

<b>SAFETY CODE FOR IRON &amp; STEEL SECTOR</b>		
MINISTRY OF STEEL, GOVT. OF INDIA	<b>WORKING IN CONFINED SPACE</b>	Doc. No: SC/03
		Rev no. : 00 Effective Date : --

## 1. OBJECTIVE

Objective of this code is to provide the safe work practices required for Confined Space entry and to protect personnel from the hazards of entering & performing jobs in Confined spaces.

Some of the hazards frequently encountered in the confined spaces are:

- 1.1 Oxygen deficiency/ enrichment
- 1.2 Presence of toxic, flammable or asphyxiating gases
- 1.3 Entry/ liberation of hazardous material/ gases/ water during work
- 1.4 Presence of rotating equipment
- 1.5 Need to work in cramped or un-natural postures
- 1.6 Dusty environment
- 1.7 Tripping hazards
- 1.8 Inadequate illumination
- 1.9 Fire/ explosion
- 1.10 Electric Shock

## 2. SCOPE

This code applies to all Works and project sites of Iron & Steel companies

## 3. PROCEDURE

### 3.1 Definitions

#### i) Confined Space

A confined space in a plant has limited means for entry or exit. It is not designed for continuous occupancy. It is so configured that an employee/ employees can enter and perform only the assigned work in the space within a designated time and is having one or more hazards listed above.

Examples of confined spaces are: pits, excavations, cable tunnels, sewers, vessels, storage tanks, gas holders, inside pipelines, cyclones, dust catchers, electrostatic precipitators, scrubbers, etc.

- a) LEL: Lower explosive limit
- b) LOTO: Lock out Tag out
- c) TLV- TWA : Threshold Limit Value – Time Weighted Average

### 3.2 PRECAUTIONARY STEPS

For safe working inside a confined space, the following must be ensured:

- i) A cross functional team should identify all the confined spaces in the plant/ projects areas and assign an identification number.
- ii) The owner department/ Executing Authority shall prepare a Safe Work procedure/ protocol after detailed Hazard Identification & Risk Assessment or Job Safety Analysis ( JSA) in conjunction with Safety Officer.
- iii) The site arrangement for safe working must be inspected by Safety officer, owning department and Executing Agency before the workmen are allowed to enter the space.
- iv) Entry permit, as in **ANNEXURE-I**, will be signed by all the above representatives and finally approved by the concerned HOD/ Section In-charge of the owning/ executing Authority.
- v) Noticeable cautions sign “Notice - Confined Space Entry Permit Required for Entry.” shall be displayed. Barricades and signs shall be put up to warn and prevent unauthorized access to the work area where confined work is in progress.
- vi) Ensure that the confined space is thoroughly free of all hazardous or corrosive substance such as gases, all kinds of fumes, chemicals, muck and solid wastes, etc. Also, it must be free from decaying vegetation and animal waste that may release Methane gas.
- vii) For clearing of smeared containments muck, solid waste etc, a safe procedure to be included in the protocol.
- viii) It shall be ensured that the confined space is completely isolated from the connected system with blank plates having correct size, material of construction and appropriate pressure rating wherever necessary and separated from all the utility systems such as inert gases, fuel gases, steam, water and other fluid connections.
- ix) Ensure that either natural or mechanical ventilation is provided to the confined space. It must also be adequate to remove fumes generated during various activities. A responsible person from the concerned department must ensure the adequacy of ventilation and rescue arrangements.
- x) Ensure that all the moving parts of equipment inside the confined space are adequately guarded and the power supply disconnected with LOTO.

- xi) Ensure adequate illumination inside the confined space. All portable illumination system shall be up to 24 Volt only. (Ref 36A of Factories Act 1948).
- xii) Ensure that all the portable electrical equipment used in a confined space are either grounded or double insulated or equipped with earth leakage cut out safety system. In case there is a likelihood of presence of explosive fumes or gases, all the electrical devices used must be of a type approved for such application.
- xiii) A calibrated multi gas detector (CO, O<sub>2</sub>, LEL) shall be made available with the working people for continuous monitoring of working inside the confined space (with ventilation off) to check for:
  - a) Oxygen deficiency and Oxygen enriched atmosphere
  - b) Presence of toxic substances, wherever applicable
  - c) Explosive concentration, wherever applicable
- xiv) It shall be ensured that all gaseous, toxic and explosive components are well within the prescribed limit before allowing the people to go inside. [Ref 36.2(a) of Factories Act 1948]
- xv) Continuous monitoring shall be used when the activity inside the confined space can alter atmospheric conditions or there is a known activity-taking place outside the space during the entry that has direct potential to alter the atmospheric conditions inside the space. Periodic monitoring (not more than 2 hours apart) shall be done in the cases when the condition inside the confined space is not likely to be altered because of the work inside the confined space and/or activities being carried out in the surrounding space.
- xvi) If the workmen are using oxygen consuming equipment (torches, burners etc) ensure that the confined space is continuously provided with sufficient air to maintain minimum Oxygen concentration of 19.0% to 23% by volume.
- xvii) A designated supervisor of the executing agency must be deputed outside the confined space whose sole responsibility will be to watch the safe execution of work, sound an alarm and render assistance immediately, if required.
- xviii) There must be a suitable means of voice communication between the workmen inside the confined space and the Supervisor outside. If for some reason, it is not possible to use a voice communication device, a proper signaling system shall be established between the workmen inside and the Supervisor.
- xix) Ensure that the persons working in a confined space are provided with adequate personal protective devices such as Safety Harness, gas masks, breathing apparatus, gas detector/ personal sampler with alarm facility, etc as per requirement. [Ref Section 36.2(b) of Factories Act 1948]

- xx) According to the nature of work and the risk involved due to presence of toxic gases and fumes, the working spell shall be interrupted by rest periods during which the person shall come out and breathe in open air. The maximum allowable spell of work shall be recorded clearly in the protocol.
- xxi) A person who has already worked for 8 hours in a confined space, must not be allowed to work further on the same day.
- xxii) If the person working inside is wearing a full body Harness with double lanyard, care must be taken to ensure that he is anchored with lifeline and proper arrangements so that he can be pulled out and rescued immediately in case of emergency. Provision of rescue team shall be kept ready for dealing with such incidents.
- xxiii) In case of gas cutting and welding in a confined space, ensure that all the hoses are free from leaks. Compressed gas bottles/cylinders are forbidden inside a confined space. The gas torches should be lighted outside the confined space and the space must be tested for explosive atmosphere each time before a lighted torch is taken inside. [Ref Section 37.4 of Factories Act 1948]
- xxiv) As far as practicable all confined space job are to be planned during day light hour.
- xxv) Whenever combustion type equipment is used in a confined space, ensure that the exhaust gases are vented outside.
- xxvi) Ensure that the warning notices/ caution boards are displayed outside the confined space at appropriate visible locations.
- xxvii) Each time a man goes in or comes out of the confined space, a proper record with their signature must be maintained at site by the supervisor/ executing Authority.
- xxviii) After the completion of the work, men and material must be removed from the confined space and permit to work shall be returned by the representative of the executing agency to the designated officer of the owning department.
- xxix) Emergency plan: To deal with any serious and imminent danger to workers inside a confined space, appropriate emergency procedures should be formulated and implemented according to the nature of the confined space, the risks involved and the nature of an emergency rescue .
- xxx) Assigned Duties:
  - a) Authorized entrant

Authorized entrants are required to:

- Know space hazards, including information on the means of exposure such as inhalation or dermal absorption, signs of symptoms and consequences of the exposure;
- Use appropriate personal protective equipment properly;
- Maintain communication with attendants as necessary to enable them to monitor the entrant's status and alert the entrant to evacuate when necessary;
- Exit from the permit space as soon as possible when:
  - ✓ Ordered by the authorized person;
  - ✓ He or she recognizes the warning signs or symptoms of exposure;
  - ✓ A prohibited condition exists; or
  - ✓ An automatic alarm is activated.
- Alert the attendant when a prohibited condition exists or when warning signs or symptoms of exposure exist.

b) Attendant

The attendant is required to:

- Remain outside the permit space during entry operations unless relieved by another authorized attendant;
- Perform non-entry rescues when specified by the employer's rescue procedure;
- Know existing and potential hazards, including information on the mode of exposure, signs or symptoms, consequences and physiological effects;
- Maintain communication with and keep an accurate account of those workers entering the permit space;
- Order evacuation of the permit space when:
  - ✓ A prohibited condition exists;
  - ✓ A worker shows signs of physiological effects of hazard exposure;
  - ✓ An emergency outside the confined space exists; and
  - ✓ The attendant cannot effectively and safely perform required duties.
- Summon rescue and other services during an emergency;
- Ensure that unauthorized people stay away from permit spaces or exit immediately if they have entered the permit space;
- Inform authorized entrants and the entry supervisor if any unauthorized person enters the permit space; and
- Perform no other duties that interfere with the attendant's primary duties.

**References:**

1. IPSS:1-11-006-14 'Guidelines for Working in a Confined Space'
2. 'Safe Work in confined space'- Published by Occupational Safety & Health Branch., Deptt. of Labour, Govt. of Hongkong

3. Tata Power Co. Ltd. 'Confined Space Entry Procedure' standard
4. Tata Steel Limited 'Working in Confined Space' standard
5. OSHA 3138-01R 2004 "Permit required Confined Space"

**ANNEXURE-I**

**PERMIT-TO-WORK FOR WORKING IN CONFINED SPACE**

(For working in a confined space containing toxic/ inflammable/ explosive gases/ vapors/ chemicals. Valid only for 1-day)

Warning: Working in a confined space is hazardous. Special precautions must be taken)

**A. GENERAL (TO BE FILLED IN BY EXECUTING AUTHORITY)**

1. Brief description of job: \_\_\_\_\_

2. Exact location & name of equipment/confined \_\_\_\_\_

Space where work is to be done \_\_\_\_\_

3. Executing Deptt. \_\_\_\_\_ Name of agency \_\_\_\_\_

4. Name, designation & Contact No. of Executive \_\_\_\_\_

5. All contractor workers taken safety induction training from Safety Engineering Department (SED)? \_\_\_\_\_

6. Name & designation of observer provided exclusively to keep a watch over persons working inside: \_\_\_\_\_

7. Adequate system of communication provided between persons working inside and observer? Y/N

8. The personnel entering confined space will use:

i) Breathing apparatus Y/N

ii) Safety Harness Y/N

9. Any Fuel Gas & Oxygen cylinders not kept inside the confined space. Yes/ No

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Designation: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Contact No. \_\_\_\_\_

**B. ELECTRICAL ACTIONS TAKEN**

1. Have all equipment connected with Sl.No. 2 been shutdown, fuses removed, earthed and caution tags displayed? \_\_\_\_ (YES/ NO)

ELECTRICAL SHUT DOWN NO. \_\_\_\_\_

2. Are low voltage lamps (24 V) provided at site? \_\_\_\_ (YES/ NO)

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Designation: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Contact No. \_\_\_\_\_

**C. OPERATIONAL ACTIONS TAKEN (TO BE FILLED BY OWNER/ OPERATION DEPTT)**

1. Confined space been depressurized and ventilated by opening Manholes, bleeders etc? \_\_\_\_\_

2. Confined space has been physically isolated by blank plates so as to prevent ingress of toxic gas/ vapors/ chemicals? \_\_\_\_\_

3. Artificial ventilation provided? \_\_\_\_\_ (YES/ NO)

4. Have adequate numbers of breathing apparatus & oxygen resuscitating equipment been kept at site? Specify quantities of each.

\_\_\_\_\_

5. Name the toxic gases/ vapors/ chemicals expected to be present.

\_\_\_\_\_

6. Have all equipment, connected with Sl. No. 2 been shutdown/ depressurized?

\_\_\_\_\_

7. Have any special arrangements been made like provision of fire extinguishers, clear water supply for chemical accidents, oxygen resuscitation equipment, fire brigade, ambulance etc. \_\_\_\_\_

8. Any other safety measure taken. \_\_\_\_\_

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Designation: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Contact No. \_\_\_\_\_



**D. MEASUREMENT OF TOXIC, EXPLOSIVE GASES & OXYGEN CONCENTRATION (TO BE FILLED BY ENERGY/FUEL MANAGEMENT DEPTT)**

1. What is the concentration of toxic gases ( shall be below 50 % of TLV-TWA)  
: \_\_\_\_\_
2. Is the confined space checked for explosive mixture and found safe?  
(LEL reading shall be zero ) \_\_\_\_\_
3. What is the concentration of Oxygen in the space and is it safe to undertake the job? (safe limits 19-23%) \_\_\_\_\_

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Designation: \_\_\_\_\_  
Date: \_\_\_\_\_ Time: \_\_\_\_\_ Contact No. \_\_\_\_\_

**E. ISSUANCE OF PERMIT-TO-WORK (TO BE FILLED BY OWNER/ OPERATION DEPTT)**

In view of the above safety measures taken, permit to work for the equipment at Sl. No. 2 is hereby issued. The executing personnel should use all relevant PPE's like BA Sets, Air line, Full Body Harness, Life line etc.:


This permit is valid for Dt: \_\_\_\_\_ from \_\_\_\_\_ Hrs to \_\_\_\_\_ Hrs


Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Designation: \_\_\_\_\_  
Date: \_\_\_\_\_ Time: \_\_\_\_\_ Contact No. \_\_\_\_\_


(To be signed by an Executive)


**CAUTION /WARNING/ DANGER**



 <p><b>WARNING</b></p>	<ul style="list-style-type: none"><li>• Provide caution board that vessel entry is in progress.</li><li>• Remove gas-cutting torch when not in use from confined space.</li></ul>
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 <p><b>CAUTION</b></p>	<p>Gas cylinder / welding machine shall never be taken in confined space</p>
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 <p><b>CAUTION</b></p>	<p>Isolation of confined spaces by simply closing of isolation valves shall not be accepted for man entry purpose.</p>
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 <p><b>CAUTION</b></p>	<p>Oxygen should not be used to ventilate the Confined Space</p>
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