

Confined Space Study Guide

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Learning Objectives

To receive credit for completion of this training course or challenge exam, you must score a grade of 80% or greater on the multiple-choice examination covering the following learning objectives:

- Identify the location and availability of the BNL Confined Spaces Subject Area.
- List the three defining elements of a confined space.
- List the four classes of confined spaces and the characteristics of each.
- Read a Classification Form
- State the classes of confined spaces that utilize the Certification Form as entry authorization.
- Read and know how to complete a Certification Form.
- Recognize activities that require a space be treated as a Class 2C (Permit Required) space.
- Read and know how to complete a Confined Space Entry Permit.
- Recognize work practices and procedures pertaining to safe confined space entry.
- State the emergency procedures for confined spaces.
- State five additional requirements for construction confined spaces

Confined Space Resources

- BNL Subject Area, [Confined Spaces \(https://sbms.bnl.gov/SubjectArea/122\)](https://sbms.bnl.gov/SubjectArea/122)
 - Based on 29 CFR 1910.146, "Permit-Required Confined Spaces"
 - Construction: 29 CFR 1926 Subpart AA, "Confined Spaces in Construction"
 - Official copy located in the BNL Standards-Based Management System
- Additional Department/Division entry protocols for Confined Spaces

The three physical characteristics of a Confined Space

1. Size: A space large enough and so configured that an employee can bodily enter and perform assigned work
2. Access: Has limited or restricted means for entry and exit
3. Design: Is not designed for continuous employee occupancy

The four potential hazards of a Confined Space

1. Hazardous atmosphere
2. Contains a material that could engulf an entrant
3. Has walls that converge inward or floors that slope downward and taper into a smaller area which could trap or asphyxiate an entrant
4. Contains any other recognized safety or health hazard, such as unguarded machinery, exposed live wires, or heat stress

Hazardous Atmosphere

Definition: Atmosphere that may expose employees to risk of death, incapacitation, impairment of ability to self-rescue, injury, or acute illness.

Examples include:

- Oxygen-deficient or oxygen-enriched atmospheres
- Flammable gas, vapor, or mist in excess of 10% of its Lower Flammable Limit (LFL)/Lower Explosive Limit (LEL);
- Airborne combustible dust at a concentration that meets or exceeds its Lower Flammable Limit
- Atmospheric concentration of any substance that exceeds its dose or permissible exposure limit

Physical hazards

- Equipment, machinery, or utilities inside a confined space:
 - Must be guarded or de-energized and locked/tagged out
 - Applies to energized electrical, steam, pressurized systems or mechanical devices
- Material contents inside a confined space
- Configuration of a confined space
 - Space tapers or floor slopes

Confined Space Classifications

Occupational Safety and Health Administration (OSHA) and BNL classify spaces based on the HAZARDS associated within.

Work Practices and Procedures

- The Work Planning process should be utilized to address the hazards of confined space entry. A work permit may be needed in addition to the Confined Space Certification Form.
- The process is based on the Integrated Safety Management (ISM) Core Functions
 - Define the scope of the work, identify the hazards, develop controls, work within the controls, and provide feedback for continuous improvement
- The work permit will point to pre-existing work conditions.
- The worker and supervisor must ensure the hazards that may be introduced during work activities are addressed prior to entry.

Atmospheric Testing and Monitoring

- Testing for oxygen deficiency, flammable gases, and toxic gases shall be performed prior to any Class 2A, 2B, or 2C entry.
- Testing will also be done prior to the removal of any manhole cover
- Monitoring shall be done on a continuous basis where hazards may exist in Class 2B or 2C spaces.

Ventilating and Purging

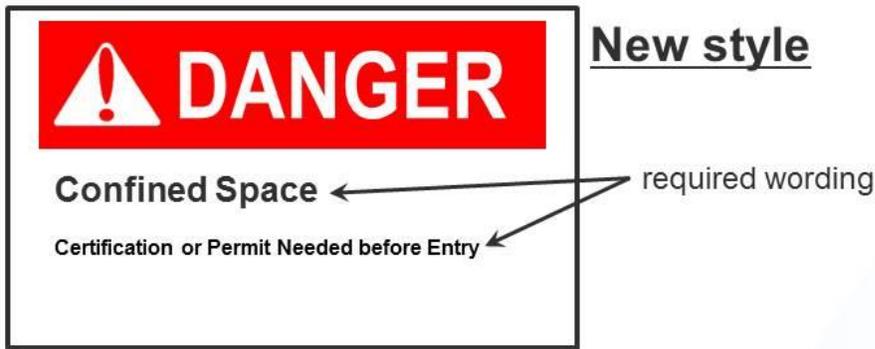
Space cannot be entered until hazardous atmosphere has been eliminated or a permit is issued.

- Ventilate the entire space.
- Use clean air.
- Atmosphere being ventilated and ventilating equipment must be monitored continuously.
- If ventilation system fails, evacuate the space immediately.

Hot Work

- Cutting, welding, and other flame/spark-producing work automatically results in any confined space being classified as a Class 2C confined space.
- Hot Work Permits are required.
- Ventilation and continuous atmospheric monitoring is required.
- Strip coatings 6 inches from area of heat application.

BNL Confined Space Postings



Program Responsibilities

Entry Supervisor

1. Know the hazards faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
2. Verify, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin;
3. Terminate the entry and cancel/suspend the permit;
4. Verify that rescue services are available before entry and will be available throughout the entry.
5. Verify that the means for summoning BNL Fire/Rescue are available and operable;
6. Verify the availability of Fire/Rescue services before and throughout the entire entry by calling extension 2350.
7. Remove unauthorized individuals who enter or who attempt to enter the space during entry operations;
8. Whenever responsibility for a Class 2C space entry operation is transferred, communicate to the new Entry Supervisor, which entry operations and conditions remain in effect. The new entry supervisor verifies that acceptable entry conditions are maintained;
9. Notify Fire/Rescue when entry is completed and rescue coverage is no longer needed.

Entrant

1. Know the hazards faced during entry, including information on the mode, signs or symptoms, and consequences of exposure;
2. Properly use all equipment associated with confined space entry, including
 - a. Ventilating equipment;
 - b. Communications equipment;
 - c. Personal protective equipment;
 - d. Lighting equipment needed to see well enough to work safely and to exit the space quickly in an emergency;
 - e. Barriers and shields;
 - f. Equipment such as ladders needed for safety entry and egress;
 - g. Any rescue and emergency equipment used in conjunction with BNL's Fire/Rescue Group in an emergency.
3. Communicate with the Attendant as necessary to enable the Attendant to monitor Entrant status and to

alert Entrants of the need to evacuate the space;

4. Alert the Attendant whenever
5. The Entrant recognizes any warning sign or symptom of exposure to a dangerous situation;
6. The Entrant detects a prohibited condition;
7. Exit from the permit space as quickly as possible whenever
8. An order to evacuate is given by the Attendant or the entry supervisor;
9. The Entrant recognizes any warning sign or symptom of exposure to a dangerous situation;
10. The Entrant detects a prohibited condition;
11. An evacuation alarm is activated.

Attendant

1. Know the hazards faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
2. Be aware of possible behavioral effects of hazard exposure in authorized Entrants;
3. Continuously maintain an accurate count of authorized Entrants in the space and ensure the means used to identify authorized Entrants accurately identifies who is in the space;
4. Remain outside the permit space during entry operations until relieved by another Attendant;
5. Communicate with authorized Entrants as necessary to monitor Entrant status and to alert Entrants of the need to evacuate the space;
6. Monitor activities inside and outside the space to determine if it is safe for Entrants to remain in the space and order the authorized Entrants to evacuate the space immediately under any of the following conditions:
 - a. If the Attendant detects a prohibited condition;
 - b. If the Attendant detects the behavioral effects of hazard exposure in an authorized Entrant;
 - c. If the Attendant detects a situation outside the space that could endanger the authorized Entrants;
 - d. If the Attendant cannot effectively and safely perform all the duties required by this subject area.
7. Summon the BNL Fire/Rescue Group at extension 911 or 2222 as soon as the Attendant determines that authorized Entrants may need assistance to escape from confined space hazards;
8. Take the following actions when unauthorized persons approach or enter a space while entry is underway:

- a. Warn the unauthorized persons that they must stay away from the space;
 - b. Advise the unauthorized persons that they must exit immediately if they have entered the space;
 - c. Inform the authorized Entrants and the Entry Supervisor if unauthorized persons have entered the space;
9. Perform non-entry rescues as specified by the Department/Division's rescue procedure;
 10. Perform no duties that might interfere with the Attendant's primary duty to monitor and protect the authorized Entrants.

Retrieval Systems for Class 2 Spaces

Entrants must utilize some form of retrieval system for non-entry rescues unless it increases the overall risk of the entry.

- Chest or full body harness attached to a retrieval line is recommended.
- Wristlets may be used if safer or more feasible.
- Mechanical hoisting devices shall be available for vertical spaces more than five feet deep.
- Personnel must be trained and qualified in the operation of retrieval systems.

Note: At BNL, the Fire/Rescue Group provides rescue equipment for BNL operations. Contractors provide their own or make arrangements for coverage by BNL Fire Rescue Group.

Confined Space Entry Emergencies

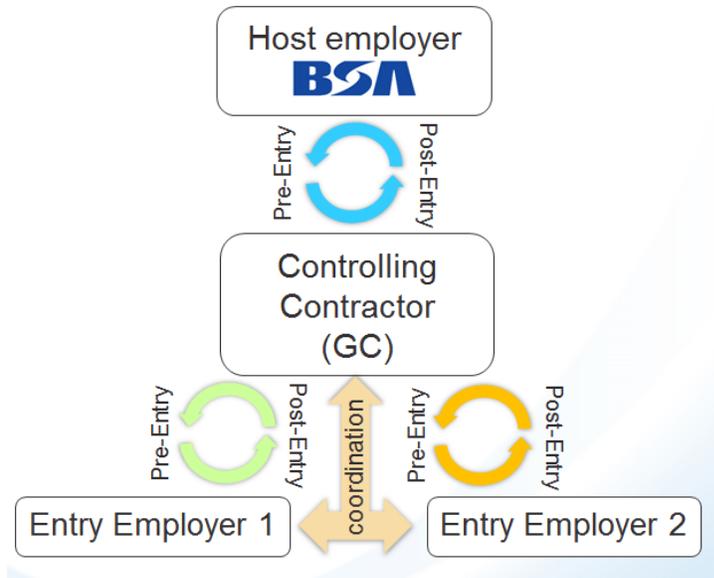
- If an emergency occurs:
 - Space must be evacuated immediately.
 - Attendant must immediately notify Fire/Rescue.
 - Attendant can only perform non-entry rescue.
 - Attendant must never attempt to rescue the entrant by entering the confined space.

Re-entry Procedure

- After a confined space has been evacuated due to an emergency or change of conditions within the space, the entry permit is no longer valid.
- Safety and Health Services and/or a Facility Support Person shall be contacted to evaluate the conditions of the space and provide guidance for the remediation of the hazards.
- A new Confined Space Entry Permit must be generated for reentry.

Confined Space Construction

- **Host Employer:** The employer who owns or manages the property where the construction work is taking place.
- **Controlling contractor:** The employer who has overall responsibility for the construction activity.
- **Entry employer:** An employer who decides that an employee it directs will enter a permit space.



Confined Space Communication

An example of one communication requirement

- Before entry operations begin, each Entry Employer must:
 - Obtain all of the information from the Controlling Contractor regarding permit space hazards and entry procedures.
 - Inform the Controlling Contractor of the permit space program that the entry employer will follow, including any hazards likely to be confronted or created in each space.

Confined Space Construction

Competent Person:

All identification of Confined Spaces must be conducted by a competent person as defined by OSHA.

- *One who is capable of identifying and predicting hazards in the surrounding or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.*

Atmospheric monitoring:

Atmospheric hazards are to be monitored continuously unless the employer can demonstrate that:

- The equipment for continuously monitoring is not commercially available,
- Periodic monitoring is sufficient to ensure that the atmospheric hazard is being controlled at safe levels.

Permit suspended:

- In the event of changes from the entry conditions listed on the confined space permit or an unexpected event requiring evacuation of the space, the permit may be suspended instead of cancelled.

Engulfment:

When an engulfment hazard is identified in a permit confined space, it shall be monitored continuously.

- Examples of this monitoring include:
 - Remote sensors
 - Posted observer
 - Other means deemed effective to provide advance notification to entrants and attendants

Rescue:

Employers must also evaluate the rescuers ability to respond in a timely manner considering the hazards.

- For example, employers should provide standby rescue capable of immediate action to rescue employee(s) wearing respiratory equipment in an IDLH atmosphere.

Review Questions

- Describe the classes of Confined Space as defined by BNL.
- Space classifications that use the Certification Form to authorize entry?
- Space classification that contains only an atmospheric hazard that is made safe for entry by continuous forced air ventilation?
- Whose signature is allowed as authorization on the Certification Form?
- Space classification that utilizes the Confined Space Entry Permit to authorize entry?
- What is the easiest and most effective form of confined space rescue?
- Under what conditions is an attendant allowed to leave their post?
- Is it acceptable to prevent contaminants from entering a confined space by plugging pipes where they enter the space?