



## Northeast Biomanufacturing Center and Collaborative

### Confined Space Entry (CSE) Program

NBC-CSE-000

**APPLICABLE STANDARD:** OSHA – 29 CFR 1910.146 *Confined Space Entry*

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#### Section A

#### Scope and Application

The Northeast Biomanufacturing Center's Confined Space Entry (CSE) program applies to the safe working policies and procedures for entering and completing work in a confined space. A confined space is a space that is large enough for a person to physically enter, but has a limited means of egress. In addition, a confined space is a space that is not designed for continuous occupancy. Confined spaces may contain a variety of hazards which may cause injury or death. The CSE program is designed to eliminate those hazards so that employees can perform work within the confined space in a safe environment.

This program outlines the definitions, procedures and training requirements to be utilized by NBC<sup>2</sup> employees and trainees to prevent an accident, which may cause injury or death when entering or working in a confined space. It is the duty of each employee to become familiar with the contents of this program and ensure compliance with its procedures. Supervisors and instructors shall ensure that employees and trainees understand the details of this program and ensure that employees receive the proper training. Supervisors and instructors are also responsible for maintaining records of this training. These records must be current and readily available for review.

#### **ASSOCIATED DOCUMENTS**

|               |                                  |
|---------------|----------------------------------|
| NBC-LOTO-000: | Lockout Tagout Policy            |
| NBC-CSE-001:  | Confined Space Evaluation Form   |
| NBC-CSE-002:  | Confined Space Entry Permit      |
| NBC-CSE-003:  | Operation of the Drager Miniwarn |

**Section  
B**

**PURPOSE**

The purpose of this program is to establish policies and procedures for safe working practices and for safe entry of a confined space.

**Section  
C**

**Definitions**

**Acceptable entry conditions**

The conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

**Attendant**

An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

**Authorized entrant**

An employee who is authorized by the employer to enter a permit space.

**Blanking or blinding**

The absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

**Confined space**

A space that:

- (1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and
- (2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and
- (3) Is not designed for continuous employee occupancy.

**Double block and bleed**

The closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

**Emergency**

Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

**Engulfment**

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

**Entry**

The action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

**Entry permit (permit)**

The written or printed document that is provided by the employer to allow and control entry into a permit space and that contains the information specified in paragraph (f) of this section.

**Entry supervisor**

The person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

*NOTE:* An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this section for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

**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 permit space), injury, or acute illness from one or more of the following causes:

- (1) Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);
- (2) Airborne combustible dust at a concentration that meets or exceeds its LFL;

*NOTE:* This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.

- (3) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;
- (4) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of this Part and which could result in employee exposure in excess of its dose or permissible exposure limit;

*NOTE:* An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

- (5) Any other atmospheric condition that is immediately dangerous to life or health.

*NOTE:* For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard,

section 1910.1200 of this Part, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

**Hot work permit**

The employer's written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

**Immediately dangerous to life or health (IDLH)**

Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

NOTE: Some materials -- hydrogen fluoride gas and cadmium vapor, for example -- may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

**Inerting**

The displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

NOTE: This procedure produces an IDLH oxygen-deficient atmosphere.

**Isolation**

The process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

**Line breaking**

The intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

**Non-permit confined space**

A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

**Oxygen deficient atmosphere**

An atmosphere containing less than 19.5 percent oxygen by volume.

**Oxygen enriched atmosphere**

An atmosphere containing more than 23.5 percent oxygen by volume.

**Permit-required confined space (permit space)**

A confined space that has one or more of the following characteristics:

- (1) Contains or has a potential to contain a hazardous atmosphere;

- (2) Contains a material that has the potential for engulfing an entrant;
- (3) 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; or
- (4) Contains any other recognized serious safety or health hazard.

**Permit-required confined space program (permit space program)**

The employer's overall program for controlling, and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.

**Permit system**

The employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

**Prohibited condition**

Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

**Rescue service**

The personnel designated to rescue employees from permit spaces.

**Retrieval system**

The equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

**Testing**

The process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

NOTE: Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

**EQUIPMENT**

**Section  
D**

The following equipment will be made available for performing confined space entries:

- Gas monitor
- Power ventilator
- Appropriate respirators as needed, which may include airline respirator system or self contained breathing apparatus (SCBA).
- Safety Tripod w/ safety harness
- Personal-lift (hoist) - required for vertical enters of more than 5 feet.
- Personal Protective Equipment including but not limited to: Hard Hat, Coveralls or other Protective Clothing, Gloves, Half Face Respirators with Chemical and Particulate Cartridges.

- Mobile Radio or communication system

## Section E

### **PROCEDURES**

General: Only employees that have received Confined Space Entry Training may enter a confined space or serve as an attendant, entry supervisor or conduct air monitoring. The training will review all information contained within the confined space program.

All affected employees must follow the steps listed below in order to comply with this guideline.

The EHS Director will assist with identifying all permit required confined spaces in their area. All spaces will have been evaluated using NBC<sup>2</sup>'s Confined Space Evaluation Procedure (NBC-CSE-001). Completed confined space evaluations will remain on file with EHS.

#### **Obtaining a Permit**

Employees whose work requires them to enter a confined space must notify their supervisor to obtain a confined space permit and specific instructions prior to entering. The Entry Supervisor fills out the Entry Permit noting the specific requirements to be followed.

#### **Supervisor Duties and Responsibilities**

The entry supervisor will:

- Discuss the work to be done, in the confined space, with the employee or employees and go over any special hazards, which might be encountered during work. The supervisor will discuss the procedures for eliminating those hazards from the confined space prior to entry.
- Fill out (completely) the Confined Space Entry Permit form (NBC-CSE-002) and maintain the form for recordkeeping purposes.
- If necessary, contact the EHS Director for input into the confined space entry procedure
- Make sure the employees test the air quality using a four gas monitor before entry, and that the unit is calibrated and operating properly.
- Make sure the employees perform any necessary lockout/tagout procedures before entering the confined space.
- Terminate entry and cancel permits when entry operations are completed or if a new condition exists
- Take appropriate measures to remove unauthorized entrants.

Pre-entry Air Quality Testing

Before a permit required confined space is entered, the atmosphere in the confined space must be tested for 1) oxygen levels; 2) flammable gases and vapors and 3) contaminants that could be found in that confined space. In addition, the space will be evaluated for physical hazards such as noise, thermal, engulfment, and other possible threats to the entrant. Initial testing shall be performed by the Director of EHS for any new confined spaces. Existing spaces may be tested by other qualified (trained) personnel.

#### 1. Oxygen

- If oxygen content is less than 19.5 % or greater than 21.5, perform additional ventilation. Then, shut off ventilation equipment and re-test the oxygen content.
- If oxygen content is between 19.5% and 21.5 %, continue the entry.

#### 2. Flammable gas level:

- If the meter is less than 10% of the lower explosive limit, continue entry preparations.
- If the meter reading is above 10% of the LEL, continue ventilation of the confined space. Shut-off the ventilation and have the atmosphere re-tested.
- If the meter reading is above 10% of the LEL, the confined space must be cleaned or purged before entry is permitted.

#### 3. Toxicity of atmosphere:

The entry Supervisor will determine the toxicity of the atmosphere as planned and discussed in training. If a toxic atmosphere is present, no person should be permitted to enter the confined space at a level exceeding the Permissible Exposure Limit without proper personal protective equipment. Environmental Health and Safety should be notified to assist in identifying proper precautions and protective measures to be taken.

#### 4. Testing Procedures

- All testing Equipment Shall be calibrated by supervisor or authorized employee as instructed by the manufacturer.
- All of the manufacturer's operating instructions must be followed.
- The test equipment should be tested in a known atmosphere to insure its accuracy.
- Ventilation equipment must be shut off before conducting any atmospheric tests.
- The atmosphere must be tested at the bottom, top, and middle of all confined spaces.

- The atmosphere must be continuously monitored while work is being conducted in the confined space.
- If the confined space is left for any reason, the atmosphere must be re-tested before re-entering the space.

#### 5. Monitoring The Confined Space:

Record the levels on the permit and continually monitor while the space is open. If the monitoring indicates an unacceptable atmosphere after either ventilating or waiting for a short time period the entry supervisor needs to be notified. An acceptable atmosphere is defined on the permit. If the atmosphere is not acceptable then employees are **NOT PERMITTED TO ENTER THE SPACE AND THE PERMIT WOULD NOT BE VALID.**

### **Entrant Duties**

Confined space qualified (trained) entrants must ensure that all “special requirements” have been provided and established and that environmental testing results are acceptable. In addition, the entrant must:

- Know the hazards associated with the confined space and their effects
- Properly use the required equipment for entry
- Maintain a continuous means of communication with the attendant
- Alert the attendant in the event of an emergency
- Evacuate the space if an emergency occurs

### **Attendant Duties**

A confined space qualified (trained) attendant must be in position at all times while workers are in the confined space. The attendant shall:

- Know the hazards associated with the confined space and their effects
- Maintain an accurate count of all persons in the space
- Remain at their assigned station until relieved by another attendant or until all entrants leave
- Know how, and have the means, to summon emergency assistance
- Order the workers out of a confined space if:

- hazardous conditions exceed those set by the permit
  - an unexpected hazard presents itself
  - workers in the confined space show signs of toxicity
  - a situation occurs outside the confined space that could pose a hazard to the workers,
  - the attendant must leave the area
- Perform non-entry rescue procedures

NOTE: UNDER NO CIRCUMSTANCES IS THE ATTENDANT TO ENTER THE CONFINED SPACE UNLESS EQUIPED AND INVOLVED IN EMERGENCY RESCUE AND THERE IS A QUALIFIED PERSON TO TAKE THEIR PLACE AS ATTENDANT

### **Post-Entry Procedures**

Entrants – shall remove all equipment and materials from the space, return the space to its planned operating condition, and secure the space

Attendant – shall account for all entrants and return all paperwork to the supervisor

Supervisor – shall ensure that all appropriate steps have been taken and return a copy of the permit to the EHS Director

Remove locks and/or tags following the NBC<sup>2</sup> lockout/tagout policies and procedures.

## **Section F**

### **TRAINING**

- For a person to be qualified (trained) for confined space entry work, they must participate in NBC<sup>2</sup>'s Confined Space Entry Training Program. This training will include:
  - Defining and characterizing confined space hazards
  - A review of the written Confined Space Entry Program
  - A review of the Confined Space Evaluation form
  - A review of the Confined Space Entry Permit
  - Atmospheric testing equipment including its use, calibration, and maintenance
  - Atmospheric testing protocol and interpretation of results
  - Methods for the control and/or elimination of confined space hazards (atmospheric and physical)
  - The use of confined space entry equipment
  - The roles and responsibilities of the confined space entry personnel, including the qualified entrant, attendant, and entry supervisor.

## **Section G**

### **OUTSIDE CONTRACTORS**

When contractors are involved in permit confined space entry work at NBC<sup>2</sup>, a qualified (trained) confined space entry supervisor will:

- Inform the contractor that the work place contains permit-required spaces and entry is allowed only through compliance with a “Permit-Required Confined Space Program.”

- Inform the contractor of the hazards of the space and precautions or procedures that must be followed
- Coordinate entry in accordance with this procedure
- Debrief the contractor at the conclusion of entry operations