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## How to Get into Confined Space Safely?

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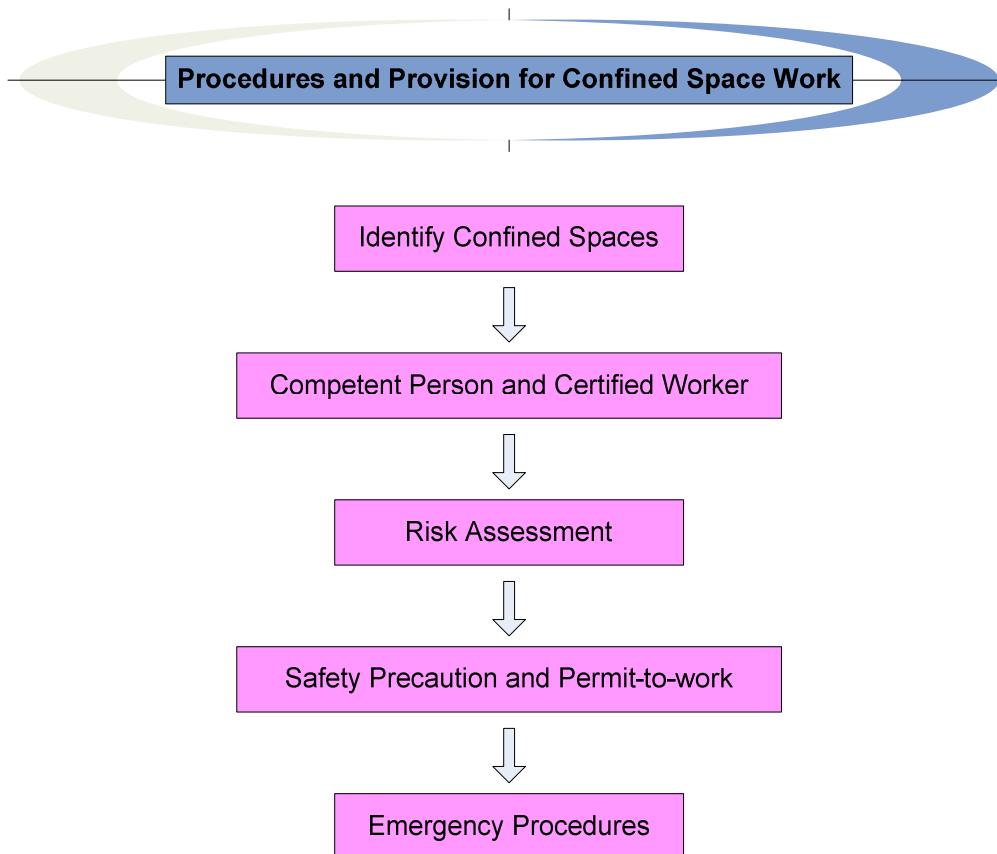
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### 1. Introduction

There are many new technologies in recent years to reduce the needs to work in confined space, for example, conduit condition evaluation by Closed Circuit TeleVision (CCTV). However, in certain circumstances, man-entry confined space works are unavoidable. It is inevitable to pay special attention on safety issues as workmen in confined space are always expose to various types of potential hazards including (1) flammable atmosphere; (2) toxic vapours, gases, mists or dusts; (3) deficiency of oxygen; (4) enrichment of oxygen; (5) engulfment; (6) entrapment; (7) electrical hazard; (8) mechanical hazard; (9) chemical hazard; (10) biological hazard; (11) thermal hazard; (12) heat and humidity hazard; (13) noise; (14) change of weather; (15) influx of fluid; and (16) other general hazards such as visibility, obstacle, etc. Any careless or inadequate preparation on confined spaces works may put human life in danger on the spot. Therefore, it is essential to have well-designed procedures for confined spaces work in order to eliminate any potential risks and dangers.

### 2. Necessary Steps to Enter Confined Space

In order to ascertain safe confined space work, stringent procedures should be followed. According to the Factories and Industrial Undertakings (Confined Spaces) Regulation that amended in Jan 1999, there are totally six steps for confined space works including (1) identification of confined spaces; (2) the availability of competent person and certified workers; (3) risk assessment; (4) safety precaution and issue of permit-to-work; and (5) planning on emergency procedures (Figure 1).



**Figure 1 – Necessary Steps to Enter Confined Spaces**

### **Identification of Confined Spaces**

The first step is to identify whether the workplace is a confined space according to its definition. According to the definition, “Confined Space” means any place in which, by virtue of its enclosed nature, there arises a reasonably foreseeable specified risk, and without limiting the generality of the foregoing, includes any chamber, tank, vat, pit, well, sewer, tunnel, pipe, flue, boiler, pressure receiver, hatch, caisson, shaft, or silo in which such risk arises.

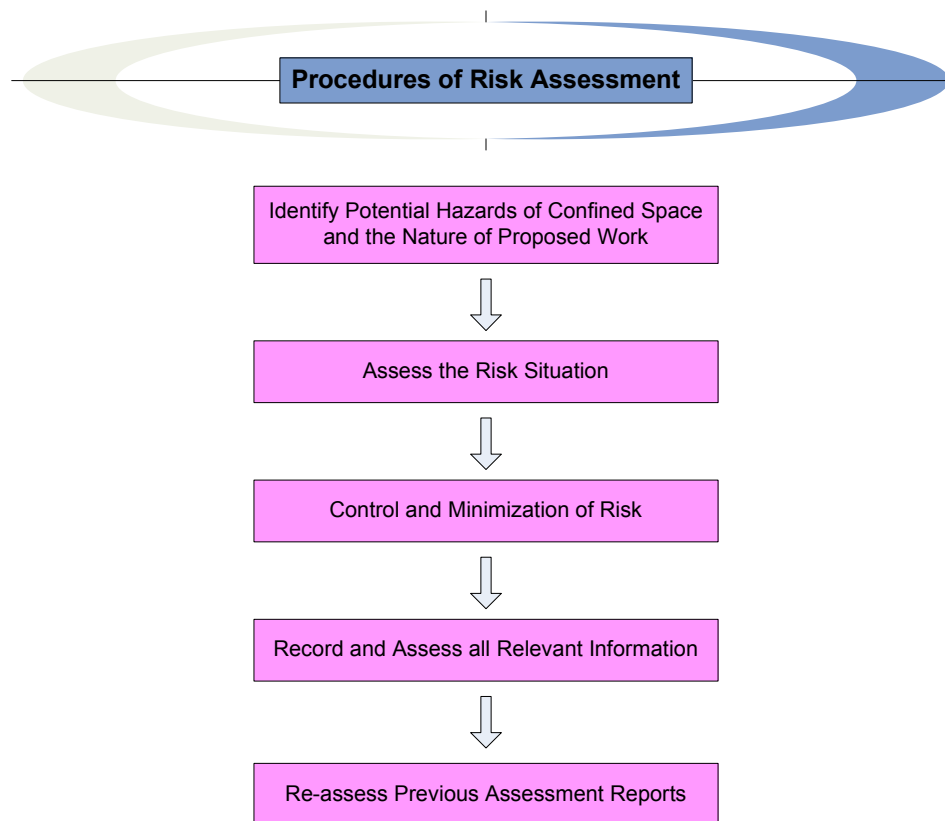
“Specified Risk” means a risk of (1) serious injury to any person at work arising from a fire or explosion; (2) the loss of consciousness of any person at work arising from an increase in body temperature; (3) the loss of consciousness or asphyxiation of any person at work arising from gas, fume, vapour or the lack of oxygen; (3) the drowning of any person at work arising from an increase in the level of liquid; or (5) the asphyxiation of any person at work arising from a free flowing solid or inability to reach a respirable environment due to entrapment by a free flowing solid.

### **Competent Persons and Certified Workers**

Competent persons and certified workers should be appointed by the proprietor or contractor to carry out subsequent risk assessment and confined spaces works respectively. The competent persons and certified works should be capable in taking up its responsibility and therefore the Labour Department, HKSAR Government has established a list of requirements on the qualification and experience of competent persons and certified workers.

### **Risk Assessment**

Before the commencement of works in confined spaces, a competent person should be appointed to carry out comprehensive assessment of the working conditions in the confined spaces and make adequate recommendations on preventive and remedial measures with respect to the safety and health of workman in the confined spaces. Normally, risk assessment would be conducted in five steps including (1) identification of potential hazards of confined spaces and the nature of proposed work; (2) assessment of the risk situation; (3) control and minimization of risks; (4) recording and assessment of all relevant information; and (5) reassessment of previous assessment reports (Figure 2).



**Figure 2 – Steps for Risk Assessment**

### **Identification of Potential Hazards of Confined Spaces and the Nature of Proposed Work**

Adequate information of dangerous substances and nature of proposed work should be consolidated. With such information, the types and forms (i.e. solid, liquid and gas) of all potential dangerous substances could be ascertained. Furthermore, the modes of entry of potential dangerous substances should be identified such as inhalation, ingestion, etc. In addition, the impact of dangerous substances on a human with respect to the time of exposure, concentration, toxicity, etc. should be carefully scrutinized. Besides, any dangerous situation during confined spaces work should be examined. For example, the increase in concentration of toxic substances during welding in the confined spaces.

### **Assessment of the Risk Situation**

Different risk situation should be considered with special care. The safe exposure level and time pertinent to different types of dangerous substances should be clearly identified. Furthermore, all possible

circumstances that may render personnel exposure to dangerous substances should be unveiled, such as mechanical failure, influx of contaminants via ventilation system, etc.

### **Control and Minimization of Risks**

Four major items should be considered during the analysis of dangerous situations of confined spaces works including (1) the extent of risk for work activities; (2) the probability of risk; (3) the consequence of risk; and (4) the identification of risk that should be tackled immediately. Priority of risk control and minimization should be given to those situations with high risk, serious consequence and high probability. With these information, proper selection of safety measures could be adopted. In addition, the extent and procedures of risk monitoring, the planning for emergency, the management of health and the provision for training could also be formulated accordingly.

### **Record and Assess all Relevant Information**

The results of risk assessment should be recorded systematically to ensure efficient trace of documents in the future.

### **Reassessment of Previous Assessment Reports**

Working condition is always dynamic in nature, in which serious changes may occur within a short period of time. Therefore, regular assessment is of essence to suit present situation.

### **Safety Precaution and Issue of Permit-to-work**

After receiving the risk assessment reports from the Competent Person, the proprietor or contractor should perform all safety precautions in relation to the hazards identified in the report and then issue a permit-to-work stating clearly the allowed working period. Safety precautions should cover all necessary pre-work, during work items and personal protective items. Risk assessment should be carried out once again should the permit-to-work expired and the whole process reiterates. The permit-to-work and risk assessment report should be kept for at least one year for reference and investigation purpose in the future.

### **Planning on Emergency Procedures**

Appropriate procedures to deal with any serious and imminent danger to workman in confined space should be planned and implemented. Sufficient supply of human resources and emergency equipment such as approved breathing apparatus, safety harnesses and ropes, etc. should also be guaranteed.

## **3. Conclusion**

Employers should try every endeavour to prevent from any human works in confined spaces. However, it is somehow ineluctable in certain situations. In order to ensure the safety of confined spaces works, the necessary steps before entering the confined spaces should be strictly adhered. The employers should appoint a capable person (Competent Person) to conduct a comprehensive assessment on the work environment, procedures and any associated items and provide adequate safety precautions accordingly. Besides, the employers should provide adequate training to all confined spaces workman in order to equip them with the basic knowledge on safe work in confined spaces. On the other hand, the employees should spend their effort in understanding the safety rules, uplift personal awareness and use the safety equipment provided by the employers. The preparation of employer and the personal awareness of employee together form the key for safe work in confined space.