HSE JOINING

HEALTH, SAFETY AND ENVIRONMENT TRAINING FOR JOINING

CONFINED SPACES

IO2 – EDUCATIONAL MATERIALS

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Definition

A work space, which by its size, site or configuration, has inadequate natural ventilation and/or limited room for welders to work. Access or egress may be difficult.

Figure 1-– Confined spaces. Source: IIS

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Risk Assessment

Confined space?

Table 1 - risk assessment confined spaces flowchart. Source:homesecurity.press/quotes/process-decision-program-chart.html

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Risk Assessment in a confined space

- **What could be inside the confined space that would pose a risk? Contents?**
- **Oxygen Deficiency?**
- **Previous Contents?**
- **Oxygen Enrichment?**
- **Residues?**
- **Structure and Layout?**
- **Conhtamination?**

What will be created due to the work carried out in the space?

- **Sources of ignition?**
- **Flamabkle substances?**

What's outside the space that might pose a risk during the proposed work?

- Inadequate isolation?
- Inadvertend Operation of plant?
- Nearby work activities?

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Confined space entry safety

Table 2 – Confined space entry safety. Source: Indian Safety Association

What is a confined space?

A confined space is na enclosed or partially enclosed space that:

- Is not primarily designed orintended for human occupancy
- Has restricted entrance or exit by way of location, size or means
- No natural lighting & ventilation

Hazards of Confined Spaces – Atmospheric

- Oxygen deficiente environment
- Oxygen enriched environment
- Toxic vapour/gas
- Flammable vapour/gas

Hazards of confined spaces – Physical

- Mechanical (eg. Blenders with tanks)
- Electrical (eg. Work, tools, lighting)
- Thermal
- Noise
- Engulfment
- Others

Confined Space entry procedure

- Must obtain entry permit signed by authorized person
- Adequate lighting & ventilation (Local exhaust ventilation)
- At least oneperson in a group must carry gas meter when entering in confined space, who has attended Gas meter Carried Training Conducted by Safety Department.
- Never enter alone
- Put the ID tag into tally box
- Must carry a Torch Light
- Gas meter carrier to enter first & level last

Entry permit system

- Purpose of entry
- Date/time of entry
- Location of confined space
- Results of gas testing (done by competente person)
- Validity of the permit
- Approval by authorised person

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Work Permit

WORK PERMIT:A safe work permit is a written record that authorizes specific work, at a specific work location, for a specific time period. Permits are used for controlling and co-ordinating work to establish and maintain safe working conditions. They ensure that all foreseeable hazards have been considered and that the appropriate precautions are defined and carried out in the correct sequence.

Entry Procedure Checklist: Complete the following steps before, during, and after a confined space entry:

Step 1

Obtain a Permit-Confined Space Entry Form from Program Coordinator.

Step 2

Notify Supervisor before the Confined Space Entry

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Work Permit

Step 3

Verify Confined Space Meter has been calibrated and is in working order

Step 4

Complete the top portion of the Permit-Confined Space Entry Form

Step 5

Ensure all rescue equipment (e.g. tripod, body-belt, lanyard) is in place prior to entry

Step 6

Monitor the confined space with the MSA 4-Gas Detector prior to entry. The entrant and attendant should sign the permit authorization section on the bottom of the permit to ensure all actions and conditions necessary for safe entry have been performed.

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Work Permit

Step 7

Employee entering the confined space should wear the 4-Gas Detector after the pre-atmosphere test. The employee should also have a full body harness and lanyard attached to the rescue tripod. Employee shall have a radio and any other necessary personal protective equipment.

Step 8

Employee can enter the confined once Step 7 is completed. The entrant and attendant should complete the Hazards of Confined Spaces and Special Requirements Section of the Permit-Confined Space Entry Form once the employee is within the confined space. The entrant should also gather the % Oxygen, % Explosive Gases, Carbon Monoxide, and Hydrogen Sulfide readings and communicate them to the attendant to place on the Permit Form.

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Work Permit

Step 9

The attendant should maintain constant communication with the entrant until the entrant has exited the confined space.

Step 10

The attendant should contact Supervisor once the entrant has exited the confined space.

Step 11

The Permit-Confined Space Entry Form should be given to program coordinator, to file in the Confined Space Records.

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WORK PERMIT

Figure 2- Forms. Source: http://www.sgworld.com/education-solutions/contractor-management/permits-to-work.html; www.osha.gov/dte/grant_materials/fy11/sh-22318-11/Mod_6_CSPermit.pdf; https://ohsonline.com/Articles/2006/04/Confined-Space-Entry-Part-3.aspx ; www.healthandsafetysigns.co.uk/product/confined-space-sticker-3/

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Watchman

The main role of the supervisor is to provide direct and close supervision of the entry operations performed by the entrants and confined space attendants.

Supervisors are responsible for:

a. ensuring that entrants and confined space attendants are briefed on the safety and health precautions to take prior to confined space entry and work;

b. authorizing entry into confined spaces;

c. ensuring that entrants and confined space attendants adhere to entry procedures;

Figure 3- Entrance. Source: http://etraintoday.com/blog/duties-of-confined-space-team-members/

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Watchman

d. rescue equipment and appointed rescue personnel are available when confined space work is to be carried out;

e. implementing control and preventive measures to manage all identified hazards are implemented;

f. applying the entry permit and have it endorsed by the Authorized Manager before commencement of confined space work;

g. terminating the entry permit after completion of work.

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Watchman

The risk assessment must be carried out by someone competent to do so. A competent person for these purposes will be someone with the necessary skills, knowledge and experience of, and familiarity with, the relevant processes, plant and equipment so that they understand the risks involved and can devise necessary precautions to meet the requirements of the Confined Spaces Regulations. In complex cases more than one person may be needed to assess the risks relating to specific areas.

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Figures 4, 5 & 6 - Confined Spaces. Source: https://igedesumantra999.wordpress.com/2012/02/14/confined-space-entry/; https://www.ingegneri.cc/accesso-a-spazi-confinati-aspetti-fondamentali-per-proteggere-gli-operatori.html & ISS Training materials

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Working Procedures

Figure 7 - Confined spaces. Source:ISS

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Working Procedures

Figure 8 – Working procedures. Source: ISS

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Welding: Fumes and Gases

Figure 9, 10 & 11 - Welding fumes and aspiration system. Source: from https://www.nederman.com/en-au/industry_solutions/welding_and_cutting; https://xfire.it/consulenza-e-formazione/addetti-a-lavorazioni-in-ambienti-confinati/

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Oxygen

Figure 12-welding reparation. Source: gwpsafety.com

Figure 13 – watchman. Source:
https://www.cchst.ca/oshanswers/hsprograms/confinedspace_program.html

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EMF & Electricity

In a confined spaces is a good practice to use 24 or 48 V to prevent electrocution and sparks which can explode.

Figure 14 – Sign. Source: https://www.warningsignsdirect.co.uk/index.php?cPath=516_689&osCsid=l2fahhij86ab67gmv1eqp5pts3

Figure 15- Welding EMF symbol.Source: https://taglioplasma.wordpress.com/article/taglio-plasma-manuale-2j79fs2s6qh46-3/

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Radiations

Figure 16 - Radiations. Source: http://ropeaccesswelding.blogspot.com/

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Ergonomy and Postural Diseases

Figure 17 – Welding positions. Source: IIS
Figure 18 - Welding operation in a confined space. Source: https://awsweldlink.org/careers/detail/pipeline-welder

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Noise

- Amplified due to acoustic within the space.
- Damage hearing, affect communication.

Figure 19 - Welding operation in a confined space. Source: ISS

Figure 21 – PPE. Source: https://www.shpnetstore.com/index.php?main_page=product_info&products_id=64809

Figure 20 – PPE. Source: https://infield-safety.fr/help-centre-f-a-q/

EN 352-2

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Environmental Analysis

Figure 22 – Measurement in a confined space. Source: https://rocorescue.wordpress.com/2010/08/04/confined-space-attendants-more-than-just-a-hole-watch

Figure 24 – Gas testing. Source: http://www.levantinetrainingcentre.com/confined-space-awareness-authorised-gas-testing-course/. Figure 25 -Measurement in a confined space. IIS

Figure 23 – Gas monitor. Source: https://www.pksafety.com/bw-honeywell-gasalert-quattro-4-gas-monitor-qt-xwhm-r-y-na/

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Gas	Symbol				
Oxygen	O_2	Deficient	19,5%[i]	Enriched	23,5%[2]
Hydrogen sulphide	H_2S	LTEL	5ppm	STEL	10ppm
Carbon monoxide	CO		30ppm		200ppm
Methane	CH_4	LEL	4,4%	UEL	17%
Propane	C_4H_{10}		1,7%		10,9%
Butane	C_3H_8		1,4%		9,3%

LTEL – long-term exposure limit (8-hour Time Weighted Average reference period)
STEL – Short-term exposure limit (15-hour Time Weighted Average reference period)
LEL – Lower explosive limit
UEL – Upper explosive limit
Figures quoted are from European standard EN61779-1:2000
-1 depicts start of deficiente atmosphere (reducing)
-2 depicts start of enriched atmosphere (increasing)

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PPE

Figure 25 – PPE. Source: https://www.liftingsafety.co.uk/product/aluminium-manriding-tripod-2792.html; https://www.mekstor.it/occhiali-e-maschere-di-protezione/1084-autorespiratore-diablo-cbombola-carica-7lt.html; https://www.39sport.it/gb/harnesses/174-4303-sierra-trio-harness.html; http://www.pesquerasynavales.com/127-material-de-salvamentoseguridad; www.ecom-ex.com/it, www.DPIsekur.it

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Controlling the risks

Figure 26 - hierarchy of control. Source: www.ishn.com

Figure 27 –Confined space Sign. Source: https://www.safetyservicesmanitoba.ca/general-health-and-safety-courses/confined-space-rescue/

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European, National Regulations and Recommendations

- ANSI/ASSE Z117.1-2016 - Safety Requirements for Entering Confined Spaces
- ANSI/ISA 92.04.01 Part I-2007 (R2013) - Requirements for Instruments Used To Detect Oxygen-Deficient/Oxygen-Enriched Atmospheres
- ASTM D4276 - 02(2012) - Standard Practice for Confined Area Entry
- UNI 7545-32: 2016 – Symbols for Danger Signs – part 32 : Confined spaces.
- ASTM F1764 - 97(2012) - Standard Guide for Selection of Hardline Communication Systems for Confined-Space Rescue
- CSA Z1006-16 - Z1006-16 - Management of work in confined spaces
- EN 529:2006 - Respiratory protective devices - Recommendations for selection, use, care and maintenance - Guidance

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