Yes	Yes	Yes	No	No	No	~~Y~~es (The space has a hazard of developing harmful level of Atmospheric contents or unsafe level of Oxygen due to performance of hot work)

Notes: (i) These examples are provided to illustrate the

application of confinedspace definition. Each entry into confined space presents a unique set of circumstances and needs to be assessed separately while identifying Confined space.

(ii) An answer of NO to any of the four questions does not necessarily mean that the space is safe to enter. The hazards should be carefully assessed and all precautions should be taken for safe working.

(iii) Where there is uncertainty as to whether a criteria is met, then more information is required to address/remove the uncertainty, or the criteria should be deemed to be met and provisions of the confined space standard applied.~~.~~

An Entry to a confined space is considered to have occurred when a part of the body enters the space and there is a risk of overcome by the conditions within the space. This would generally occur if the person's head enters the confined space.

* A concentration of airborne contaminant that may cause impairment, loss of consciousness or asphyxiation: or inflammable material etc

$ Oxygen levels below 19.5% or above 23.5%

Once the confined spaces have been identified, the evaluation and documentation of potential hazards that may exist before and during entry must be identified.

These potential hazards shall be addressed in the permit controlling any entry into the specific confined space. It is good practice to develop this documentation before planning each entry. Another method of evaluating a confined space is to do a hazard assessment when completing the entry permit.

Confined spaces that are opened with keys or that have physical barriers or excavated areas shall have warning signs placed on them once the entrance to the confined space has been opened. Signs for these confined spaces shall be near potential points of access. Confined spaces that are accessible without tools or keys or that do not have effective physical barriers to entry shall have clearly visible signs attached to them. These signs alert personnel and assist in avoiding unauthorized entry to confined spaces.

All signs for confined spaces shall include words to alert people to danger being present and that entry is only allowed if authorized.

5.2.3. Preparing confined spaces for entry

Prior to entry, all possible controls shall be applied to prevent personal exposure to potential hazards and to maintain safe entry conditions. Potential hazards that could be created by the activity within the confined space shall be anticipated. The potential effects of activities outside the space on the conditions within the space shall also be anticipated.

Controls shall address individual hazards and contaminants and be used in the following order of effectiveness:

- Eliminate the hazards.
- Reduce the risks to an acceptable level.
- Use job specific and area specific PPEs.

5.2.3.1.Isolate

Confined spaces must be isolated from all external sources of energy and materials. An isolation checklist should exist and be included as an attachment to the permit for each confined space.

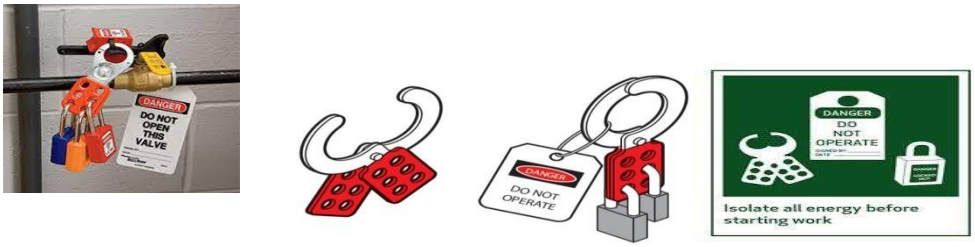


Fig: Example Lockout- Tagout with padlocks of two worker

Pipelines attached to the vessel must be disconnected or have a physical barrier present (e.g., blank or blind flange of suitable material and pressure ratings). When complete separation cannot be accomplished, the space should be isolated by following the guidance in HZL GN 20 Lockout/ Tagout Standard and HZL LOTO standard XXXX and applying a double block and bleed.

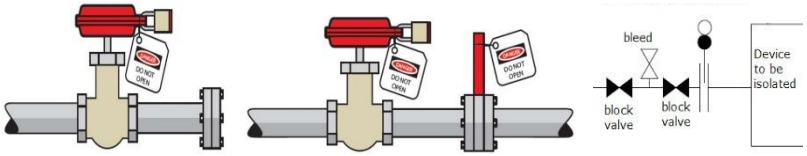


Figure: Example of isolation of vessel from pipeline

Power-driven equipment that affects the space (e.g., an agitator) must be mechanically and electrically disconnected from the power source and locked out, tagged out & try out (LOTOTO) if the equipment can feasibly pose a hazard during the entry, regardless of whether the work involves that particular piece of equipment.

For more information about lockout/tag out, see HZL GN 20 Lockout/ Tagout Standard and HZL LOTO standard HZL/SRPSC/03 Rev 2

Clean

Chemical and atmospheric hazards should be removed from the confined space. Cleaning a confined space includes, but is not limited to, the following actions:

- Emptying the space
- Clearing the space (e.g., flushing, washing, and rinsing)
- Neutralizing the hazards
- Ventilating the space (see Section 5.2.5.2)
- Purging

5.2.4. Monitoring the space's atmosphere before and during entry

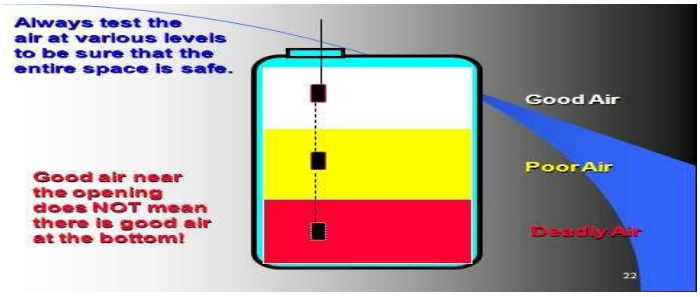
5.2.4.1. Instrument Calibration

Instrumentation used for measuring atmospheric concentrations in confined spaces must have valid calibrations. Once in 06 months and to be written on instrument

It is good practice to verify that the meters are operational (i.e., operate the instrument on a known source for field verification) before and after each use.

5.2.4.2. Representative Sampling

A sampling methodology should be developed that addresses the configuration of the confined space to be sampled and the potential contaminants that might be present. Samples should be collected from representative areas throughout a confined space that is being entered, paying particular attention to areas where people may be working. For all but the smallest spaces, representative sampling should involve collecting samples from at least the top, middle, and bottom of the space and shell be recorded in permit annexure (results of all three points). The normal order of testing should be oxygen content, flammability, and then toxicity.



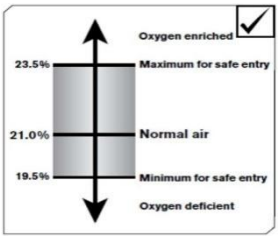
Sampling should only occur when any purging of gases is not in progress, because this reduces the risk to the person collecting the sample and maintains a realistic environment during sampling. All samples shall comply with the mandatory ranges required by this standard. Extended probes are sometimes the appropriate tools for gathering correct samples from within the space. Only trained personnel shall sample and test the atmosphere in a confined space.

In situations where adequate sampling cannot be completed from outside the defined space, initial sampling shall be conducted to determine atmospheric characteristic prior to developing a specific plan for sampling while entering. This entry shall be regarded as a confined-space entry which requires a valid entry permit and the specified controls and procedures. All risks of IDLH must be addressed completely.

The person who authorizes entry to the confined space must be satisfied that the sampling was representative.

5.2.4.3. Oxygen Levels

The quality of the air inside the confined space should be equal to that outside the space. The oxygen concentration in the air outside the confined space is assumed to be 20.9 percent at sea level, allowing for equipment error.



If the air quality inside the confined space is different from that outside the space, then the reason for the discrepancy must be determined and documented before entry into the space is authorized. When there is no discrepancy between the quality of the air inside and outside the confined space, the oxygen level must fall in the range of 19.5 to 23.5 percent at sea level, allowing for equipment error.

5.2.4.4. Flammability Levels

The accepted maximum for flammable vapors, including for welding and grinding activities, shall be no more than 5 percent of the lower flammability limit (LFL). The optimal result in this test should be zero. Consideration should be given to using instrumentation specific to the potentially flammable agent (e.g., hydrogen). Refer to Section 5.2.4.6 for further information on continuous monitoring in a confined space and maintaining the continuity of conditions.

5.2.4.5. Toxicity Levels

Toxicity readings from commercial meters only have meaning if the equipment has been calibrated for the contaminant that might be present. If not, then these meters can give a false sense of safety.

If a toxic substance is suspected of being present, then either a specific test (e.g., performed using a Draeger tube or other direct-reading instrument) for the substance must be made or respiratory protection must be worn. Substances may

be present up to the acceptable exposure limit established by Company or local legislation, whichever is lower.

5.2.4.6. Continuous monitoring and repeat testing

Continuous monitoring shall be used when the activity inside the confined space can alter atmospheric conditions or there is a known activity taking place outside the space during the entry that has direct potential to alter the atmospheric conditions inside the space. Alarms on monitors shall be shown to be working. Normal breathing by entrants should only noticeably affect the air quality monitoring in small confined spaces.

A continuous monitor shall be kept close to the work in progress and shall be positioned so that the attendant sees and/or hears any alarm. The monitor should be positioned so that an entrant

in the confined space sees and/or hears any alarm.

Continuous monitoring provides the most reliable means of detecting changing conditions and should be the preferred choice for entry. If periodic monitoring is used, the frequency that adequately protects the entrants from potential contaminants should be established. Periodic monitoring shall not exceed a two- hour period.

Spaces shall be evaluated prior to reentry after any break in continuous entry.

5.2.5 Identifying and controlling hazards

An effective, dependable communication route between the attendant and the entrant shall be maintained at all times when the entrant is in the confined space. Such routes might include pulling on a rope or the attendant being able to end an activity inside a space that is noisy or obscures vision.

5.2.5.1. Temperature

The temperature in the confined space should not create a hazard for personnel at any time during the entry

5.2.5.2. Atmosphere

Ventilation can be used to reduce or remove the atmospheric hazards created while personnel are in a confined space. Active ventilation is preferred over natural ventilation.

The air quality in a confined space shall never be improved by circulating fresh air to the atmosphere. Using forced ventilation to circulate the air within a confined space is good practice. Never use pure oxygen to improve atmosphere to safe level.

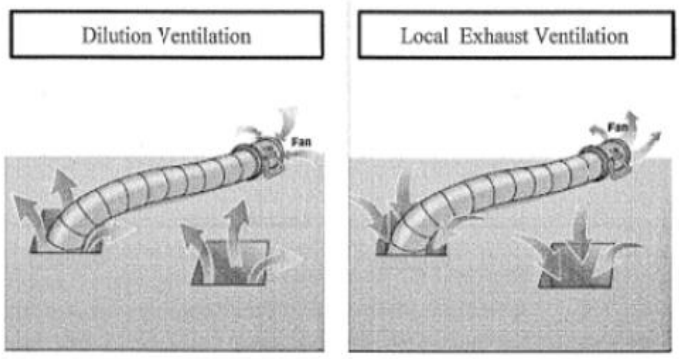
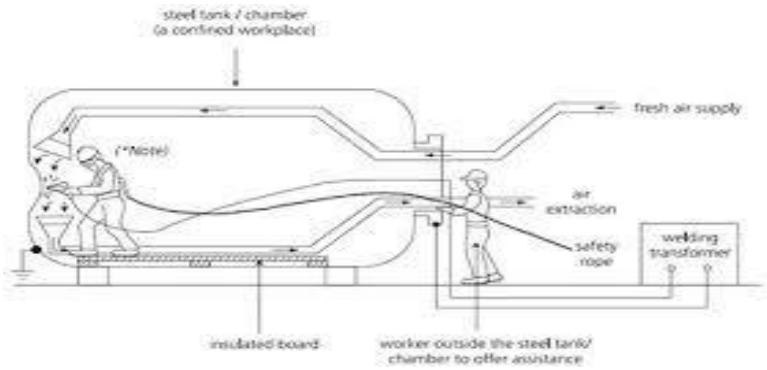


Figure: Examples of Mechanical Ventilation

Figure: Examples of Mechanical Ventilation

Air suction (i.e., negative exhaust), if used, should be pulling air away from the immediate vicinity of the work. This is effective means of drawing out the potential pollutant which may be generated from the work being carried out e.g. welding or cutting within the confined space.



Where forced ventilation is required for entry, it shall be directed as to ventilate the immediate areas where the entrants is or will be present during the entry for work. The forced air ventilation shall continue to run until all the entrants have exited the confined space in question. In case of failure of forced ventilation, the confined space shall be vacated immediately.

5.2.5.3. Process Equipment within the Space Dilution Ventilation Local Exhaust Ventilation

Although process equipment (e.g., an agitator) within a confined space is isolated, it still poses a hazard. Equipment could move or it could hinder personnel from moving or being rescued. *Equipment that could move must be secured.*

5.2.5.4. Visibility

Consideration shall be given to the level of visibility inside a confined space, both prior to entry and during the work, and appropriate equipment and precautions shall be incorporated in the task method.

If the entry and the work to be performed call for illumination, the type of lighting used should not create additional hazards. Some choices are low-voltage lights (including air-powered lights) and intrinsically safe lighting. Any lighting used should be positioned to enable the attendant(s) to see clearly the entrants working in the confined space. Earth Leakage Circuit Breakers (ELCB)/ Residual Current Circuit Breakers (RCCB) should be used as described in Section 5.2.5.8. If any inflammable gas, fume or dust is likely to be present in such confined space, no lamp or light other than that of flame-proof construction shall be permitted to be used therein

5.2.5.5. Fall Prevention

Cramped working conditions can make changing levels difficult and can increase the risk of falling.

Consideration shall be given to the potential for falling when preparing and entering confined spaces, as well as specific details of the rescue method and how an attendant shall monitor the condition of people inside the confined space.

Falls can occur from heights or at grade. Particular attention should be given to the working level (including potential residues, work materials, or equipment) in a confined space and how people are to reach it. It is recommended that a written fall-prevention plan be developed for each entry space. The plan should address the use of work platforms and elevations, scaffolding, personal fall-arrest systems, and means of rescue (see Section 5.2.8 for more information). Fall protection and procedure must conform to HZL/SRPSC/01 Working Height Standard.

5.2.5.6. Personal Protective equipment

Determination of acceptable PPE for a confined-space entry is based on an assessment of the hazards associated with the material, atmosphere, and conditions that are normally present in the space, plus the work being planned. Once the PPE and respiratory protection levels are specified, they shall not be relaxed unless the hazards are reassessed and found to call for a lower level of
reassessed. If ongoing forced ventilation shall be in place, the assessment must be conducted as if the ventilation were not present.

Respiratory protective equipment must be used when the composition of gas inside a space falls outside the ranges given in Sections 5.2.4.3 and 5.2.4.5. This equipment must also be used when there is a possibility (including the activities inside and outside the space) for altering the local gas composition to outside these limits. Units shall determine whether there are additional mandatory authorization requirements in such cases. Examples of circumstances addressed here include removing residues that may contain toxic materials or grinding away interior wall coverings, which may release hazardous gases. See HZL Standard
HZL/SRPSC/004 for Personal Protective Equipment for information about respiratory PPE.

5.2.5.7. Static

Equipment must be grounded where static is a potential hazard or could be created by the activities in or around the confined space (e.g., water washing).

5.2.5.8. Electrical Hazards

Confined-space entrants shall be protected from electrical hazards arising from tools and lighting.

Low-voltage tools and lighting or use of ELCB/RCCBs are the preferred routes for achieving this. protection.

5.2.6 Obtaining a permit for confined space entry

Entry to a confined space must be authorized. All confined spaces must have a permit for entry unless exempted by the mandatory requirements in Section 5.6.

A permit may be required for the varying periods of time depending upon the time required to complete the work being carried out in the specified confined space.

The permit should be revalidated/re-issued if the person with the direct control of the work in the confined space changes, a break in the continuity of work occurs (e.g. lunch break), change in the scope of work that introduces hazards that are not addressed by the current permit, or a new control measures are needed.

5.2.6.1. Conditions affecting the entry

Entry into a confined space and the conditions within it can be affected by work activities, environmental conditions, and process activities unrelated to the entry.
These potential effects must be taken into account during the preparation process so that suitable warnings and rescue plans can be developed. Changes to the space by planned work activity are addressed in the –Identifying and Controlling hazards, section 5.2.5.

5.2.6.2. Authorization and signatures

The entry supervisor (or Permit Initiator) shall be responsible for signing the permit and shall do

so only after verifying that the space is safe for entry. Only someone trained and assigned to this specific role shall serve as the entry supervisor. Signing the permit shall represent authorization to enter a confined space.

All authorized entrants and attendants shall sign the permit to indicate that they have read the permit and understand the work to be done, the hazards associated with the work, and the precautions that are essential to maintaining acceptable entry conditions. A copy of the permit should be displayed near the space. All authorized entrants and attendants should be satisfied with the atmospheric test results.

Note: The person who performed the atmospheric testing shall sign the permit and include the atmospheric test data. The time the testing was conducted shall be included on the permit.

The entry supervisor should note on the permit the time the entry is completed. Additional details on responsibilities are outlined in Section 5.3.

5.2.6.3. Duration

Each entry permit shall identify the length of time for which it is valid. The permit shall not last longer than the duration of the job (i.e., maximum duration of the entry permit is one shift).). It shall be reauthorized if the work continues in subsequent shifts as per HZL PTW standard-HZL/SRPSC/0 .

The brief time (i.e., up to the maximum duration of one shift) when entry permits are valid results in repeated, rigorous checks and maintains the integrity of the precautions.

Full checks shall be conducted for each new or reauthorized permit. Units shall define how responsibility shall be transferred if the entry supervisor leaves the unit.

Written permission from competent authority (Unit Head) shall be mandatory for CS entry during odd hours from 18:00 to 08:00 hrs.

5.2.6.4. Permit Content

The basic elements of an entry permit shall include:

- A description of the space, location of work, ID number of the CS and the task(s).
- Date and authorized duration of permit
- A list of the hazards likely to be present initially and during the activity.
- A list of the controls essential for preparing the space.
- A list of the controls essential while the entry is in progress (e.g., isolations, measures for hazard control, PPE, warning notices/barricades, rescue plan, and communication procedures).
- The atmospheric test data and the time the testing was performed.
- The name and signature of the entry supervisor.
- The names and signatures of all authorized entrants, attendants, and the individual who performed the testing.
- A sign-off box to indicate the task's completion and the time the entry was complete.

5.2.6.5. Scope Change:

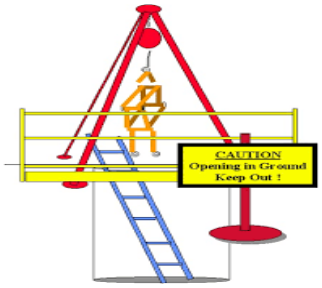
An entry permit shall be cancelled if the task's scope changes. A new permit that includes an assessment of the new task shall be issued.

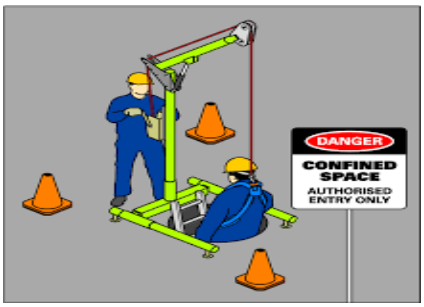
5.2.7 Entering and maintaining the continuity of conditions in the confined space

Before entry into a confined space starts, appropriate rescue plans and the essential resources must be available.

5.2.7.1 Warning against inadvertent entry:

Once a confined space has been opened, a sign and physical barrier to warn against inadvertent entry shall be installed at each point of possible entry. This barrier should be removed while the authorized entry is in progress.





5.2.8 Planning & Preparing for rescue

5.2.8.1 Rescue service rehearsals

To maintain proficiency, each member of the rescue team shall participate in a confined-space rescue annually. This may be a real rescue or a training exercise. Simulated rescues should include removing dummies, mannequins, or people from actual confined spaces or representative ones (i.e., those having similar opening sizes, configurations, and accessibility to the real confined spaces that may be encountered).

Figure: Rescue rehearsal using mannequint

5.2.8.2 Written Rescue Plan

A written procedure for summoning the rescue team and for rescuing authorized entrants from the space must be developed, reviewed with personnel involved with the job, and implemented.

Appendix A provides additional details of a written rescue plan.

While this standard allows the unit to select and use off-site rescue personnel, it is preferred and recommended that on-site rescue teams be developed & used. This is mainly because of the generally shorter response time for on-site teams.

Non-entry rescue is preferred unless the retrieval equipment increases the overall risk to the authorized entrants and/or the rescue team.

5.2.8.3 Summoning the rescue team

A means for the attendant to summon the rescue team shall be established prior to the entry.

5.2.8.4 Equipment

Each authorized entrant shall wear a safety harness and lifeline to facilitate rescue. The only exception is in extreme cases where the equipment may hamper rescue efforts or creates a greater hazard.

The written rescue plan shall identify the essential rescue equipment. The rescue team must have appropriate equipment to perform rescues involving entry. Rescue equipment shall be periodically inspected.

Non-entry rescue equipment should be properly installed and be operational prior to each entry.

Appropriate rescue equipment where the rescue method is to pull the person vertically upward should include a winch connected to the entrant's full body harness, unless such an arrangement increases the overall risk.

Selected rescue equipment should be kept in close proximity to the confined space so that it can be used immediately in case of emergency.

5.2.8.4.Off-site Rescue Services

Personnel other than Company employees who are expected to perform on-site rescues shall be qualified to fulfill this role - Units should consider holding drills using outside rescue personnel to verify the adequacy of their rescue capabilities.

5.3. Responsibilities

5.3.1. Entry Supervisor

The entry supervisor shall be responsible for recognizing and evaluating the hazards throughout the entry, specifying the essential precautions, and authorizing the entry. The entry supervisor's responsibilities include the following:

- Knowing the potential hazards that may be faced during the entry, including mode of exposure, signs & symptoms and consequence of the exposure
- Evaluating changes to entry conditions as a result of the work being performed within the space
- Knowing how to control and manage hazards
- Verifying that the space is safe to enter, including checking that representative atmospheric sampling results are compatible with acceptable entry conditions

- Authorizing space entry
- Terminating entry when entry operations are completed or in case new conditions a rises ~~e xists~~/ scope changes
- Transferring duties formally
- Verifying emergency plans

5.3.2. Entrant

The entrant shall be responsible for entering the space and completing the authorized task. The entrant's responsibilities include the following:

- Knowing the potential hazards that may be faced during the entry, including mode of exposure, signs & symptoms and consequence of the exposure
- Knowing how the hazards are controlled
- Evaluating changes to entry conditions as a result of the work being performed within the space and alert the attendant whenever the entrant recognizes any warning sign or symptom of exposure to dangerous situation, or detects a prohibited condition
- Maintaining communications with Attendant and informing him of space condition on regular basis
- Knowing how to use entry equipment and PPE
- Evacuating the space as quickly as possible whenever the entrant recognizes any
  - warning sign or symptom of exposure to dangerous situation, or detects a prohibited
  - condition, when asked by attendant or CSES to evacuate, in case of emergency
  - situation
- Knowing the terms and conditions of safe entry
- Obeying the Attendant and the rescue superintendent.

5.3.3. Attendant

An attendant shall be responsible for remaining outside the space, monitoring conditions affecting it, communicating with those inside the space, and controlling access to the space. The attendant's responsibilities include the following:

- Knowing the potential hazards that may be faced during the entry, including mode of exposure, signs & symptoms and consequences of the exposure.
- Being aware of the effects of the hazards on the authorized entrants
- Knowing how many and which personnel are always in the given confined space (through maintaining the accurate record of entrant in the permit)
- Communicate frequently with the authorized entrants as necessary to monitor the entrant status and alert entrants (& CSES) of the need to evacuate the confined space.
- Monitor the activities in and around the confined space to determine if it is safe of the entrant to remain in the space or ask them to evacuate if he detects a prohibited condition, signs or symptoms of exposure to any entrant, any activity outside space that can affect entrant e.g. smoke, fire etc.
- Summoning rescue services in case of emergency, which calls for the attendant to have appropriate language skills to communicate with the rescue service personnel

- Remaining outside the space unless relieved by another authorized attendant
- Preventing unauthorized entry
- Initiating evacuation
- Performing rescues that do not involve entry
- Knowing where the closest telephone, safety shower, exits, alarm boxes, and other emergency equipment are.
- Perform no duties that might interfere with the attendant's primary duties to monitor and protect authorized entrants as above

5.3.4. **Atmospheric gas testers:** Persons involved in evaluating the air quality within a confined space should be certified in the following topics:

- Identification of potential hazards that might be associated with the space (along with their characteristics and warning properties)
- The hazards, precautions, and initial checks associated with collecting samples, including appropriate means of sampling from confined spaces (e.g., access and purging with inert gases) and any permissions to begin sampling.
- Knowing how to operate the measuring equipment and its imitations.
- Knowing how to operate the selected equipment
- Determination of the essential sampling points of the spaces.
- Knowing how to sample appropriately and in the correct sequence for current conditions (e.g., oxygen, flammability, toxicity, or biological hazard in that order)
- Verification that the equipment is operating properly and how to collect a sufficient volume to sample for potential contaminants
- Recognition of indicators of other potential hazard properties or improper calibration
- Knowing when to initiate changes in sampling to expand the space hazard classification (i.e., actions when an unusual result is encountered)
- Validation of sampling findings against the outlined entry parameters Posting the sampling findings on the permit

5.4. Training and Certification

Personnel acting in roles associated with confined-space entry shall be trained to perform the activities defined in the unit's confined-space entry procedures (see **Appendix B**). This training shall be provided before personnel perform any duties related to these roles. Training must be certified

Training for personnel involved in confined-space entry shall be provided by knowledgeable and experienced instructors and shall cover the content outlined in this standard. Training shall be documented.

5.4.1. General Awareness Training

All personnel who may encounter a potential confined space shall be given information explaining what constitutes a confined space and that Confined Space requires a permit before entry may occur.

5.4.2. Task-specific Training

Training and certification shall be provided to personnel who are involved with confined- space entry (i.e., the entry supervisor, authorized entrants, attendants, authorized gas tester and rescue team personnel).

AGT training shall be conducted once in two years by competent, authorized & certified agency.

Training should be provided in the following topics:

- General terms
- Written entry program
- Characteristics of confined spaces
- Potential hazards of confined spaces
- Procedures to authorize confined-space entry
- Rescue procedures

See **Appendix B** for descriptions of the specific training for each involved person, including the responsibilities outlined in Section 5.3.

5.4.3. Refresher Training

General awareness and task-specific training shall be provided prior to entry for people involved whenever the following situations arise:

- Changes to the inherent confined-space hazards
- Changes to the written program
- Deviations from the permit or entry procedures
- Inadequacies in an employee's knowledge or use of the procedures

Simulated rescue drills shall be conducted annually for all personnel who assist in rescue operations.

Refresher training should be provided at an interval of no more than two years from the previous training.

5.4.4. Training Records

Training records shall be retained until retraining has occurred or as indicated under local requirements.

5.5. Contractor Qualifications

Contractor employees shall be trained to perform the duties associated with their assigned role during confined-space entry. Units must verify that contractor employees who are working in confined spaces demonstrate appropriate knowledge of entry, rescue, and duty-specific tasks. The contractor should provide the training and determination of employee knowledge. The unit training program shall be at least as inclusive as what is outlined in this standard. Unit-specific confined space entry mandatory requirements and procedures shall be coordinated with contractors before any entries commence.

5.6. Special Cases

While vessels are readily understood to be confined spaces, there are other, less-obvious spaces where similar potential hazards can be encountered; hence, the precautions specified in this standard should apply. Conversely, there are circumstances where hazards within the space are less severe; once hazards and precautions are fully defined and in place, then the full scope of this standard may not apply. Both types of

situations are addressed in this section.

All confined spaces must have a permit for entry unless exempted by the mandatory requirements in this section.

5.6.1. Non-permit Confined Spaces

In some cases, the hazards associated with working in a confined space are fully defined and have already been protected against. When this is the case, and as long as local regulations allow it, then work with a control system other than a full-entry permit may be allowed.

A work control system shall be in place that documents the basis and details of the space's reclassification as a non-permit confined space and the conditions to be met for it to remain in force.

Conditions in confined spaces that do not call for a permit must not include actual or potential hazards posed by any of the four conditions mentioned in the confined-space definition. These conditions are:

- An atmosphere that is hazardous, either because of its normal contents or because of the nature of the work to be done.
- Actual or potential contents that could engulf a person.
- A space with inwardly converging walls.
- Any other known or readily identifiable safety or health hazard.

5.6.2. Spaces not clearly defined as "confined"

There are areas or locations that do not meet the confined-space criteria but may pose similar hazards to a confined space should an entry occur (e.g., putting one's head inside a 12-in. [30-cm] diameter pipe or duct or into a nitrogen-purged pot). *In these cases, a work hazard assessment shall be performed and appropriate controls shall be used to address these hazards.* Units may adopt the confined-space permit system to control such activities; in some regions, local legislation may specify this.

5.6.3. Inert Gas Purging of Spaces

Inert gas purging of confined spaces can create atmospheric hazards not only close to openings into the space but also outside the defined confined space. Precautions specified for entry preparation and during the entry when such purging is in progress should include definition of the hazardous zones around openings, provision of barricades to prevent inadvertent access to these zones, and placement of signs to warn people. Atmospheric testing should be used to verify that defined hazardous zones are correctly sized.

5.6.4. Dykes

In many cases, dikes are not obvious confined spaces; however, they can be regarded as equivalent to open-topped tanks.

Which dikes are confined spaces and which are not is a complex issue involving judgment. The definition of a confined space (see Section 4) applies but with particular emphasis on the elements of restricted means of entry and exit and the presence of additional hazards. A dike that has vertical walls

4 ft (1.2 m) high or higher and does not have fixed steps from within the dike to the top is deemed as restricting entry or exit.

When additional hazards may be present, they override height considerations or the presence of fixed steps. The determining aspect is the feasible exposure to physical or chemical hazards within the diked area. An example of a physical hazard is when the pipe layout inside the dike hinders exiting the dike. An example of a chemical hazard is a heavier-than-air gas stored in the tank, used in the area, or piped through the diked area. In this case, the extent of the hazard might depend on the task to be performed. The normal approach with chemical hazards is to isolate possible sources and then prove that the area is a non-permit confined space.

5.6.5. Excavations and trenches

A trench, permanent or temporary, and excavations are similar to dikes in that the approach adopted involves judgment. The physical hazard involves the ease of exiting the area and is readily assessed. For chemical hazards, the assessment addresses whether or not people may be exposed to chemicals, usually gases. A key aspect is whether the task involves people working with their heads below the trench or excavation lips. Hence, digging a trench that is 3 ft (1 m) deep is unlikely to create a confined space, but lying flat inside it to perform a task would. As above, the normal approach with chemical hazards (where possible) is to isolate possible sources and then prove that the area is a non-permit confined space.

The temporary nature of trenches and excavations that might be considered confined spaces makes it impractical to include them in any Unit's list of confined spaces. However, appropriate warnings should be on display at the location in keeping with the principles set out in this standard.

6. Management Systems

6.1. Support Resources

HZL Unit and business will ensure resources are available to assist with implementation of this standard.

6.2. Management Records

Records shall be retained in compliance with the Corporate Records and Information Management Program.

6.3. Audit Requirements

Each Unit or region should audit compliance with this standard as part of its HZL audit program.

6.4. Standard Renewal Process

This standard shall be reviewed and revised as necessary and, at a minimum, not later than two years from the date of the last revision.

6.5. Deviation Process

Deviations from this standard must be authorized by the Unit head for the relevant unit after consultation with the Corporate Safety Council. Deviations must be documented, and documentation must include the relevant facts supporting the deviation decision. Deviation authorization must be renewed periodically and no less frequently than every one year.

6.6. Training and Communications Requirements

Each business and unit should provide training as appropriate. See Section 5.4 for specific provisions.

6.7. Contact

The contact for this document is the Chairman, Corporate Standard, Rules and Procedures Sub Committee

Appendix A — Developing a rescue plan

A.1 Introduction

The intent of this standard is to allow confined-space entry and operations without depending on rescue services. However, experience indicates that circumstances can arise when rescues may be necessary.

It is therefore important to have a rescue plan for each entry, including identification of the rescue teams.

For all rescue teams or services, the evaluation should consist of two components:

- An initial evaluation to decide whether a potential rescue service or team is adequately trained and equipped to perform appropriate confined-space rescues at the unit and whether such rescuers can respond in a timely manner
- A performance evaluation measuring the performance of the team or service during an actual or practice rescue

A.2 Rescue plan

Written rescue plans are specific to the confined spaces and the activities they address. As such, before each entry authorization, each rescue plan should be checked to see that it is tailored to the specific activity.

The written plan should address the possibility of implementing a non-entry rescue after sounding the alarm. A non-entry rescue is preferable to entry rescue whenever this can be accomplished. Protecting rescue personnel is as important as extracting entrants, and in many cases, non-entry rescue is quicker.

A number of key elements should be present in all plans:

- The precise identification of the space
- The specified and detailed methods for raising the alarm, including what method (e.g., air horn) are to be used by the attendant(s) or which is the nearest fire-alarm activation point
- The equipment specified for a rescue and its location nearby, if it is not located at the point of entry or rescue
- Who should have a copy of the rescue plan (It is good practice to give a copy of the rescue plan to the rescue teams before entry starts.)
- The rescue method, including any specifics, any elements to avoid, and any particular hazards the rescue team is likely to face

A.3 Initial evaluation of rescue service

The capabilities of a rescue service vary with the type of confined spaces from which rescue may occur and the hazards likely to be encountered in those spaces.

Answering the following questions is helpful in determining whether the rescue service is capable of performing rescues in the confined spaces.

- What are the limits with regard to response time? For entry where an atmosphere that is immediately dangerous to life or health (IDLH) could occur, rescue should be swift (i.e., team standing by at the confined space). In other cases, swift rescue is desirable but not essential. Can the rescue team appropriately respond?
- What is the availability of the rescue service and of key personnel, and does it match the times when confined-space entries might be in progress? If the rescue service becomes unavailable while an entry is underway, is there a robust communications method available that the entry can be aborted immediately?
- For off-site services, has the service agreed to perform rescues at the workplace?
- Are communications adequate?
- For rescues into spaces that may pose significant atmospheric hazards and from which rescue entry and patient packaging and retrieval cannot be safely accomplished in a relatively short time (i.e., 15 to 20 minutes), are airline respirators (with escape bottles) available for the rescuers and for supplying rescue air to the patient? If self-contained breathing apparatus (SCBA) is to be used, does the rescue service have appropriate equipment and training?
- If the space has a vertical entry over 4 ft (1.2 m) deep, can the rescue service properly perform entry rescues? Does the service have the technical knowledge and equipment to perform rope work or elevated rescue?
- Does the rescue service have skills in medical evaluation, patient packaging, and emergency response?
- Is the appropriate equipment to perform rescues available?

A.4 Performance evaluation

The rescue service or another qualified party should critique the practice rescue, which is conducted once every 12 months, to identify and correct deficiencies in procedures, equipment, training, or resources. The critique and the corrections made to respond to the identified deficiencies should be given to the employer to enable the employer to determine whether the rescue service can be upgraded quickly to meet the employer's rescue parameters or whether another service should be selected.

The following questions can guide evaluations of the rescue service's performance.

- Have all members of the service been trained as confined-space entrants and attendants?
- Have all team members been given the PPE, ~~trained in its use,~~ and trained in its use in a rescue?
- Are team members trained in the first aid and medical skills to treat victims overcome or injured by the types of hazards that may be encountered in the confined spaces at the facility?
- Do all team members perform their functions safely and efficiently? Do rescue service personnel focus on their own safety before considering the safety of the victim?
- Can the rescue service properly test the atmosphere to determine if it is IDLH?
- Can the rescue personnel identify information pertinent to the rescue from entry permits, hot-work permits, and material safety data sheets?
- Has the rescue service been informed of any hazards to personnel that may arise from outside the space
- Can the rescue service properly package and retrieve victims from a confined space that has a limited size opening (less than 24 in. [60.9 cm] in diameter), limited internal space, or internal obstacles or

hazards?

- Can the rescue service safely perform an elevated (i.e., high-angle) rescue?
- Does the rescue service have a plan for each kind of confined-space rescue operations at the unit? Is the plan adequate for all types of rescue operations at the unit? Teams should practice in representative spaces or “worst-case” spaces. The following elements should be incorporated in rehearsal spaces:
  - **Internal configuration**

    Obstructed— The space contains some type of obstruction around which a rescuer would maneuver. Examples would be a baffle or mixing blade or large equipment, such as a ladder or scaffold.
  - **Elevation**

    Elevated— A confined space where the entrance portal or opening is above grade by 4 ft (1.22 m) or more. This type of space usually involves knowledge of high-angle rescue procedures because of the difficulty in packaging and transporting a patient to the ground from the portal.
  - **Portal size**

    Restricted— A portal of 24 in. (61 cm) or less in the least dimension. Portals of this size are too small to allow a rescuer to simply enter the space while using SCBA. The portal size is also too small to allow normal spinal immobilization of an injured employee.
  - **Space access**

    Horizontal— The portal is located on the side of the confined space. Use of retrieval lines could be difficult.

    Vertical— The portal is located on the top or bottom of the confined space, so that rescuers could climb down or up, respectively, to enter the space. Vertical portals may involve knowledge of rope techniques or special patient packaging to safely retrieve a downed entrant.

Appendix B—Training for personnel participating in confined-space entry

B.1 Entry supervisor

The entry supervisor should be trained and certified in the following topics:

- Responsibilities
- Application of entry principles
- Preparation for entry
- The hazards (e.g., chemical, mechanical, thermal, atmospheric, fall, and any other special hazard) that may be faced during entry , mode, signs and symptoms of exposure, and consequences of the exposure
- Conditions that prohibit entry
- Monitoring equipment use (e.g., types available, limitations, and calibration)
- Confined-space entry equipment uses and limitations
- PPE uses and limitations
- Entry authorization
- Procedures for entry and permit termination
- Methods of removing unauthorized entrants
- Methods of transferring entry operation responsibility
- Methods of maintaining entry operations consistent with entry permit conditions
- Methods of verifying the availability of rescue services
- Rescue procedures

B.2 Authorized entrants

Authorized entrants should be trained and certified in the following topics:

- Responsibilities
- PPE uses and limitations
- Entry equipment use (e.g., testing, monitoring, ventilation, communication, lighting, fall protection, barriers, and access and rescue equipment)
- Communication methods that allow attendants to monitor the status of the authorized entrants and alert them in the event of an evacuation
- Methods to alert attendants when warning signs or symptoms of exposure are
- Hazard exposure modes, signs or symptoms, and consequences
- Conditions that prohibit entry
- recognized or when a prohibited condition is detected

When to exit the confined space (i.e., when the attendants order evacuation, The hazards (e.g., chemical, mechanical, thermal, atmospheric, fall, and any other special hazard) that may be faced during entry (mode, signs and symptoms of exposure, and consequences of the exposure)

- Entry preparation
- when exposure signs or symptoms are recognized, when a prohibited condition is detected, or when an evacuation alarm is activated)
  - Procedures for isolating hazards and verifying the Isolation

B.3 Attendants

Attendants should be trained and certified in the following topics:

- Responsibilities
- The hazards (e.g., chemical, mechanical, thermal, atmospheric, fall, and any other special hazard) that may be faced during entry , mode, signs and symptoms of exposure, and consequences of the exposure
- Hazard exposure effects on behavior of entrants
- Conditions that prohibit entry
- Methods of continuously maintaining an accurate account of authorized entrants
- Methods of identifying the authorized entrants
- Methods of monitoring activities inside and outside the space to preserve the safety of the authorized entrants
- Communication methods with which to monitor the status of the authorized entrants and alert them in the event of an evacuation
- Procedures for evacuating the authorized entrants and when these procedures should be initiated
- Methods of summoning rescue and emergency services to help the authorized entrants evacuate
- Responsibilities during rescue operations
- Methods of preventing unauthorized entry, informing unauthorized entrants, and informing the authorized entrants that an unauthorized person has entered the space
- When and how duties should be transferred
- What duties should and should not be performed

B.4 Atmospheric gas testers

Persons involved in evaluating the air quality within a confined space should be certified in the following topics:

- Identification of potential hazards that might be associated with the space (along with their characteristics and warning properties)
- The hazards, precautions, and initial checks associated with collecting samples, including appropriate means of sampling from confined spaces (e.g., access and purging with inert gases)

and any permissions to begin sampling.

- How to operate the measuring equipment and what its limitations are
- How to operate the selected equipment
- Determination of the essential sampling points of the space
- How to sample appropriately and in the correct sequence for current conditions (e.g., oxygen, flammability, toxicity, or biological hazard in that order)
- Verification that the equipment is operating properly and how to collect a sufficient volume to sample for potential contaminants
- Recognition of indicators of other potential hazard properties or improper calibration
- When to initiate changes in sampling to expand the space hazard classification (i.e., actions when an unusual result is encountered)
- Validation of sampling findings against the outlined entry parameters
- Posting the sampling findings on the permit

B.5 Rescue team personnel

Rescue team personnel are those designated to rescue authorized entrants from confined spaces. They should be trained in the following topics:

- The same training expected of authorized entrants
- Rescue duties
- The hazards (e.g., chemical, mechanical, thermal, atmospheric, fall, and any other special hazard) that may be faced during entry
- Procedures for isolating hazards and verifying their isolation
- The modes, signs or symptoms, and consequences of hazard exposure
- Proper use of PPE
- Proper use of entry and rescue equipment (e.g., testing, monitoring, ventilation, communication, lighting, fall protection, barriers, and access and rescue equipment)
- Communication methods
- CPR and basic first aid

Appendix C—Confined-space entry program annual review

Note: This appendix supplements the information in Section 5.2.1.

Any occurrence of confined-space entry deficiencies should be noted in conjunction with the appropriate confined-space permit.

Examples of circumstances that call for additional review of the confined-space program include the following:

- Unauthorized entry of a permit space

- Detection of a confined-space hazard not covered by the permit
- Detection of a condition prohibited by the permit
- An injury or near-miss during entry
- A change in a confined space's use or configuration
- Personnel complaints about the program's effectiveness

During this review, Units should evaluate the following:

- Canceled work permits/previous entry operations
- The current confined-space list for accuracy
- New potential hazards or operations
- The rescue service's operation and response time
- The availability and provision of adequate equipment for entry
- If the confined-space entry program is being effectively communicated
- If the written confined-space entry program is firmly implemented and being enforced
- If the training is being effectively presented to and completed by personnel
- Review of previous report and progress with recommendation
- Review of entry analytical data and supportive documentation (including any discrepancies between analyses)

Documentation

- The name of the person or groups of people completing the annual review and the date the review was completed
- The number of permits reviewed.
- Recommendations for improvements

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