STANDARD
INDUSTRI
PEMBINAAN
(CONSTRUCTION INDUSTRY STANDARD)

CIS 16:2019

GUIDELINES FOR WORKS AT CONFINED SPACE
IN CONSTRUCTION SITE

Description: Duties and responsibilities, HIRARC, entry permit system, works associated with working at confined areas

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CONSTRUCTION INDUSTRY DEVELOPMENT BOARD MALAYSIA
GUIDELINES FOR WORKS AT CONFINED SPACE IN CONSTRUCTION SITE
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COMMITTEE REPRESENTATION

This Construction Industry Standard Industry (CIS) was managed and developed by the Construction Industry Development Board Malaysia with the assistance of the Technical Committee of Safety and Health in Construction which comprises representative from the following organizations;

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Construction Industry Development Board Malaysia
Department of Occupational Safety and Health (DOSH)
Ekovest Construction Sdn Bhd
IJM Corporation Berhad
Malaysia Society for Occupational Safety and Health
Master Builders Association Malaysia (MBAM)
National Institute Occupational Safety and Health
Naza TTDI Sdn Bhd
Perbadanan Kemajuan Negeri Selangor
Real Estate and Housing Developers’ Association Malaysia (REHDA)
S P Setia Bhd
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Universiti Teknologi Mara (UiTM)
PREFACE

Guidelines for Works at Confined Areas in Construction Site was developed in 2009 as Construction Industry Standard (CIS 16:2009). This standard was revised 10 years later and now known as CIS 16:2019. The revision was carried out by Technical Committee formed by CIDB, represented by the construction industry stakeholders.

Reference were made to several documents generally used by industry players in managing construction safety and health. This revised version of Guidelines for Works at Confined Space In Construction Site is expected to provide clearer guidance to construction practitioners in assessing their safety and health performance at construction sites.

It should be noted that compliance with this Construction Industry Standard does not in itself confer immunity from legal obligations.
SECTION 1: GENERAL

1.1 Scope

This guideline applies to the Main Contractor, Employer, Sub Contractor and all construction site administrative personnel who manage and enter a confined space at construction sites, but it does not apply to underground mining or to work in a space at other than atmospheric pressure.

For the purpose of this guideline, a person whose upper body and/or head is/are within a confined space is considered to have entered the confined space. Examples of confined spaces are as follows:

i. Storage tanks, tankers, boilers, silos and other tank-like compartment usually having a manhole for entry;

ii. Open-topped spaces of more than 1.5 metres in depth such as pits or degreasers, which are not subject to adequate natural ventilation; and

iii. Pipes, sewers, tunnels, shafts, and ducts, and similar structures.

1.2 Normative references

These guidelines should also be read in conjunction with other relevant Act, Code of Practice or Guidelines that may provide more detailed information in certain areas. These include, but are not limited to:

i. CIS 16:2009 Guidelines for Works at Confined Areas in Construction Site


ix. Occupational Safety and Health Act (1994) and its Regulations.


1.3 Terms and definitions

For the purpose of this Guideline:

i. **Act**

   The Act refers to The Occupational Safety and Health Act 1994 and Factories and Machinery Act 1967 and Regulations made under these Acts.

ii. **Acceptable Entry conditions**

   The conditions that must exist in a confined space to allow entry and to ensure that employees involved with a confined space entry can safely enter into and work within the space.
iii. **Authorised Entrant**
An employee who is authorized by the employer to enter a confined space.

iv. **Authorised Gas Tester (AGT)**
A competent person authorized by Department of Occupational Safety and Health (DOSH) and in writing by an employer or occupier to carry out atmosphere test.

v. **Confined Space**
Confined space at construction site means a space which enclosed or partially enclosed space that:

a) is not primarily designed or intended for human occupancy
b) has a restricted entrance or exit by way of location, size or means
c) can represent a risk for the safety and health of anyone who enters, due to one or more of the following factors
   • its design, construction, location or atmosphere
   • the materials or substances in it
   • work activities being carried out in it, or the
   • mechanical, process and safety hazards present
d) is at atmospheric pressure during occupancy.

vi. **Confined Space Programme**
The employer overall program for controlling and, where appropriate, for protecting his employees from confined space hazard and for regulating employee entry into confined space.

vii. **Claustrophobia** (from Latin claustrum "a shut in place")
Is the fear of having no escape, and being closed in. It is typically classified as an anxiety disorder and often results in panic attack. Claustrophobia is typically thought to have two key symptoms: fear of restriction and fear of suffocation.

viii. **Contaminant**
Any dust, fume, vapour, gas or other substance, the presence of which can be harmful to health.

ix. **Designated Person**
A person who possesses specialized abilities in a specific area and is assigned by the employer to perform a specific task in that area. (i.e. confine space associated areas).

x. **Director General**
Respectively to Director General of DOSH.

xi. **DOSH**
Department of Occupational Safety and Health Malaysia.

xii. **Engulfment**
The surrounding and effective capture of a person by a liquid or finely divided solid substance that can be aspirated to cause death by filling or plugging the respirator system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

xiii. **Entry Supervisor**
The person appointed by the employer who is responsible for determining if acceptable entry conditions are present at a confined space where entry is planned, for authorized entry and overseeing entry operations, and for terminating entry.
xiv. **Ergonomics problem**
Can be caused by both work-associated and non-work associated conditions can either individually, or by both interacting with each other. The main risk for Ergonomic problems like Repetitive Strain Injury and Carpal Tunnel Syndrome are the frequent repetitive motion tasks, awkward posture, vibrations, forceful movements, stress at workplace, poor workplace setup.

xv. **Explosive (Flammable) Range**
The range of flammable vapour-air or gas-air mixture between the Lower Explosive Limit (LEL) and Upper Explosive Limit (UEL).

xvi. **Forced Ventilation**
The use of mechanical devices, such as fans or air movers (venturis), to produce a safe atmosphere within a confined space.

xvii. **Hazardous Atmosphere**
An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a confined space), injury or acute illness from one or more of the following causes:

a) Oxygen content is below 19.5% or above 23.5 % by volume (at sea level);
b) Accumulation of flammable or explosive gas greater than 10% of its LEL;
c) Accumulation of toxic gas equal to or exceeding its permissible exposure limit (PEL); and
d) Any other atmospheric condition that is immediately dangerous to life or health (ILDH).

xviii. **Hot Work**
Welding, thermal, oxygen cutting, heating, ignition and other fire-producing or spark-producing operation or any process that can be a source of ignition when flammable material is present or can be a fire hazard irregardless of the presence of flammable material in the workplace.

xix. **LEL (Lower Explosive Limit)**
The minimum concentration of gas in air which must be present before it is capable of being explosively ignited by an ignition source.

xx. **Leptospirosis** (also known as Weil's disease, canicola fever, canefield fever)
Is a relatively rare bacterial infection in humans. The infection is commonly transmitted to humans by allowing water that has been contaminated by animal urine (rats, cats, dogs, etc) to come in contact with unhealed breaks in the skin, eyes or with the mucous membranes.

xxi. **Permit System**
The contractor's written procedures for preparing and issuing permits for entry and for returning the confined space to service following termination of entry.

xxii. **Permit to Work** (hereinafter referred to as "Permit")
The written or printed document that is provided by the employer to allow and control entry into a confined space.

xxiii. **Purging**
The method by which the contaminants are displaced from a confined space.

xxiv. **Stand-by Person**
An individual stationed outside one or more confined spaces who monitors the authorized entrants and who performs all stand-by person's duties assigned in the confined space programme and has attended a training course on safe working in confined space for authorised entrant and standby person and passed the test or examination.
xxv. **UEL (Upper Explosive Limit)**
The maximum concentration of gas that can be present in air if an explosion is to occur.

xxvi. **Zoonotic**
Diseases caused by infectious agents that can be transmitted between (or are shared by) animals and humans.

**SECTION 2: CONFINED SPACE IN CONSTRUCTION SITE**

**2.1 Types of confined spaces**

**2.1.1 Vaults**
Vault is an underground structure that serves to cover a space. The restricted nature of vaults and their frequently below grade location can create an assortment of safety and health problems.

**2.1.2 Pipe Assemblies**
One of the most frequently unrecognized types of confined spaces encountered throughout the construction site is the pipe assembly. The generally restricted dimensions of the pipe provide little room for the employees to move about and gain any degree of comfort while performing their tasks.

**2.1.3 Ventilation Ducts**
Ventilation ducts and pipe runs are very common at the construction site. Ventilation ducts may require that employees enter them to cut out access holes, install essential parts of the duct, etc. Depending on where these ducts are located, oxygen deficiency could exist.

**2.1.4 Tanks**
Tanks are another type of confined space commonly found in construction: They are used for a variety of purposes, including the storage of water, chemicals, etc. Tanks require entry for cleaning and repairs. Oxygen deficient atmospheres, along with toxic and explosive atmospheres created by the substances stored in the tanks, present hazards to employees.

**2.1.5 Sumps**
Sumps are commonplace. They are used as collection places for water and other liquids. Employees entering sumps may encounter an oxygen deficient atmosphere. Sumps are often poorly illuminated. Inadequate lighting may create an accident situation.

**2.1.6 Sub-basement in a building**
Sub-basement is one or more floors of a building that are either completely or partially below the ground floor. In construction activities, sub-basement is considered as a confined space due to its closed structure which causes the air inside a sub-basement to be trapped. Thus, accumulate hazardous air pollutants that may endanger the personnel entering the Sub-basement if there are no proper safety precautions taken.

**2.1.7 Lift Shaft**
A lift shaft is defined as a vertical shaft in a building to permit the passage of a lift/ elevator from floor to floor. It is an enclosed structure and provides limited space for employees to conduct tasks.
2.2 Unusual Conditions

2.2.1 Confined Space within a Confined Space

This situation appears as tanks within pits, pipe assemblies or vessels within pits, etc. In this situation, not only do the potential hazards associated with the outer confined space require testing, monitoring, and control, but those of the inner space also require similar procedures.

A good example of a confined space within a confined space is a vessel with a nitrogen purge inside a filtering water access pit.

2.2.2 Hazards in One Space Entering Another Space

During an examination of confined spaces in construction, one often encounters situations which are not always easy to evaluate or control. For instance, a room or area, which classifies as a confined space may be relatively safe for work. However, access passages from other areas outside or adjacent to the room could, at some point, allow the transfer of hazardous agents into the "safe" one.

One such instance would be a pipe coming through a wall into a containment room. Welding fumes and other toxic materials generated in one room may easily travel through the pipe into another area, causing it to change from a safe to an unsafe workplace. A serious problem with a situation such as this is that employees working in the "safe" area are not aware of the hazards leaking into their area. Thus, they are not prepared to take action to avoid or control it.

It is recommended that contractors identify and record confined space work areas at their workplaces.

SECTION 3: HAZARD IDENTIFICATION, RISK ASSESSMENT AND RISK CONTROL

Fatalities and injuries constantly occur among construction employees who, during the course of their works, are required to enter confined spaces. These hazards must be identified prior to a confined space entry so that the appropriate controls can be applied. For further details on the preparation of the HIRARC, reference can be made to CIS 25:2018 Construction Activities Risk Assessment (CARA–HIRARC).

3.1 Types of Hazard

3.1.1 Atmospheric Hazards

Atmospheric hazards include things such as oxygen deficiencies, dusts, chemical vapours, welding fumes, fogs and mists that can interfere with the body's ability to transport and utilize oxygen, or that have negative toxicological effects on the human body. These hazards can be fatal as they create a limited window in which to perform a rescue. The general rule is that after four minutes without oxygen, a person in a confined space will likely suffer asphyxia resulting in either brain damage or death.

The most common atmospheric hazards associated with confined spaces are:

i. Oxygen deficiency in the confined space which may caused by –

   a) Slow oxidation reactions of either organic or inorganic substances;
   b) Rapid oxidation (combustion);
   c) The dilution of air with an inert gas or asphyxiating gas;
   d) Absorption by grains chemical or soil; or
   e) Physical activities
ii. Oxygen displacement
iii. Flammable, combustible or explosive atmospheres
iv. Toxic gases may be from of solids, liquids, sludges, gases, vapors, fumes or particulates

a) The operation performs in the confined space (for example painting, with coating containing toxic of flammable substances, and welding or brazing with metal) capable of producing toxic fumes
b) Operation of moving equipment (for example excavator, forklift) can create other gases such as carbon dioxide

The explosive range for common gases and vapours are listed in Table 1 below.

### Table 1. Explosive Range for common gases and vapours.

<table>
<thead>
<tr>
<th>Gas/Vapour</th>
<th>Lower Explosive Limit (%)</th>
<th>Upper Explosive Limit (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>2.6</td>
<td>12.8</td>
</tr>
<tr>
<td>Ammonia</td>
<td>16.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Benzene</td>
<td>1.3</td>
<td>7.1</td>
</tr>
<tr>
<td>Ethyl Alcohol</td>
<td>3.3</td>
<td>19.0</td>
</tr>
<tr>
<td>Gasoline</td>
<td>1.4</td>
<td>7.6</td>
</tr>
<tr>
<td>Hexane</td>
<td>1.1</td>
<td>7.5</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>4.0</td>
<td>44.0</td>
</tr>
<tr>
<td>Methane</td>
<td>5.0</td>
<td>15.0</td>
</tr>
<tr>
<td>Methyl Alcohol</td>
<td>7.3</td>
<td>36.0</td>
</tr>
<tr>
<td>Propane</td>
<td>2.4</td>
<td>9.5</td>
</tr>
<tr>
<td>Toluene</td>
<td>1.2</td>
<td>7.1</td>
</tr>
<tr>
<td>Xylene</td>
<td>1.1</td>
<td>7.0</td>
</tr>
</tbody>
</table>

#### 3.1.2 Physical Hazards

Physical hazards often present a greater danger inside an enclosed space than they do outside. Examples of those hazards are described below.

a) Noise and vibration

An enclosed environment can amplify noise. Excessive noise can damage hearing and prevent communication. It can affect employees' ability to hear alarms, warning shouts, or orders to evacuate.
b) Extreme Temperature

Ask site project managers if employees could encounter dangerous temperatures. For example, heat stress can be a hazard when working around boilers, hot pipe or tanks, or structures heated by the sun. Protective clothing can also add to heat stress.

c) Cramped work spaces

Cramped work spaces restrict movement and can make using tools and equipment difficult and dangerous.

d) Poor access or exit

Confined space openings are generally small and not well-located. This can make entry and exit difficult and can interfere with rescue.

e) Rotating or moving equipment

Before entry, identify any moving or rotating equipment (such as conveyors, mixers, augers, etc.) which could become activated by stored pressure, accidental contact, or gravity action. Check with plant personnel on lockout and tagging procedures, and review drawings, plans, and specifications.

f) Electrical hazards

Any exposed conductors or energized equipment should be identified before entry. The presence of water in confined spaces may pose an additional electrocution hazard where electrical circuits, equipment, and tools are used.

g) Engulfment due to uncontrolled movement of liquids and solids

Liquids, sludge, fine solids, and other material may not be completely removed from confined spaces and may present an engulfment or drowning hazard. Use inspection ports and dipsticks, and check with plant personnel to evaluate such hazards.

h) Slick or wet surfaces

Employees can be severely injured from a slip or fall on oily, wet, or moist surfaces.

i) Lighting

Confined spaces generally have poor lighting. Employees often need temporary lighting. In potentially explosive atmospheres, use lighting designed for such situations.

3.1.3 Biological Hazard

Employees working in a confined space may be exposed to biological hazards. There may be a risk of exposure to zoonotic diseases from animal living in confined spaces or leptospirosis, tetanus and gastroenteritis.

3.1.4 Psychological Hazard

Anyone or combination of the above hazards when working in a confined space can induce psychological factors such as stress and claustrophobia and ergonomics problem.
3.2 Hazard Identification

Hazard identification for a confined space should be done by a competent person who is familiar with the potential hazards of a confined space as described in the previous section. It is done to identify the controls necessary to manage the hazards which are likely or unlikely to happen. A hazard identification checklist can be used for this purpose, please refer to Annex A.

A hazard assessment is generally required for each confined space. But if there are two or more similar confined spaces containing the same hazards then only a single assessment document is required.

A preliminary hazard identification will provide the basis for a further risk assessment as described in the following section.

3.3 Risk Assessment

The employer shall carry out the risk assessment before carrying out works involving entry in confined space.

a) The factor to consider on general safety hazards that may exist and develop outside the confined space but not limited to;
   i. The number of person required to maintain the equipment such as ventilation, communication and observation of the person within the confined space and initiate rescue procedures
   ii. Status of fitness and training of those person involved in the confined space work
   iii. Availability and adequacy of appropriate personal protective equipment, protective clothing and rescue equipment for all person

b) The factor to consider on general safety hazards that may exist and develop inside the confined space but not limited to;
   i. Noise, which may be caused by hammering or the use of equipment within the confined spaces
   ii. Radiation within a confined space (for example, from X-rays, radiation gauges, isotopes, lasers and welding)
   iii. Excessive oxygen in the confined space which may be caused by a leaking oxygen supply fitting such as in gas cutting or heating equipment which can lead to fire or explosion

c) Emergency and rescue procedures

   i. Arrangement for rescue, first aid and resuscitation;
   ii. Communication between authorised entrance with stand-by person, and/or stand-by person with rescue services.
   iii. The assessment shall be carried out by an assessor if there is any chemical hazardous to health used in confined space as required under Occupational Safety and Health (OSHA), regulation 2000 (Use and Standarts of Exposure of Chemicles Hazards to Health)

To perform a risk assessment, it is necessary to anticipate potential hazards. Often, the hazards of working in confined spaces are not recognized until it’s too late. For more detailed examples of confined space risk assessment, please refer to Annex B and C.
3.4 Risk Control

Based on the risk assessment, the employer shall establish and implement the procedures and practices of hazard control that provide safe entry into the confined space. It shall include, but not be limited to the following:

i. Specifying acceptable entry conditions;
ii. Isolating the confined space;
iii. Purging, inerting, flushing or ventilating the confined space as necessary to eliminate control atmospheric hazards; and
iv. Verifying that conditions in the confined space are acceptable for entry throughout the duration of an authorized entry. This can be done by testing the confined space atmosphere before entry and if necessary during the course of entry operations.

3.4.1 Stand-by-person

Provision of at least one stand-by person outside the confined space into which entry is authorised for the duration of entry operations.

3.4.2 Monitoring of multiple confined spaces

For monitoring of multiple confined spaces by a single stand-by person, the programme shall include the means and procedures to enable the stand-by person to respond to an emergency affecting one or more of the confined spaces being monitored without distraction from stand-by person’s responsibilities under these Industry Code of Practices.

3.4.3 Permit system

The employer shall develop a written system for preparation, issuance, implementation, and cancellation of permit to work.

3.4.4 Sign-posting

Confined space warning signages shall be posted at conspicuous places when work is being carried out after the issuances of the permit to work.

3.4.5 Employee training

The employer shall ensure that their employees who are involved in confined space operation have undergone training on confined space safety course approved by the Director General and passed the examination.

3.4.6 Equipment

The employer shall provide appropriate equipment as follow-

a) Atmosphere testing and monitoring equipment;
b) Personal protective equipment as far as practicable if engineering and work practice controls do not adequately protect authorized entrants;
c) Forced air ventilation equipment require for achieving acceptable entry conditions;
d) Lighting equipment needed to enable authorized entrants to see clearly, work safely and to be able to exit the confined space quickly in case of emergency;
e) Barriers and shield
f) Equipment for safe ingress and egress for authorised entrants, such as ladders, winch and tripod;
g) Emergency and rescue equipment; and
h) Any other equipment necessary for safe entry into and rescue from confines spaces.
3.4.7 Means of communication

The means of communication may vary depending upon the type of work being done and the nature of the work place. In most instances communication devices such as telephone or walkie-talkie are preferred. There may be instances that other methods of communication may be used such as verbal communication, hand signal, light and cord signal.

3.4.8 External hazard protection

Protection such as physical barriers shall be provided to control potential hazards posed by pedestrians and vehicles.

3.4.9 Identification of the duties

a) The employer shall designate and identify the duties of employees to be an authorized entrant, stand-by person, entry supervisor, authorized gas tester, permit issuer or the other related personnel in entry operation.

b) The employer shall ensure that the personnel mention in (a) carried out their duties as specified in part 5.0.

3.4.10 Information to the contractor

The employer shall provide and brief contractors with information about the confined space hazards, safety rules and emergency procedures.

SECTION 4: SAFE WORK PRACTICES AND PROCEDURES

By developing and implementing safe work procedures, employer is compulsory to ensure all employees involved in confined space to follow standardized methods, reducing the risk of injury or death. These procedures will include emergency response plans and rescue procedures to be followed in the event of an accident or other emergency in a confined space.

4.1 Entry Permit System

An employer must ensure that a person in-charge and a employee who is required or permitted to enter a confined space complies with the safe work practices and procedures respecting work in such a space. A pre-entry briefing should be conducted for all employees who will enter the confined space. Employees will be informed of the hazard and safety conditions of the particular job.

The entry permit must also be completed and signed by an entry supervisor and be readily available at the site of the confined space before an employee enters that confined space. It must contain the following information:

a) Location of the confined space
b) Names of each employee who will enter the confined space, the reason for their entry and the work that they will do.
c) Time during which the entry permit is valid. Entry permits will display the issue date and time of the permit and have an expiration time that will be valid for only one shift. Validity of permit of entry shall be 8 hours and an extension of 4 hours may be granted if the situation permits.
d) Safe work procedures for entering, being in, and leaving the confined space
e) Complete isolation list–blanking and/or disconnecting
   • electrical lock-out
   • mechanical lock-out
   • any other applicable information
f) Special clothing and equipment - personal protective equipment and clothing
   • full body harness, lifeline, and retrieval system
   • special tools for hazardous location work

g) Atmospheric test readings - explosive levels and/or flammability levels
   • oxygen levels – deficiency or enrichment
   • toxic substances
   • others, as necessary

h) Atmospheric monitoring, including type, while work is being performed
i) Trained personnel, with a complete understanding of the hazard
j) Standby employees must be named on the permit
k) Signed authorization by the supervisor (competent person) for work to be done
l) First aid provisions, emergency response and rescue procedures in place
m) Isolation of confined space - erect barriers, post warning signs

Because of the diversity of work in confined spaces, it is not possible to have an entry permit that covers every situation. Assess each work situation and design a specific entry permit to cover it.

The contractor must review and revise the confined space entry permit whenever the work activity changes or circumstances at the workplace change in a way that poses a risk to the safety and health of an employee. The contractor must also inform employees, who may be affected by the change to an entry permit, of the change.

The contractor or owner must take all practical and reasonable steps to prevent any person, other than an employee who is required or permitted to do so, from entering a confined space at the workplace. Only a medically fit person shall be allowed to enter confined space as per the requirement of the Industry Code of Practice for Safe Working in a Confined Space, Department Of Occupational Safety And Health Malaysia (2010).

Examples of the various types of work permits include:

a) Hot work permit – where heat used or generated in work process is of sufficient intensity to cause an explosion or fire
b) Cold work permit – where hazards from toxic gases, fumes, dusts, mists, fogs, corrosive substances, biological agents exist or may exist
c) Safety work permit – for work that involves steam, air, water, electricity
d) Entry permit – for entering into confined spaces

See an example of an entry permit in Annex E.

4.2 Isolation requirement

Isolation of a confined space is required, accidental or inadvertent introduction of the material or movement or actuation of machinery would create a hazard.

The employer shall take positive steps to ensure the following but not limited to –

a) positive isolation to prevent accidental introduction into the confined space of materials, through equipment such as piping, ducts, drains, conveyors, service pipes, or fire protection equipment. Closing of a valve is not considered as a positive isolation;

b) de-energisation and lock-out, or de-energisation and tag out, or both, of machinery, mixers, agitators or other equipment containing moving parts in the confined space. This may require additional isolation, blocking or de-energisation of the machinery itself to guard against the release of stored energy (for example, springs); and
Isolation of all other energy sources which may be external to but still capable of affecting the confined space, for example heating or refrigerating media.

4.2.1 Isolation from hazardous materials

A confined space shall be isolated before entry is permitted. The method of isolation shall be determined based on the risk involved and in accordance with one of the methods described below or by an alternative method ensuring equivalent security –

a) Removal of a valve, spool piece, or expansion joint in piping leading to, and as close as possible to, the confined space, and blanking or capping the open end of the piping leading to the confined space. The blank or cap shall be identified to indicate its purpose. Blanks or caps shall be of a material that is compatible with the liquid, vapor or gas with which they are in contact. The material shall also have sufficient strength to withstand the maximum operating pressure, including surges, which can be built up in the piping;

b) Insertion of a suitable full-pressure spade (blank) in piping between the flanges nearest to the confined space;

c) Where neither of the methods described in (a) or (b) is practicable, isolation by means of closing and locking, or closing and tagging, or both, of at least two valves in the piping leading to the confined space. Where practicable, a drain valve between the two valves shall also be locked open or tagged open to atmosphere as part of this method.

4.2.2 Isolation from moving parts

Before entry is permitted into any confined space, which can move, or in which agitators, fans or other moving parts of potential hazard to personnel are present, the possibility of movement shall be prevented by the relevant method described below or by alternative methods offering equivalent security. Where practicable, equipment or devices with stored energy, including hydraulic, pneumatic, electrical, chemical, mechanical, thermal or other types of energy, shall be reduced to a zero energy condition –

a) The authorized entrant shall place a lock or tag, or both, on the open circuit-breaker or isolating switch supplying electric power to equipment with hazardous moving parts, to indicate that a person is in a confined space and that such isolation shall not be removed until all persons have left the confined space. When a lock is used, the key shall be kept in the possession of the authorized entrant;

b) Where a power source cannot be controlled readily or effectively, a belt or other mechanical linkage shall be disconnected and tagged to indicate that a person is in a confined space and that such belt or linkage shall not be reconnected until all persons have left the confined space;

c) Where (a) and (b) are not practicable, moveable components shall be blocked, and switches, clutches or other controls shall be tagged to indicate that a person is in a confined space and that such blocks and tags shall not be removed until all persons have left the confined space.

NOTE: Where more than one person is to work in the confined space, there shall be a system developed so that the isolating device is locked, or tagged, or both, by each person entering the confined space.

4.2.3 Removal of means of isolation

a) There shall be a system to ensure the removal of locks, tags, blanks or other protective factors are removed only by the person who originally installed them.

b) Activation or energization of the system shall be done by the person who originally deactivated or deenergized them or any other person who has adequate knowledge and skills. And has been authorized by the entry supervisor or permit issuer to perform correctly the task.
4.3 Ventilation and Purging

Before entering a confined space, it would be necessary to ensure the atmosphere in the confined space is clear of hazardous substances. This can be achieved in a number of ways.

a) Ventilation – a method of forcing air into a confined space near the bottom using a mechanical device. A competent person must continuously monitor the atmosphere and re-test after ventilating the space for an appropriate time and before any employee enters (See figure 1).

b) Purging – a method of removing contaminants from a confined space by using liquids (water) or by non-flammable gases (carbon dioxide or nitrogen).

c) Inert – refers to the process of introducing a substance, usually a gas, to make the contaminants non-reactive.

![Figure 1. An employee ventilating a manhole. This process must be ensured that ventilation reaches all parts of the confined space, especially where baffles or other obstruction exist.](image)

4.4 Atmospheric Testing

Before entering any confined space, it is important to use appropriate monitoring equipment, determine the frequency of tests and inspections needed to protect employees from exposure to any identified hazard (e.g. atmosphere – explosive gases, oxygen levels, toxic gases) and ensure the tests and inspections are completed as appropriate.

Representative sampling should take into account the presence of stratified atmospheres and pockets of contaminated air within the confined space (see Figure 2). Continuous monitoring is required:

a) when performing hot work in a confined space that contains or is likely to contain an explosive or flammable gas or vapour;
b) when the atmosphere in the confined space has been rendered inert; or

c) as set out in the confined space entry permit

Whenever there is a doubt on the content of other airborne hazards, then employees entering confined spaces must wear approved pressure-demand, supplied air breathing apparatus, and use continuous monitoring equipment for explosive atmospheres. The atmosphere should not be more than 10% of the lower explosive limit. Do not permit entry if concentrations of flammables or explosives cannot be reduced to less than 10% of the lower explosive limit.

![Monitoring the confined space at varying levels](image)

Even though a continuous monitor may have data logging capability, results must still be recorded at adequate intervals as determined in the entry permit. This ensures that employees are constantly alert to the levels that they are encountering such as fluctuations and unusual build-up of atmospheric hazards.

Only employees who have received training and assigned to use monitoring equipment will carry out such monitoring. The training mentioned must include instrument calibration, equipment maintenance, and proper interpretation of instrument readings and warning signals.

All monitoring equipment must be serviced, maintained and calibrated to ensure it is working properly before each use. Maintain service logbooks for each piece of confined entry monitoring and testing equipment.

### 4.5 Training

#### 4.5.1 General Training Requirements

Confined space work requires an effective training program that will provide awareness of safe work procedures. Provide the training to all individuals who supervise employees (entry supervisor), perform the work (entrant, authorized gas tester), or those assigned as standby (stand-by person) or rescue persons.

Training shall be provided to every affected employee:

a) before the employee is first assigned duties;
b) before there is a change in assigned duties; and
c) whenever there is a change in confined space operations that presents a hazard which an employee has not previously been trained for.
An effective training program should cover the following:

a) safe work practices and procedures for working in the confined space including:
   • personal protective and safety equipment;
   • communication procedures - standby employee/employee/emergency;
   • procedures for isolating, mechanical and electrical lock out, blanking, disconnecting pipes, lines and sources of energy; and
   • emergency response and rescue procedures.

b) recognizing the hazards associated with working in the confined space; and
c) the content and control measures outlined in the required entry permit.

4.5.2 Specific Training Requirements

Training is required for persons involved in confined space and shall include but not be limited to the following categories of persons:

a) Authorized Entrant and Stand-by person

Authorized entrant and standby person has to attend training course on working in confined space and authorize entrant and standby person conducted by recognized training provider. The training provider shall passed the examination, registered and the training module shall be approved by Director General DOSH.

b) Authorized Gas Tester and entry supervisor

Authorized gas tester and entry supervisor has to attend training course on authorized gas tester and entry supervisor. The training provider shall passed the examination, registered and the training module shall be approved by Director General DOSH.

Authorized gas tester and entry supervisor shall be registered with Department Occupational Safety and Health (DOSH)

c) Refresher Training

All four categories of employee have to undergo a refresher course every 2 years using module approved by Director General DOSH.

The employer shall keep the record of the training required, result of the examination or test. The record shall be available for inspection by the employees, member of committee or Director General DOSH

4.6 Safety Provisions and Equipment for Confined Space Work

a) Safety Provisions

An employee entering a confined space shall be equipped with all safety apparatus, testing and monitoring equipment relative to the hazard/risk assessment for that confined space such as those described below.

i. Supplied air breathing apparatus
ii. Air line respirator
iii. Self-contained breathing apparatus (SCBA) – (see Figure 3).
iv. Confined space full body harness with lifeline – (see Figure 4)
v. Hoist/retrieval system (two-way tripod hoists, three-way tripod hoists, Davit arm hoists, self-retracting line with winch, etc.)
b) Electric equipment and non electric equipment

i. Any portable lamp, electrical tools to be used in the confined space shall to be connected to an earth-free extra low voltage supply in accordance with standard recognized by Energy Commission.

ii. The equipment shall be fitted with a flexible supply cable of heavy-duty type. Cable shall be located, suspended or guarded to minimize accidental damage.

iii. All portable electrical such as lamp, torch light and other electrical instruments shall be explosion proof and intrinsically safe.

iv. Where possible use the pneumatic tools are preferred.

v. The compress gas supply to equipment in the confined space shall be turn off at the cylinder valve and the hose shall be removed and depressurized outside the confined space when not in use. A hose supplying gas-operated equipment used in confined space shall be located, suspended or otherwise guarded to avoid accident.
c) Maintenance of equipment

i. All equipment shall be inspected prior to use.

ii. All other equipment used for entry shall be maintained and thoroughly examined by qualified personnel appointed by employer in accordance with manufacturer’s recommendation.

iii. The report of every examination shall be kept available for inspection. The employer shall also maintain all other relevant documents but not limited to reports, inspections, risk assessment, training records, medical reports, rescue plan, confined space entry program and checklist.

4.7 Health Requirement of Person Working in Confined Space

There are physical and psychological stress associated with works in a confined space. Apart from the quality of lighting and the fact of confinement, which may alter and restrict the way most people work, the lighting and confinement can exaggerate existing problems of poor vision, poor balance, mobility and blood circulation.

The employer shall ensure that his authorized entrance intending to work in confined space are certified physically and mentally fit determined by an occupational health doctor (OHD). The examination may be tailored to detect the following:

a) History of fits, blackouts or fainting attacks;

b) Heart disease or heart disorder;

c) Chronic airway diseases such as asthma, bronchitis or a shortness of breath on exertion;

d) Deafness;

e) Meniere’s disease or disease involving giddiness or loss of balance;

f) Claustrophobia or other mental disorder;

g) Neurological and Musculo Skeletal Disorder such as back pain or joint trouble that would limit mobility in confined spaces;

h) Condition that limit movement in confined space such as gross obesity, pregnancy and physical handicap;

i) Metabolic diseases;

j) Serious defect in eyesight; and

k) Any other disease or condition that may affect or endanger the person’s safety and health while working in confined space.

The occupational health doctor (OHD) shall issue a health fitness certificate that shall be valid for a period of two (2) years. Example of health examination checklist is given in Annex F and example of health fitness certificate is given in Annex G.

The authorized entrance shall declare that he is fit to enter the confined space in writing prior to each entry. Example of health status declaration is given in Annex H.

4.8 Hot Work

Hot work is work that could produce a source of ignition, such as a spark or open flame. Examples of hot work include welding, cutting, grinding and the use of non-explosion proof electrical equipment.

To perform hot work in the presence of a combustible dust or mist, ensure that the space is ventilated or purged to reduce the combustible dust or mist airborne concentration to a level below that which may create a hazard of explosion.

If ventilation or purging cannot reduce the risk of explosion hazard, the space must be rendered inert by adding an inert gas and be continuously monitored to ensure the atmosphere remains inert. Employees must wear adequate respiratory protective equipment.
If hot work is necessary in a confined space with a flammable atmosphere the safest method to reduce the risk of explosion is to clean and eliminate all flammable liquids, vapour, and solid material (scaling) in the confined space before entry is permitted. Cleaning should be preformed by a professional team with experience in dealing with flammable materials and confined spaces. Absorbent materials can be used to remove any liquid that can not be drained from tanks.

In addition, to perform hot work in the presence of explosive or flammable gas or vapour, ensure that:

a) The space is purged and continuously ventilated to maintain an atmosphere of less than 1% of the LEL;
b) The space is purged and continuously ventilated to maintain an Oxygen concentration of not less than 19.5% and not more than 23.5%.
c) The atmosphere in the confined space is continuously monitored
d) The entry permit includes adequate provision for hot work and details the appropriate measures to be taken (see figure 5); and
e) An alarm system and exit procedure are in place to provide adequate warning and allow safe escape if the levels in (a) and (b) above are exceeded. It is good practice to incorporate a safety factor that provides for adequate warning should the levels be approached.

Note that the ventilation air should not create an additional hazard due to recirculation of contaminants, improper arrangement of the inlet duct, or by the substitution of anything other than fresh air (approximately 19.5% Oxygen). The use of forced ventilation can expand the limits of flammability and increase the hazards of fire and explosion.

Alternately the space must be rendered safe by inerting with an inert gas and continuously monitoring the atmosphere, particularly with regard to Oxygen concentration. Employees must wear adequate respiratory protective equipment and equipment be made available to allow persons outside the confined space to locate and rescue them, if necessary.

Figure 5. Provisions for Hot Work in confined space.
4.9 Emergency Response, Rescue and Communication

An employer must ensure that there are adequate on-site emergency response and rescue procedures that are ready for immediate implementation in order to effectively remove an employee who has been overcome in the confined space.

For confined space entry, the contractor must designate one or more standby persons, who are qualified in first aid, trained in confined space work and emergency response and rescue procedures.

An employer shall provide standby person and authorised entrant in the confined space with suitable communication system.

An employer must ensure that the rescue equipment identified in the entry permit is readily available to affect a rescue in the confined space, appropriate for entry into the confined space and inspected by a trained person as often as is necessary to ensure that it is in good working order.

a) Rescue Procedures.

Emergency procedures, including provision for rescue equipment, shall be established and implemented. Arrangements shall consider the following –

i. The shape and size of the confined space;
ii. The nature of the task to be performed;
iii. Obstacles within the confined space and the size and position of the means of ingress to and egress from the confined space; and
iv. The number of persons occupying the confined space and the number of persons required outside the confined space to maintain equipment essential for the confined space task, to ensure adequate communication with the persons within the confined space, to observe persons within the confined space, and to properly initiate rescue procedures if required.

b) Emergency action

Emergency action is the necessary action to be taken during emergency which includes the sequence of action to be done and decisions to be made to control the emergency situation. An action plan for emergency shall be prepared in advance.

c) Evacuation, rescue and first aid

The evacuation, rescue and first aid procedures shall address at least the following –

i. Evacuation shall be to a predetermined safe assembly point;
ii. The procedure shall designate someone to record all employees arrive at the assembly point;
iii. Activate the rescue team or summon the rescue services to search for missing employees;
iv. Apply first aid on injured person, only if qualified person available; and
v. Inform the nearest hospital if necessary.

d) Communication

Communication is a crucial factor in handling an emergency. The communication procedure involves the co-ordination and flow of information within the company or the work site and outside of the company. At the work site, the person in charge shall be the entry supervisor.

Communication shall be established between the following persons –

i. The site manager;
ii. Entry supervisor;
iii. Rescue team; and
iv. any other rescue and emergency services e.g. Fire & Rescue Department, Hospital.

4.10 Record Keeping

Records shall be kept as evidence that precautions are practiced for example, hazard assessments, entry permits, training of entrants, standby and first-aid persons, training and certification of authorized gas tester, etc. These records shall be maintained at the construction site office throughout the duration of the construction until handover of the project to the owner.

SECTION 5: DUTIES OF EMPLOYER

5.1 Duties of employer as Client

Where the employer is a client, the employer shall-

a) Inform his employees and contractor that confined space entry is allowed only through compliance with the confined space entry program stipulated under these industry standard;
b) Inform his employees and contractor the previously identified hazards and employer’s experience with confined space;
c) Inform his employees and contractor of any precautions or procedures that the employer has implemented for the protection of employees in or near confined spaces where his employee or contractor’s employee will be working;
d) Co-ordinate entry operation with the contractor, when both the employee and the contractor’s employee’s will be working in or near confined spaces; and
e) Ensure that the contractor, permit issuer, entry supervisor, authorized gas tester, authorized entrance and stand-by person full fill their duties specified under paragraph 5.2, 5.3, 5.4, 5.5, 5.6, and 5.7

5.2 Duties of employer as Contractor

Where the employer is a contractor, an employer shall-

a) Obtain all information regarding confined space hazards and entry information from the owner of industry;
b) Cooperate with owner of industry when both the owner of industry’s personal and the contractor personal will be working in or near confined spaces;
c) Brief the owner of industry on their implementation of the confined space entry programme;
d) Inform the owner of industry of any hazards confronted and created during the entry operation in confined spaces, through a debriefing;
e) If the contractor posses the site, then shall comply with the duties of owner of industry; and
f) Ensure that permit issuer, entry supervisor, authorized gas tester, authorized entrance and stand-by person to fulfil their duties specified under paragraph 5.3, 5.4, 5.5, 5.6, and 5.7

5.3 Duties of Permit Issuer

Each permit issuer shall –

a) Update his knowledge on hazards that may be faces during entry, including information on the mode, signs and symptoms and consequences of the exposure;
b) Identify all hazards and recommends control measures to ensure safe entry;
c) Ensure there is no other incompatible activity in the vicinity of the confined space;
d) Authorize the permit the works; and
e) Endorse the cancellation and closure of the permit to works
5.4 Duties of Entry Supervisor

Each entry supervisor shall –

a) Update his knowledge on hazards that may be faced during entry, including information on the mode, sign and symptom, and consequences of the exposure;
b) Supervise all the activities before during and after operation;
c) Verify by checking that appropriate entries have been made on the permit the work, that all tests specified by the permit to works have been conducted and that all procedures and equipment specified by the permit to work are in place before the permit issuer authorize the permit to work and allow entry to begin;
d) Terminate entry and cancel the permit to work if the acceptable entry condition cannot be maintained;
e) Close the permit to works in the completion of the entry;
f) Verify that rescue services are available before any entry and that the means for summoning them are operable;
g) Remove unauthorized individuals who enter or who attempt to enter the confined space during entry operation;
h) Determine that entry operation remain consistent with terms of the permit to works and that acceptable entry condition are maintained, wherever responsibility for a confined space entry operation as transferred and it intervals dictated by the hazards and operations perform with the space;
i) Brief the entry team on the hazards, permit to works requirement and emergency procedures;
j) Conduct a debriefing session with the contractor or his employees at the conclusion of the entry
k) Ensure means to restrict unauthorized entry are available;
l) Be in charge of communication during emergency; and
m) Entry supervisor cannot to as same person with permit issuer

5.5 Duties of Authorise Gas Tester

Each authorized gas tester shall-

a) Update his knowledge on the hazards that may be faced during entry, including information on the mode, signs and symptoms, and consequence of the exposure;
b) Identify all chemical hazards and recommends control measure to ensure safe entry;
c) Be familiar with all confined space entry equipment used, for example emergency breathing apparatus, man riding winch, tripod and etc;
d) Test and interpret the reading level of gaseous in the confined space.

5.6 Duties of Standby Person

Each stand-by person shall-

a) Have knowledge of the hazards that may be faced during entry, including information on the mode, signs and symptoms, and consequences of the exposure;
b) Be aware of possible behavioral effects to authorized entrances due the exposure hazards;
c) Continuously maintain an accurate count of authorized entrants in confined spaces and ensure that the means used to identify authorised entrants accurately identifies who is in the confined space;
d) Make sure that the number of authorised entrant tally to the permit to work;
e) Remain within his assigned work area outside the confined space during operation until relieved by another stand-by person;
f) Communicate with authorized entrant and / fire watch if available regularly to monitor entrant status and to alert entrants of the need to evacuate their space;
Monitor activities inside and outside of every confined space to determine if it is safe for entrants to remain in the confined space and orders the authorised entrants to evacuate a confined space immediately under any of the following circumstances -

i. If the stand-by person detects a prohibited condition;
ii. If the stand-by person detects the behavioural effects to any authorised entrant due to exposure to hazard;
iii. If the stand-by person detects a situation outside the space that could endanger the authorised entrants;
iv. If the stand-by person cannot effectively and safely perform all the duties; or
v. If any alarm is activated

Summons rescue and other emergency services as soon as he determines that authorised entrants may need assistance to escape from confined space;

Takes the following actions when unauthorised persons approach or enter a confined space while the entry is in progress –

i. warn the unauthorised persons to stay away/out from the confined space; and
ii. inform the authorised entrants and entry supervisor if unauthorised persons have entered the confined space;

Perform non-entry rescue as specified by the employer’s rescue procedures;

Not perform any duties that might interfere with the stand-by person’s primary duties to monitor and protect the authorised entrants; and

Monitor the condition of equipment required for safe entry work such as lighting and ventilation.

5.7 Duties of Authorised Entrant

Each authorized entrant shall –

a) Have the knowledge of the hazards that may be faced during entry, including information on the mode, signs or symptoms, and the consequences of the exposure;
b) Declare his fitness in writing prior to entry into confined space in ANNEX H
c) Used equipment required for the job including personal protective equipment correctly;
d) Communicate with the stand-by person regularly and alert the stand-by person whenever

i. He recognizes any warning sign or symptom of exposure to a dangerous situation ;
ii. He detects a prohibited condition

e) Exit the confined space as quickly as possible whenever

i. An order to evacuate is given by the stand-by person or entry supervisor;
ii. He recognizes any warning sign or symptom of exposure to a dangerous situation;
iii. He detects a prohibited condition; or an evacuation is alarmed; or
iv. An evacuation alarm is activated.
ANNEX A

Hazard Identification Checklist for Confined Spaces
(If there is a Yes response, please describe in the space after the question)

YES  NO

1. CONFINED SPACE CRITERION

☐ ☐ Is the space intended to be or is likely to be entered by any persons any reasons?
☐ ☐ Does the space have a limited or restricted means of entry and exit for personnel?
☐ ☐ Is the space intended to be at normal atmosphere pressure while any person is in the space?
☐ ☐ Is the space likely to contain or once contained:
  - An atmosphere that has a harmful level of any contaminant (e.g. fumes, vapour, gas, steam, mist or explosive gas) or
  - An atmosphere that does not have a safe oxygen level (e.g. too low or too high) or
  - Any stored substance that could cause engulfment (e.g. sand, garnet, grit, blast, grain)?

2. ATMOSPHERIC HAZARDS

☐ ☐ Is there a risk of the atmospheric pressure within the space changing to an unsafe level?
☐ ☐ Are there toxic, flammable, or oxygen-diluting gases / vapours present?
  - Hydrogen sulphide
  - Carbon monoxide
  - Methane
  - Carbon dioxide
  - Other (list) ______________________________________________________________

☐ ☐ Once inside the space, is there a risk of any harmful contaminant or process entering the space or being created from inside? (e.g. Fumes, gas leak, sewer, ducts, oil, or fuel)
☐ ☐ Are any of the processes occurring inside or adjacent to the space likely to cause any oxygen deficiency?
☐ ☐ If ventilation is required, is the air intake for the ventilation system located in an area that is free of combustible dusts and vapours and toxic substances?

3. LIGHTING / ELECTRICAL

☐ ☐ Could there be insufficient lighting?
☐ ☐ Are there any possible hazards associated with the lighting in the space? (e.g. an explosive atmosphere)
☐ ☐ Are there conductors or energized equipment in the space?
☐ ☐ If electrical equipment is to be used inside the space, is there water in the space?
☐ ☐ Is it possible to disconnect (lock-out / tag-out) electrical equipment where possible?

4. PHYSICAL HAZARDS

☐ ☐ Is there a risk of falls, debris or slipping hazards inside the confined space?
☐ ☐ Are there lines under pressure?
☐ ☐ Has mechanical equipment been blocked, chocked, and disengaged where necessary?
☐ ☐ Is heat stress possible inside the confined space?
☐ ☐ Is noise a hazard that will be encountered inside the confined space?
☐ ☐ Is there an engulfment hazard?
☐ ☐ Is there an entrapment hazard?

5. PHYSICAL HAZARDS

☐ ☐ Is there a risk of biological hazards inside the confined space?
# ANNEX B

## CONFINED SPACE HAZARDS AND EFFECTS

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<th>Effects of Hazard</th>
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<tbody>
<tr>
<td>1. Explosive Atmosphere</td>
<td>Before entering a confined space, tests for presence of an explosive atmosphere must be done. It should be noted that air-borne dust from grain, fine ground metals or other materials can form an explosive atmosphere. Explosive gases may displace oxygen. Note: Oxygen enrichment or deficiency can cause error in combustible gas detector readings.</td>
<td>Use a combustible gas detector. Monitor explosive gases by using equipment that can detect the lower explosive limit (LEL) and upper explosive limit (UEL). Residuals may have to be disturbed to allow the release of explosive gases.</td>
<td>Explosion, burns, multiple injuries, death</td>
<td>1. Methane (natural gas) CH₄ sources: gas line leaks, decaying matter. May be found adjacent to land fill sites, backed up or sluggish sewers. 2. Gasoline and other solvents: storage tanks and adjacent areas, sewer systems proximity to pipelines, accidental spills. May have definite odour.</td>
</tr>
<tr>
<td>2. a) Oxygen Deficiency</td>
<td>Acceptable breathing air contains between 20.8% and 23% oxygen. Deficiency is when the air contains less than 20.8% of oxygen by volume and is therefore a hazardous atmosphere.</td>
<td>Oxygen detection monitor.</td>
<td>Could result in slowing down of pulse rate, disorientation, unconsciousness, and death.</td>
<td>Oxygen (O₂) deficiency can occur when it is displaced by other gases, or by biological or chemical reactions, such as rusting or burning.</td>
</tr>
<tr>
<td>2. b) Oxygen Enrichment</td>
<td>Enrichment means an atmosphere where the oxygen content is greater than 23% by volume. Oxygen enrichment can cause an error in explosive meter readings. If the oxygen content cannot be reduced to less than 23%, do not allow entry.</td>
<td>Oxygen detection meter. Note: Some equipment is not capable of detecting oxygen enrichment.</td>
<td>This creates an Explosive atmosphere and increases rates of chemical reactions.</td>
<td>Enrichment may occur through the improper blanking of oxygen lines, leaking fuel gas welding equipment or ventilation with oxygen instead of air.</td>
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**CONFINED SPACE HAZARDS AND EFFECTS**

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</table>
| 3. Toxic Gases, Vapour | To create and maintain a safe environment, appropriate detection equipment must be used to determine the presence of toxic gases. | Monitors: specific testers must be used for specific toxic gases, ex: H₂S monitoring. It may be necessary to disturb residue or sludge to allow release of toxic gases and vapours | Can cause euphoria, disorientation, drowsiness, headaches, weakness, injury, disability and death. | 1. Carbon monoxide (CO) is colourless, odourless, tasteless and extremely poisonous. The most common sources of CO are poorly adjusted and maintained combustion devices.  
2. Carbon dioxide (CO₂) is odourless. It is a heavy gas that concentrates at lowest levels. It displaces oxygen and does not diffuse or mix readily with air.  
3. Nitrogen dioxide (NO₂): a pungent, acrid odour, a product of gasoline and diesel engines. Hydrogen sulphide (H₂S) is a deadly gas commonly found in sewers and manure pits. It is produced by decomposing organic matter. It has a typical rotten egg odour, but high levels can shut down the sense of smell. |
| **4. Fumes, Dusts, Mists, Fogs** | These hazards can often be seen. | Use specific monitors or testers for each fume, dust, mist or fog. | Explosion, disability, injury, burns, irritation, poisoning and death | 1. Fumes: from asphalt, welding, acid fumes from washing processes.  
2. Dust: grain dust, sandblasting (silica)  
3. Mist: spraying applications |
| 5. Smoke | Smoke is a combination of gases, vapours, fumes and dusts | Can be seen. Use appropriate detection and monitoring equipment to determine presence of toxic agents. | All effects of gases, dusts, vapours, mists, fumes | Result of combustion, ex: burning materials, smoke from welding |
## ANNEX B

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<tr>
<td>6. Biological Agents</td>
<td>Biological agents are found in a variety of locations. Take extreme care when working near health care facilities or industrial processes using biological agents. Conscientious personal hygiene is essential.</td>
<td>Testing for presence of biological agents is very difficult. If you know the type of agent, then perform the specific testing.</td>
<td>Ill health, disease, disorders, irritation and death.</td>
<td>1. Bacterial and viral infections.</td>
</tr>
<tr>
<td><strong>B. PHYSICAL SAFETY HAZARD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Entry/Exit (Access/ Egress)</td>
<td>Openings that are small, narrow or otherwise difficult to negotiate can be a serious hazard. When using self contained breathing apparatus, openings must be of a size to allow employee with equipment properly worn to pass through. Access openings less than 700 millimeters (28 inches) are not recommended.</td>
<td>Visual identification of obstructions that could interfere with normal movement or emergency rescue.</td>
<td>Injury, disability, and death</td>
<td>1. Exits at height that could cause falls 2. Constricted openings 3. Angled openings 4. Exits into traffic and machinery 5. Exits at deep depths</td>
</tr>
<tr>
<td>2. Ventilation Systems</td>
<td>Lack of adequate ventilation may cause a build-up of contaminants. Ventilation systems can introduce hazards into the work area, ex: carbon monoxide (CO) fumes.</td>
<td>Monitoring (anemometer, smoke tubes for air movement). Toxic monitors may also be necessary to ensure good quality air.</td>
<td>Explosion, disease, irritation, injury, disability and death</td>
<td>Improper ventilation can result in: 1. Oxygen level variations 2. Build up of toxic gases, vapours, dusts, mists, fumes, smoke. 3. Introduction of biological agents, toxic gases, explosive gases.</td>
</tr>
<tr>
<td>3. Machinery/ Mechanical Equipment</td>
<td>Make sure equipment is immobilized (de-energized) so that it will not be a hazard to employees.</td>
<td>Visual and function testing</td>
<td>Injury, disability and death</td>
<td>Drive belts, augers, paddles, scrapers, agitators and pumps</td>
</tr>
</tbody>
</table>
### ANNEX B

**CONFINED SPACE HAZARDS AND EFFECTS**

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Explanatory Notes</th>
<th>Methods of Test</th>
<th>Effects of Hazard</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Piping/Distribution Systems</td>
<td>Contents of pipes and supply lines, if allowed to enter a confined space can create a life threatening situation for employees.</td>
<td>Monitoring, visual</td>
<td>Chemical poisoning, drowning, burns, injury, disability, death</td>
<td>Steam lines, liquid distribution lines, feed mills and cement plants</td>
</tr>
<tr>
<td>5. Residual Chemicals/materials (I)</td>
<td>1. Residual corrosive or toxic chemicals. Ensure all lines, valves, and meters are completely drained and properly decontaminated.</td>
<td>Monitoring</td>
<td>Injury, disability, death, explosion</td>
<td>Storage tanks, digesters, liquid distribution systems, augers.</td>
</tr>
<tr>
<td>5. Residual Chemicals/materials (II)</td>
<td>1. Material that may be adhered to surfaces/walls of enclosures may collapse. 2. Loose granular material that may engulf employee. 3. Material that may encapsulate/trap other toxic/explosive materials. 4. Flooding by liquids.</td>
<td>Visual, monitoring</td>
<td>Engulfment, suffocation – drowning, injury, disability, death.</td>
<td>1. Silos, grain hoppers, fertilizer storage. 2. Sand, grains (ex: flax) 3. Build up of hydrogen sulphide (H₂S) 4. Flooding in underground facilities</td>
</tr>
<tr>
<td>7. Poor Visibility</td>
<td>Poor lighting, obstructions, work process and procedure, fog/mist due to high humidity.</td>
<td>Visual</td>
<td>Injury, disability and death</td>
<td>Improper/inadequate lighting, poor design of confined space, work process.</td>
</tr>
</tbody>
</table>
## ANNEX B

### CONFINED SPACE HAZARDS AND EFFECTS

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<th>Hazard</th>
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<th>Effects of Hazard</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Physical Obstacles</td>
<td>This would include obstacles that impede movement and performance of work and rescue procedures.</td>
<td>Visual</td>
<td>Inability to remove injured employee, contusions, abrasions, fractures, disability, injury, death.</td>
<td>Cross bracing, baffle plates, piping.</td>
</tr>
</tbody>
</table>
| 9. Walking/Working Surfaces    | Surfaces that are irregular in shape, sloped, angled, elevated, slippery, or obstructed are slip and fall hazards. Work areas may require toe boards to prevent objects from falling on employees below. | Visual          | Injury, disability, and death.                                                   | 1. Lift stations, aqueducts, dams                                         
|                                |                                                                                  |                 |                                                                                  | 2. Work areas that require toe boards to prevent objects from falling on employees below. |
| 10. Temperature Extremes       | Temperature extremes have definite health and safety hazards, as well as having a limiting effect on the ability of an employee to perform tasks adequately. | Thermometer, heat stress, wet bulb globe thermometer (WBGT) | 1. Frost bite, loss of co-ordination, hypothermia, disability, death.          | 1. Working in freezers, extreme cold climate conditions.                 
|                                |                                                                                  |                 | 2. Heat exhaustion, heat stress, disorientation, death.                         | 2. Working in boilers, super-heated areas (cooling towers), and areas with steam/heat distribution pipes. |
## ANNEX B
### CONFINED SPACE HAZARDS AND EFFECTS

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<th>Hazard</th>
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</tr>
</thead>
<tbody>
<tr>
<td>12. Noise</td>
<td>If sound levels exceed 80 decibels, then work practices shall conform to requirements of current regulations respecting hearing conservation and noise control in workplaces.</td>
<td>Sound level meters</td>
<td>Distraction, stress, disorientation, communication problems, hearing loss.</td>
<td>Sources include operating equipment, such as jack hammers, pumps, grinders, other work procedures.</td>
</tr>
<tr>
<td>Radiation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Hazardous</td>
<td>Rats, pigeons, mice and other vermin and their by-products (excrement). Snakes, other poisonous animals</td>
<td>Visual</td>
<td>Respiratory disease, injury, e.g. leptospirosis</td>
<td>rats, pigeons, bats, mice</td>
</tr>
<tr>
<td>Animals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### ANNEX B

**CONFINED SPACE HAZARDS AND EFFECTS**

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<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C. TYPE OF WORK TO BE PERFORMED</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Hot work, where the heat used or generated by the work process may cause an explosion.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Cold work, a situation where toxic substances or other hazards may exist.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **D. HUMAN FACTORS** | | | |
| 1. Phobias | Some employees are not suitable for work in confined spaces. As a result of these factors they can cause injuries to themselves or others. | Medical interview screening | Injury, disability, death | 1. Claustrophobia 2. Fear of heights |
| 2. Mental & Physical Condition | All employees must be mentally and physically capable of performing the work. | Visual, medical examination (pre employment, annuals) | Injury, disability, death | 1. Intoxication (alcohol, drug abuse) 2. Impairment (prescription medication) |
## ANNEX C

### SAMPLE OF CONSTRUCTION ACTIVITIES RISK ASSESSMENT (CARA – HIRARC) FOR CONFINED SPACE

<table>
<thead>
<tr>
<th>Item</th>
<th>Work Activity</th>
<th>Hazard</th>
<th>Consequences / Effect may cause</th>
<th>Existing Control</th>
<th>Likelihood</th>
<th>Severity</th>
<th>Risk Rating</th>
<th>Risk Classification</th>
<th>Recommended Control Measures</th>
</tr>
</thead>
</table>
| 1    | Manhole Cleaning    | Oxygen Deficiency       | Slowing down of pulse rate, disorientation, unconsciousness, and death | No existing risk control measure | 3          | 3        | 9           | YELLOW-Medium         | a. ENGINEERING CONTROL (EC)  
  - Conduct gas test before signing entry permit  
  - Ensure ventilation fan in good working condition  
  b. ADMINISTRATIVE CONTROL (AC)  
  - To provide Entry Supervisor  
  - To conduct Toolbox Talk  
  - Work must be carried out by competence person  
  c. PPE Control (PC)  
  - Wearing of proper SCBA and shall be tested |
|      |                     | Poisonous Gases / Vapour / Fumes | Can cause euphoria, disorientation, drowsiness, headaches, weakness, injury, disability and death. | No existing risk control measure | 2          | 3        | 6           | YELLOW-Medium         | a. ENGINEERING CONTROL (EC)  
  - Conduct gas test before signing entry permit  
  - Ensure ventilation fan in good working condition |
<table>
<thead>
<tr>
<th>RISK</th>
<th>GREEN-LOW</th>
<th>YELLOW-Medium</th>
<th>RED-High</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. ADMINISTRATIVE CONTROL (AC)</td>
<td>To provide Entry Supervisor</td>
<td>- To conduct Toolbox Talk</td>
<td>- Work must be carried out by competence person</td>
</tr>
<tr>
<td>c. PPE Control (PC)</td>
<td>Wearing of proper SCBA and shall be tested</td>
<td>- Ensure working gloves and face mask is worn at all time when performs cleaning activity</td>
<td>- Working gloves shall be disposable type</td>
</tr>
<tr>
<td>a. ENGINEERING CONTROL (EC)</td>
<td>Conduct gas test before signing entry permit</td>
<td>- Ensure ventilation fan in good working condition</td>
<td>- No existing risk control measure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Slowing down of pulse rate, disorientation, unconsciousness, and death</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Oxygen deficiency</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Can cause mild fever, diarrhea, other contagious diseases</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Contact with bacteria/disease</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- No existing risk control measure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- No existing risk control measure</td>
</tr>
</tbody>
</table>

32
<table>
<thead>
<tr>
<th>Throughput</th>
<th>Hazard Description</th>
<th>Risk Control Measure</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxic Gases / Fumes</td>
<td>Can cause euphoria, disorientation, drowsiness, headaches, weakness, injury, disability and death.</td>
<td>No existing risk control measure</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Explosion / Fire</td>
<td>Explosion, burns, multiple injuries, death</td>
<td>No existing risk control measure</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

- **To conduct Toolbox Talk**
- **Work must be carried out by competence person**
- **c. PPE Control (PC)**
  - Wearing of proper SCBA and shall be tested

- **a. ENGINEERING CONTROL (EC)**
  - Conduct gas test before signing entry permit
  - Ensure ventilation fan in good working condition

- **b. ADMINISTRATIVE CONTROL (AC)**
  - To provide Entry Supervisor
  - To conduct Toolbox Talk
  - Work must be carried out by competence person

- **c. PPE Control (PC)**
  - Wearing of proper SCBA and shall be tested

**Explosion / Fire**
- **YELLOW-Medium**
  - Conduct gas test before signing entry permit
  - Gas test shall be performed periodically to ensure no signs of flammable gas detected.
|   |   |   |   |   |   | b. ADMINISTRATIVE CONTROL (AC)  
  |   |   |   |   |   |   |  
  |   |   |   |   |   |   | • To provide Entry Supervisor  
  |   |   |   |   |   |   | • To conduct Toolbox Talk  
  |   |   |   |   |   |   | • Work must be carried out by competence person  
  |   |   |   |   |   |   | • Only non-explosive tools shall be allowed to use in confined space.  
  |   |   |   |   |   |   | • Firefighting personnel and equipment shall be in standby mode  
  |   |   |   |   |   |   | c. PPE Control (PC)  
  |   |   |   |   |   |   | • Wearing of proper SCBA and shall be tested  

ANNEX C

Note:

<table>
<thead>
<tr>
<th>Level</th>
<th>Severity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Catastrophic</td>
<td>Death, fatal diseases or multiple major injuries.</td>
</tr>
<tr>
<td>4</td>
<td>Major</td>
<td>Serious injuries or life-threatening occupational diseases (includes amputations, major fractures, multiple injuries, occupational cancers, acute poisoning, disabilities and deafness).</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Injury or ill-health requiring medical treatment (includes lacerations, burns, sprains, minor fractures, dermatitis and work-related upper limb disorders).</td>
</tr>
<tr>
<td>2</td>
<td>Minor</td>
<td>Injury or ill-health requiring first-aid only (includes minor cuts and bruises, irritation, ill-health with temporary discomfort).</td>
</tr>
<tr>
<td>1</td>
<td>Negligible</td>
<td>Negligible injury.</td>
</tr>
</tbody>
</table>

A guide to severity rating

<table>
<thead>
<tr>
<th>Level</th>
<th>Likelihood</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rare</td>
<td>Not expected to occur but still possible.</td>
</tr>
<tr>
<td>2</td>
<td>Remote</td>
<td>Not likely to occur under normal circumstances.</td>
</tr>
<tr>
<td>3</td>
<td>Occasional</td>
<td>Possible or known to occur.</td>
</tr>
<tr>
<td>4</td>
<td>Frequent</td>
<td>Common occurrence.</td>
</tr>
<tr>
<td>5</td>
<td>Almost Certain</td>
<td>Continual or repeating experience.</td>
</tr>
</tbody>
</table>

A guide to likelihood rating
<table>
<thead>
<tr>
<th>Likelihood Severity</th>
<th>Rare (1)</th>
<th>Remote (2)</th>
<th>Occasional (3)</th>
<th>Frequent (4)</th>
<th>Almost Certain (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic (5)</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Major (4)</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>Moderate (3)</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Minor (2)</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Negligible (1)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Risk matrix with numeric ratings

<table>
<thead>
<tr>
<th>Risk level</th>
<th>Risk Acceptability</th>
<th>Recommended Actions</th>
</tr>
</thead>
</table>
| Low        | Acceptable         | • No additional risk control measures may be needed.  
|            |                    | • Frequent review and monitoring of hazards are required to ensure that the risk level assigned is accurate and does not increase over time. |
| Medium     | Tolerable          | • A careful evaluation of the hazards should be carried out to ensure that the risk level is reduced to as low as reasonably practicable (ALARP) within a defined time period.  
|            |                    | • Interim risk control measures, such as administrative controls or PPE, may be implemented while longer term measures are being established.  
|            |                    | • Management attention is required. |
| High       | Not acceptable     | • High Risk level must be reduced to at least Medium Risk before work starts.  
|            |                    | • There should not be any interim risk control measure. Risk control measures should not be overly dependent on PPE.  
|            |                    | • If practicable, the hazard should be eliminated before work starts.  
|            |                    | • Management review is required before work starts. |

Low, Medium and High Action for Risk Level

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### SUMMARY OF PROCEDURE FOR CONFINED SPACE ENTRY

1. **Request for work**
   - Can work be done without entry to confined space?
     - NO: Prohibit entry during work
     - YES: Perform work from outside

2. **Request for work**
   - Can work be done without entry to confined space?
     - NO: Prohibit entry during work
     - YES: Perform work from outside

3. **Hazard Identification/ risk assessment**
   - Is atmosphere explosive or oxygen-enriched?
     - NO: Move to next step
     - YES: Ventilate to dilute unsafe atmosphere

4. **Is atmosphere safe for entry?**
   - NO: Must work continue?
     - NO: Evacuate confined space
     - YES: Must work continue?
       - NO: Evacuate confined space
       - YES: Select issue appropriate breathing apparatus

5. **Evaluate atmosphere**
   - Is atmosphere explosive or oxygen-enriched?
     - NO: Move to next step
     - YES: Ventilate to dilute unsafe atmosphere

6. **Test/monitor atmosphere regularly**
   - Is atmosphere still safe for current entry situation?
     - NO: Evacuate confined space
     - YES: Must work continue?
       - NO: Evacuate confined space
       - YES: Select issue appropriate breathing apparatus

7. **Issue personal protective clothing and equipment**
   - Must work continue?
     - NO: Evacuate confined space
     - YES: Authority to enter or work in confined space

8. **Clearing and purging if necessary**
   - Entry to confined space
     - Is atmosphere explosive or oxygen-enriched?
       - NO: Move to next step
       - YES: Ventilate to dilute unsafe atmosphere
     - YES: Authority to enter or work in confined space

9. **Evaluate atmosphere**
   - Is atmosphere explosive or oxygen-enriched?
     - NO: Move to next step
     - YES: Ventilate to dilute unsafe atmosphere

10. **Evacuate confined space**
    - Must work continue?
      - NO: Evacuate confined space
      - YES: Select issue appropriate breathing apparatus

11. **Authorisation to enter or work in confined space**
    - Is atmosphere explosive or oxygen-enriched?
      - NO: Move to next step
      - YES: Ventilate to dilute unsafe atmosphere
    - YES: Authority to enter or work in confined space

12. **Issue personal protective clothing and equipment**
    - Must work continue?
      - NO: Evacuate confined space
      - YES: Authority to enter or work in confined space

13. **Clearing and purging if necessary**
    - Entry to confined space
      - Is atmosphere explosive or oxygen-enriched?
        - NO: Move to next step
        - YES: Ventilate to dilute unsafe atmosphere
      - YES: Authority to enter or work in confined space

14. **Evaluate atmosphere**
    - Is atmosphere explosive or oxygen-enriched?
      - NO: Move to next step
      - YES: Ventilate to dilute unsafe atmosphere

15. **Evacuate confined space**
    - Must work continue?
      - NO: Evacuate confined space
      - YES: Select issue appropriate breathing apparatus

16. **Hazard Identification/risk assessment**
    - Is atmosphere still safe for current entry situation?
      - NO: Evacuate confined space
      - YES: Must work continue?
        - NO: Evacuate confined space
        - YES: Select issue appropriate breathing apparatus

17. **Is atmosphere explosive or oxygen-enriched?**
    - NO: Move to next step
    - YES: Ventilate to dilute unsafe atmosphere

18. **Evaluate atmosphere**
    - Is atmosphere explosive or oxygen-enriched?
      - NO: Move to next step
      - YES: Ventilate to dilute unsafe atmosphere

19. **Evacuate confined space**
    - Must work continue?
      - NO: Evacuate confined space
      - YES: Select issue appropriate breathing apparatus

20. **Approve for return for service**
    - Work completed/suspended
      - YES: Approve for return for service
      - NO: Evacuate confined space
1. (a) Location of Work: ______________________________________
   (b) Authorized Entrants: ______________________________________
   (c) Contractor: ______________________________________________

2. (a) Description of Work to be undertaken:

   Possible Hazards:

   __________________________________________________________________________
   __________________________________________________________________________

   Initiation of Request: __________________________ Date: _______________
   Entry Date: ______________________ Time: __________________

THE WHOLE OF THE REMAINING DETAILS OF THIS PERMIT MUST BE AUTHORIZED BEFORE WORK IS TO PROCEED AND ONLY WORK LISTED MAY BE DONE

1. ISOLATION OF CONFINED SPACE

   The items ticked below have been isolated or made safe:
   □ Pipelines (Water, Steam, Gas, etc)
   □ Mechanical/Electrical drives
   □ Sludge/Deposits/Waste
   □ Harmful materials
   □ Electrical services
   □ Warning notices, locks or tags have been fixed to means of isolation

   Entry Supervisor: ________________________________________________

2. ATMOSPHERIC TEST REQUIREMENTS

   The atmosphere has been tested to ensure no oxygen deficiency or excess and for the following contaminants: (Fill in details and results of tests)
   ( Oxygen ) ___________________________ (Acceptable if content between 20.8% to 23.5%)
   ( Gas ) _______________________________ (Flammable / explosive gas not more than 10% of its LEL)
   ( Toxic gas ) _________________________ (Toxic gas should be its PEL)
   ( Others ) __________________________

   Continuous monitoring of the atmosphere required / not required*. (*Delete as appropriate)
   Continuous ventilation required / not required *. (*Delete as appropriate)

   The conditions are safe for entry under the conditions ticked below:
   □ With a supplied-air respiratory protective device.
   □ With an air purifying (non-air-supplied) respiratory protective equipment.
   □ Without a respiratory protective device.

   Testing time: ______________ Date: ______________ Authorized Gas Tester: ______________
3. PERSONAL PROTECTIVE EQUIPMENT (PPE)

The following PPE ticked below shall be worn:

- Supplied-air respirators
- Air purifying respiratory protective devices.
- Safety belt, harness and/or safety line or life line/rescue line
- Eye protectors
- Hand protection
- Feet protection
- Protective clothing
- Hearing protectors
- Safety helmets

Entry Supervisor: ________________________________

4. USE OF CHEMICAL AGENTS (Details to be completed)

No chemical agents other than those listed below to be taken into the confined space:

(a) __________________________________________________________________________

(b) __________________________________________________________________________

(c) __________________________________________________________________________

(d) __________________________________________________________________________

Entry Supervisor: ________________________________

5. HOT WORK

The precautions ticked below must be observed:

- Area clean and free of all readily combustible materials with in 15 meters.
- All drains within 15 meters covered with wet fireproof blanket.
- Appropriate fire extinguishers on site near source of ignition.
- A water hose run to job site and tested/left running.
- All sparks for work more than 2 meters above ground contained completely by use of a suitable enclosure that shall be inspected before commencing work.
- Welding machine/gas cylinders located ______________________ (not within 8 meters of any drains)
- Welding machine earthed directly to equipment being welded as close to welding point as possible.
- Power leads not draped across pipelines or access ways.
- Electrical trace on pipes isolated.
- Hot work permissible/not permissible* inside the space. (*Delete as appropriate)

Hot Work Permit Issuer: ________________________________

6. STAND-BY PERSON AND RESCUE ARRANGEMENTS

Stand-by persons are ________________________________ (identify)

Rescue and emergency procedure are understood and have been posted.

Stand-by person: ________________________________
ANNEX E

ANY EMERGENCY CALL EXT:

7. OTHERS PRECAUTIONS
   Precautions ticked below have been implemented:

   □ Warning notices/barricades are in position.
   □ Smoking has been precluded in confined space.
   □ Special precautions (indicate) _________________________________________________

   Entry Supervisor: ______________________________________________________________

8. AUTHORIZATION (To be completed)
   The confined space described above is in my opinion in a safe condition for the work to be done, provided that the precautions above are fully observed.

   Responsible person ________________ Time ________________ Date ________________
   Valid until _______________________ Time ________________ Date ________________

   I/We understand the procedure required for entry and work in the confined space and the precautions measures and equipment to be used.

   Signed ______________________ Date ________________ Time ________________
   ______________________ Date ________________ Time ________________

   SIGNED OFF
   All persons have left confined space and further entry should not be permitted unless a new entry permit is signed.

   Project Owner: ______________________________________________________________

10. WORK COMPLETED/SUSPENDED
    All persons/equipment* have been withdrawn, the work has been completed/suspended* and any plant/machinery* is deemed fit/not fit* for use. (*delete as appropriate)

    The following observation(s) of unsatisfactory aspects of the operation in the confined space are noted for attention prior to undertaking similar operations. (attached separate sheet if necessary)

    __________________________________________________________________________
    __________________________________________________________________________
    __________________________________________________________________________

   Entry Supervisor: ______________________________________________________________

11. ACCEPTANCE OF COMPLETED JOB
    I accept the work as defined in Section 2 of this Permit has been completed.

   Entry Supervisor: ______________________________________________________________
1. Make: ________________________________

2. Model number: ________________________________
   Serial number: ________________________________

3. Type of monitor: ________________________________

4. Date of purchase: ________________________________

5. Date calibrated: ________________________________
   Calibrated by: ________________________________

Notes:

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________
ANNEX F

HEALTH EXAMINATION CHECKLIST FOR WORKING IN CONFINED SPACE

(TO BE FILLED UP BY OCCUPATIONAL HEALTH DOCTOR (OHD))

This is to certify that the below statement are true. I give consent to the OHD for medical examination and to communicate with the management regarding my work capability after discussion with me.

Employee’s Signature: _______________________________ Date: _______________________

A) Employee

Name: ___________________________________________

Address: ________________________________________

Tel No. : _______________________

IC No. : _______________________

Age : _______________________

Sex : Male ☐ Female ☐

Ethnic : Malay ☐ Chinese ☐ Indian ☐ Other ☐

Marital Status: Single ☐ Married ☐

Nationality : Malaysian Citizen ☐ Non Malaysian Citizen ☐
B) Next of kin to be contacted in case of emergency

Name : ____________________________________________________________

Relationship : ______________________________________________________

Address : __________________________________________________________
____________________________________________________________________
____________________________________________________________________

Tel No : ____________________________

C) Employer

Name : ____________________________________________________________

Address : __________________________________________________________
____________________________________________________________________
____________________________________________________________________

Tel No : ____________________________ Fax No / Email : ______________________

D) Occupational history

1. Job title : _________________________________________________________

2. Duration of service : ________________________________

3. Any training received for this job Yes ☐ No ☐

4. Other Job (Other This Job) : _______________________________________

5. H/O using PPE Yes ☐ No ☐
   Specify __________________________________________________________

6. H/O Allergy of difficulty in using PPE Yes ☐ No ☐

7. Specify _________________________________________________________

E) Family history

1. H/O medical illness Yes ☐ No ☐

2. H/O allergy Yes ☐ No ☐

3. Other illness (specify) Yes ☐ No ☐

Specify (if yes) ______________________________________________________

43
F) For female only
Currently Pregnant Yes [ ] No [ ]

G) Physical examination
1. Anthropometry
   a) Weigh: ______________________ kg
   b) Height: ____________________ cm
   c) BMI: _______________________

2. Vital sign
   a) Blood Pressure: ______________ mmHg
   b) Pulse: ______________ per minute

3. General Condition:
   a) Eye:
      i Visual acuity
      ii Visual field
      iii Colour vision
      iv Funduscropy
   b) Ear:
      i External ear
      ii Tympani membrane
      iii Air condition
      iv Bone conduction
   c) Nose
      Right | Left
   d) Throat: ______________________
   e) Skin: _______________________
   f) Lymph nodes: ______________________


### 4. Target organ

<table>
<thead>
<tr>
<th>No</th>
<th>Normal</th>
<th>Abnormal</th>
<th>Specify (If abnormal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Central Nervous System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Cardiovascular System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>Respiratory System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>Gastrointestinal System</td>
<td></td>
<td></td>
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<tr>
<td>e)</td>
<td>Endocrine System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>Renal System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g)</td>
<td>Musculoskeletal System</td>
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</tbody>
</table>

### H) Investigation

<table>
<thead>
<tr>
<th></th>
<th>Date</th>
<th>Normal</th>
<th>Abnormal</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>FBC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>UFEME</td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>Spirometry</td>
<td>FVC</td>
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<td></td>
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<td>FEV1</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>FEV 1 / FVC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Other (specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
One the basic of the applicant's personal declaration, my clinical examination and diagnostic test result recorded on the medical examination form, I declare that this employees is FIT/NOT FIT* for working in confined space. (*delete if not appropriate)

Doctor signature :_____________________________

Name of OHD :_____________________________ DOSH RN :____________________

Name of clinic :_____________________________ Clinic Tel No. :____________________

Fax No. :_____________________________ E-mail add :_________________________

Date :_____________________________
HEALTH FITNESS CERTIFICATE FOR WORKING IN CONFINED SPACE

Name of person examined:______________________________________________________________

NIRC/Passport No:_________________________        Date of Birth _____________________

Name and addressed of employer

_________________________  __________________________
_________________________  __________________________
_________________________  __________________________

I hereby certify that I have examined the above named person on____________________. From the information related to health being declared by the person, my clinical examination and diagnostic test recorded on medical examination form, I certify that this person is FIT / NOT FIT ( *delete if not appropriate) for working in confined space.

Doctor’s Signature :__________________________

Name of OHD :___________________________

DOSH Register No :________________________

Name of Clinic :__________________________

Tel :__________________________

Fax :__________________________
ANNEX H

DECLARATION OF HEALTH STATUS BY AUTHORISED ENTRANCE

Name: ________________________________________________________________

NIRC / Passport No._____________________________________________________

Date of Birth : _____________________ Sex: _________________________________

Name and Address Employer :

_____________________________________________________________________

_____________________________________________________________________

I hereby would like to declare that having following sickness____________________________

and felt FIT / NOT FIT to works in confined space for ___________________________(Date)

Remarks (if any): __________________________________________________________

_____________________________________________________________________

Signature

_________________________________________

Date
ACKNOWLEDGEMENT

Construction Industry Development Board Malaysia would like to extend our sincere appreciation to all those involved in the development of this Standard.

Advisor of Construction Industry Standard
Dato' Ir. Ahmad 'Asri Abdul Hamid

Chairman of Construction Industry Standard Main Committee
Datuk Ir. Elias Ismail

Technical Committee

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ir. M. Ramuseren (Chairman)</td>
<td>Construction Industry Development Board Malaysia</td>
</tr>
<tr>
<td>Puan Norhidayah Razali (Secretary)</td>
<td></td>
</tr>
<tr>
<td>Puan Elaini Binti Wahab</td>
<td>Department of Occupational Safety and Health</td>
</tr>
<tr>
<td>Encik Mohammad Fakharazi Bin Ahmad Tarmizi</td>
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<tr>
<td>Encik Ahmad Firdaus Bin Mohd Noh</td>
<td>Perbadanan Kemajuan Negeri Selangor</td>
</tr>
<tr>
<td>Encik Mohd Syafiq Bin Mohd Yusof</td>
<td>Ekovest Construction Sdn Bhd</td>
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<td>Encik Mohd Noraiman Bin Jaafar</td>
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<td>Encik Rozaimy Bin Amiruddin</td>
<td>IJM Corporation Berhad</td>
</tr>
<tr>
<td>Encik Kamaruzaman Bin Mohamed Isa</td>
<td>Naza TTDI Sdn Bhd</td>
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<tr>
<td>Encik W. Vincent Rajkumar</td>
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<td>Encik Kamarul Faezai Bin Salim</td>
<td>S P Setia Bhd</td>
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<tr>
<td>Ir. K. Sundraraj</td>
<td>Association of Consulting Engineers Malaysia</td>
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<tr>
<td>Major (R) Leong Yee Keong</td>
<td>Master Builders Association Malaysia</td>
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<tr>
<td>Encik Wong Kheng Siew</td>
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<tr>
<td>Encik Nor Azahar Md Husain</td>
<td>Real Estate and Housing Developers’ Association</td>
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<td>Puan Siti Noor Aziah Yaacub</td>
<td>Malaysia</td>
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<tr>
<td>Encik Mohamad Redzuan Shah Bin Masri</td>
<td>National Institute Occupational Safety and Health</td>
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<tr>
<td>Encik Mohammad Irwan B. Mohd Pilus</td>
<td>Malaysia Society for Occupational Safety and Health</td>
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<tr>
<td>Dr. Yap Soon Poh</td>
<td>Universiti Malaya</td>
</tr>
<tr>
<td>Encik Nasaruddin Bin Abd Rahman</td>
<td>Universiti Teknologi Mara</td>
</tr>
</tbody>
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