

# **CONFINED SPACES**

## **STANDARD**

**OCTOBER 1995**

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## I. Introduction

Numerous NDSU employees are obligated, at various times, to perform limited work duties in areas of restricted size, limited entry/exit, and less than ideal conditions. Working in confined spaces is one of the greatest safety hazards on campus. The employer, NDSU, has taken into consideration the possibility of hazards due to work performed in confined spaces and has identified a need for employee education and training.

## II. Purpose

The Confined Spaces Standard is to provide written procedures regarding safety and compliance of NDSU employees working in confined spaces. The Standard clarifies the protective measures required in Permit Required and Non-Permit Required Spaces.

## III. Goals

NDSU's goal is to prevent occupational injury or death when working, supervising, or inspecting a hazardous area that has been identified as a confined space. Training and education are an effort to protect all employees from undue injury and loss.

The Confined Space Standard is available to all employees who attend the mandatory training session for Confined Spaces. It is also available for inspection, upon request, by all employees and their designated representative.

## IV. Organizational Responsibilities

The Office of Safety and Environmental Health (OSEH), under the direction of the Safety and Risk Management Coordinator, Dick Rayl, has prepared the Standard for Confined Spaces at NDSU. Material was researched and compiled for the Standard in order to identify protective measures and a standard procedure for employees working in identified confined spaces.

The Physical Plant Operations Manager advises all supervisory personnel of the details of the Standard and the minimum requirements needed to meet the Standard as outlined.

The supervisors in each department shall see to it that the requirements for working in confined space on the NDSU campus are met and the job is completed according to Standard Procedure.

## V. Definitions

1. **Confined spaces** at NDSU have been identified as those areas on campus with the following limitations:
  - a) Large enough and so configured that an employee can bodily enter and perform

assigned work.

- b) Has limited or restricted means for entry or exit. Examples of such area include the following:
- |               |              |       |
|---------------|--------------|-------|
| Tanks         | Hoppers      | Silos |
| Vessels       | Storage Bins | Pits  |
| Steam Tunnels | Vaults       |       |

c) Are **Not** designed for continuous employee occupancy.

2. **Non-Permit Confined Space** - a confined space that does not contain, or with respect to atmospheric hazards, have the potential to contain any hazards capable of causing death or serious physical harm.
3. **Permit-required Confined Space** - (permit space) means a confined space which has the limitations of a confined space **and** one or more of the following characteristics:
- a) Contains or has a known potential to contain a hazardous atmosphere.
  - b) Contains a material that has the potential for engulfing an entrant.
  - c) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section .
  - d) Contains any other recognized serious safety or health hazard.
4. **Hazardous Atmosphere** - an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue ( escape unaided from a permit space), injury, or acute illness from one or more of the following causes:
- a) Atmospheric oxygen concentrations below 19.5 per cent or above 23.5 percent by volume. Normal: 20.9% Alarm at: 19.5% and 23.0%.
  - b) Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit. Normal : 0 Alarm set at: 10%
  - c) Airborne combustible dust at a concentration that meets or exceeds its lower flammable limits. This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet or less.
  - d) Atmospheric concentration of any substance for which a dose or a permissible exposure limit which could result in employee exposure. Carbon Monoxide in ppm: Normal: 0ppm Alarm at: 35ppm
  - e) Any other atmospheric condition that is immediately dangerous to life or health.

## VI. Procedure

NDSU will identify and evaluate all spaces which are or could potentially be confined work spaces to determine if they are permit-required. Currently, confined spaces on the NDSU campus, according to prior experience and knowledge of industrial use and testing, have been considered non-permit required spaces.

This standard confirms that confined spaces at NDSU will be considered non-permit required spaces. **Pre -Entry Procedures** will be followed, providing supportive data that will demonstrate the confined spaces at NDSU continue to be non-permit required.

## **VII. Training**

Employees whose jobs require them to enter and work in confined space are obligated to attend training sessions regarding confined spaces.

Employees will acquire the understanding, knowledge and skills necessary for the safe performance of their assigned duties. Employee proficiency in specific duties must be established with additional training provided as necessary for new or revised procedures.

The department supervisors, in conjunction with the OSEH, are responsible for the training of employees in the management of the hazards of confined spaces. Training will provide information, give demonstrations, and allow hands on training . It will include the following:

- 1) Procedures in the use and maintenance of the monitoring equipment.
- 2) Use and application of respiratory equipment.
- 3) Use and application of ventilation systems, fans or blowers.
- 4) Use and application of fall protection
- 5) Procedure for the pre-entry evaluation/checklist.
- 6) Lockout/Tagout Procedures

## **VIII. Pre - Entry Procedures**

To confirm a safe work environment in a non-permit required confined space, Pre-Entry Procedures are to be used prior to entry. They show the following:

- 1) The only hazard posed by the space is an actual or potential hazardous atmosphere.
- 2) That continuous forced air ventilation alone is sufficient to maintain the space safe for the duration of the job.

- 3) Document supportive data for a non-permit required confined space.
- 4) Provides current information to employees.

## **IX. Pre-entry Evaluation**

The department whose services are requested, will designate a competent person for pre-checking or entering confined space. The designated employee shall have successfully completed, at a minimum, the training required for monitor use and understand the values of the data needed to complete a pre-entry checklist and verify a confined space. If requested, the Office of Safety and Environmental Health will assist with the pre-entry evaluations.

Equipment necessary for evaluating a confined space is to include but not limited to the following

- 1) Air Monitoring Devices
- 2) Ventilation
- 3) Respiratory Protection
- 4) Fall Protection

Data from on-site inspections and continuous air tests will provide monitor readings for the following items prior to and during entry to demonstrate there are no actual or potential atmospheric hazards posed by the confined space. This information is available at the job site until the task is completed.

- 1) oxygen content
- 2) combustible gas
- 3) carbon monoxide

The hazards within the space will be eliminated without entry into the space and prior to physical entry by the employee. If working in two adjoining /connected spaces, the most hazardous condition shall govern.

A Pre-Entry Check List, which verifies a confined space as non-permit required, is to be completed and compared with acceptable guidelines prior to approval of entry.

The supervisor will certify in writing, based on the results of the pre-entry testing, that all of the hazards have been eliminated and entry is safe.

## **X. Criteria for Pre-entry**

The pre-entry check list must include the following information/items prior to entry of a confined space.

- 1) Any condition(s) making it unsafe to remove an entrance cover must be eliminated prior to the removal of the cover. Monitor readings must be taken to provide data within acceptable limits and show safe entry .
- 2) Prior to entry, an employee must test the space atmosphere with a calibrated direct-

reading instrument. Data must correlate with safe levels in the atmosphere.

- 3) Openings must be promptly guarded to prevent an accidental fall through the opening and to protect entrants from foreign objects.
- 4) Continuous forced air ventilation must be used according to procedure. Data from monitor readings must show the atmosphere to be in acceptable limits.
- 5) Continuous monitor readings or periodically testing the atmosphere within the confined space are mandatory to ensure that the ventilation is preventing the accumulation of a hazardous atmosphere. The safeguard is an audible warning device in case of a change in conditions. Entrants are to exit immediately.
- 6) An audible warning system is the safeguard of choice to warn attendants and entrants of a change of condition. At the sound of the warning, all entrants are to exit the confined space immediately.
- 7) The employer must verify that the space is safe for entry through written certification which contains the date, location of the space, and signature of the certifying individual.
- 8) In the event of an emergency, NDSU will use outside emergency response team. The City of Fargo, Fire Department/HazMat Team, is the team of choice.

Attach:Pre-Entry Checklist  
Monitor Instructions

## PREENTRY CHECKLIST

Location and Description of Confined Space \_\_\_\_\_

Purpose of Entry \_\_\_\_\_

Date \_\_\_\_\_

Time \_\_\_\_\_

Tester \_\_\_\_\_

Crew \_\_\_\_\_

Leader \_\_\_\_\_

REQUIREMENT	YES/NO	YES/NO	REQUIREMENT
Lock Out/Tag Out			Atmospheric Monitor
Purge - Flush and Vent			Ventilation- prior/during
Lighting Requirements			Fall Protection
Secure Work Area/Backup Power Source			Isolate Work Area/Barriers Ropes/Flags
Respiratory Protection			Cords/Tool Inspected
Other PPE			Phone/Walkie-Talkie

**NORMAL VALUES:**

**Oxygen = 20.9%**

Alarm @19.5% /23.0%

**Combustible Gas = 0%**

Alarm @ 10%

**Carbon Monoxide = 0ppm**

Alarm @ 35ppm

Atmosphere	Pre-Entry Reading	1st Reading	2nd Reading	3rd Reading	Initials
Oxygen					
Flammable					
Toxic					

Supervisor authorizing all above conditions satisfied: \_\_\_\_\_

Date: \_\_\_\_\_

## **XI. Options for Job Performance**

Each supervisor will have one of two options available for managing the entry and job performance. One or both methods may be used.

- 1) **Single Worker** - If the designated employee is to work alone, he will complete the pre-entry check list before entering the confined space and follow standard procedure prior to entry. He will wear a monitor or have one in the immediate work area during the task until exit of the space. Continuous monitor readings will show that mechanical (forced air) ventilation is sufficient to eliminate any hazards and maintain the confined space safe for entry and completion of the assigned task. This will document the changes and management of the confined space.

If a hazard should arise and the personal warning devices go off within the confined space, the employee will exit the space immediately. The employer will then reevaluate the space and determine whether it must be reclassified. All test data will be documented and reviewed for acceptable limits prior to further entry.

- 2) **Buddy System** -(2) two employees perform the job in a confined space.

An **attendant** will supervise the entrance of the confined space. He will monitor all conditions in and around the confined space, maintain contact with entrant(s) and initiate emergency services if necessary. He will not leave his position until relieved by another authorized attendant or the job is completed and all the entrants have exited the confined space.

The **entrant(s)** will go into the confined space and perform the job task. They will maintain contact with the attendant and act immediately upon the requests of the attendant. All monitoring and documentation of conditions of the confined space will be done by the attendant for the entrants.

All information and data collected regarding the atmosphere will be documented as a permanent record and kept at the job site for the duration of the job. The information is available for review by employees who enter confined spaces.

Upon completion of the job, the data will be kept on file in the individual department for reference.

## **XII. Ventilation**

Ventilation of a permit space using a blower or fan can be an effective means of removing or controlling atmospheric hazards in a confined space. With the use of the pre-entry procedure the following items must be met prior to entry:

- 1) An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere. Pre-entry readings will be mandatory.
- 2) The ventilation system must be positioned to ventilate the immediate working area when any employee is/ will be present within the space.
- 3) The air supply for ventilation must be from a clean source and must not increase the hazards in the space. Its back up power source must also be identified.
- 4) Ventilation should normally consist of a 30 minute pre-entry purge with several air changes, followed by continuous introduction of fresh air during occupancy.
- 5) Documentation of results must show acceptable limits prior to entry. All records will be kept at the job site until completion of the job task.

## **XIII. Contract Employees**

If confined spaces are to be entered by contract employees, the host employer must provide the contractor with specific information. Entry operations must be coordinated by the host employer when personnel will be working in or near permit spaces and include the following:

- 1) Identify all confined spaces - permit/non-permit.
- 2) Identify and evaluate specific hazards for each confined space.
- 3) Post warnings and barriers to prohibit entry into unauthorized spaces.

## **XIV. Rescue**

Rescue attempts will **NOT** be made by NDSU personnel.

Rescue services will be managed by the City of Fargo, Search and Rescue Team .

NDSU will ensure that the designated rescuers are aware of the hazards they may confront during the rescue operation. NDSU will also provide them with information and access to confined spaces they may have to enter so that they can practice and develop appropriate rescue procedures.