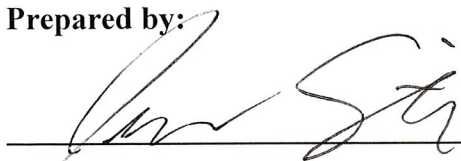


CONFINED SPACES

BSB- 0200-07

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Date: 01/30/2023

Procedure approved by:



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Date: 01/30/2023

BOILER SAFETY BUREAU

STANDARD OPERATING PROCEDURE MANUAL

1.0 PURPOSE

To provide a means by which employees shall be protected from the hazards associated with entry into confined spaces.

2.0 SCOPE

This procedure is applicable to all Boiler Safety Bureau (Bureau or BSB) inspection personnel, including Inspector Supervisors and Bureau Management. This procedure is to be used for all personnel to identify permit required confined spaces and non-permit required confined spaces. In addition it will instruct personnel on how to re-classify confined spaces from permit required to non-permit required. All entry into confined spaces by Bureau Personnel must be done in accordance with this procedure.

3.0 PERSONNEL RESPONSIBILITIES

- 3.1 The Bureau Chief - BSB has the overall responsibility for implementation of this procedure and to assure that inspection staff is properly trained in the requirements herein.
- 3.2 The Inspector Supervisors are responsible for ensuring that Inspectors use this procedure, when applicable.
- 3.3 The Bureau inspection staff is responsible for cognizance, understanding and strict use of this procedure when conducting inspections requiring entry into confined spaces. They are also responsible for informing their supervision when there is reason to suspect the accuracy of assigned gas monitors.

4.0 HEALTH and SAFETY ISSUES

Addressed in the body of this document.

5.0 PROCEDURE

5.1 Inspector Supervisors shall:

- 5.1.1 Ensure that the Inspectors have the equipment necessary for entry testing.
- 5.1.2 Train Inspectors in their responsibilities under this procedure:
 - a) Inspectors entering a permit space may be both the Entry Supervisor and the Entrant.
 - b) Inspectors serving as an Attendant for a permit space entry shall not be an Entrant during that entry.
- 5.1.3 The Inspector Supervisors shall maintain the required canceled permits and documentation.
- 5.1.4 The Inspector Supervisors shall act as the Program Coordinator for their respective regions.

5.2 Rescue Operations

5.2.1 The Entry Supervisor shall verify that the owner/operator of the pressure equipment to be entered has established instructions to provide for rescue operations during permit required-confined space entry.

- a) The rescue service needs to be evaluated and approved in accordance with the following criteria by the Entry Supervisor. To be accepted it must be documented that the rescue service;
 - 1. Can reach the victim in time
 - 2. Understands the hazards of the space
 - 3. Is certified in emergency first aid and CPR
 - 4. Understands appropriate entry procedures
 - 5. Knows how to use rescue equipment
 - 6. Has practiced confined space rescues at least annually either in the occupied space or representative spaces that most accurately replicate the hazards presented by the entrant.

Despite what the host provides as his understanding of the application and coordination with rescue services it is the entry supervisors responsibility to make decisions based on the exposure or potential exposure to hazards which may necessitate a rescue of BSB personnel.

Factors one through five above are all predicated on the rescue services; training and qualification for entry rescues, equipment needed to make such a rescue and most importantly the services willingness to make such an entry/rescue.

NOTE: If the owner/operator has no established instructions for rescue operations, Bureau personnel will not make entry into a permit-required confined space.

5.3 Entry Supervisor

- 5.3.1 The Inspector Supervisor and Inspectors shall be trained as Entry Supervisors.
- 5.3.2 Inspectors encountering a confined space into which they need to enter shall contact their Inspector Supervisor for permission to proceed. The Inspector Supervisor will review the Inspector's qualifications and the confined space detail before approval to proceed is granted. The Inspector Supervisor may elect to be the Entry Supervisor or assign that duty to an Inspector.
- 5.3.3 The Entry Supervisor shall perform the pre-entry duties for the permit space in concert with the controlling entity.
 - a) If the controlling entity has a permit required confined space program:
 - 1. The Entry Supervisor shall ensure entry is in accordance with the requirements of this program.
 - 2. The Entry Supervisor may authorize the use of an adequately trained Attendant provided by the controlling entity and must qualify the attendant in accordance with this procedure. The Attendant's name, position, and employer shall be recorded on the permit.
 - 3. The Entry Supervisor may accept actions taken by the controlling entity to authorize "Alternate Entry Procedures" or to reclassify the space as non-permit, after verifying and documenting the effectiveness of such actions and that they are in accordance with this program. After a review of documentation the Entry Supervisor may accept a copy of the controlling entity's documentation to meet the documentation requirement.
 - 4. The Entry Supervisor may accept the controlling entity's rescue instructions if the entity agrees, but must verify that rescue personnel are qualified and willing in accordance with this procedure and that they are notified prior to entry.
 - 5. Upon request by the controlling entity, the Entry Supervisor shall obtain and provide the following documents as proof of program and Entrant training:
 - i. A copy of this procedure

- ii. A copy of the Department's training protocol for Entrants
 - iii. A copy of the Entrant's training documentation
 - b) If the controlling entity does not have a permit required confined space program or has not identified the space as permit required, the Entry Supervisor shall classify the confined space as non-permit, permit required or alternate entry in accordance with 4.5 of this procedure.
 - 1. If the controlling entity agrees to take the actions necessary for classifying a space as non-permit, the Entry Supervisor may oversee such actions, test their effectiveness, and classify the space in accordance with this program, even if the decisions reached in that evaluation classify the space differently than the host.
 - 2. If the controlling entity agrees to supply and require an individual to perform the functions of an Attendant, the Entry Supervisor must qualify the attendant in accordance to this procedure and then the Entry Supervisor may authorize the individual as the Attendant. The Attendant's name, position, and employer shall be recorded on the permit.
- 5.3.4 The Entry Supervisor shall prepare and issue the permit (Attachment 1), or prepare the required documentation for classification.
- 5.3.5 The Entrant and Attendant shall follow the instructions for their classification for the duration of the entry, and return the permit or documentation to the Entry Supervisor at completion of the entry.
- 5.3.6 The Entry Supervisor shall perform post-entry duties in concert with the controlling entity.
- a) If the controlling entity has a permit-required confined space program, the Entry Supervisor shall allow the controlling entity to perform the post-entry activities required by that program.
 - b) If the controlling entity does not have a permit-required confined space program, the Entry Supervisor shall oversee the return of the space to the condition prior to entry. This includes the return of security to the entry space.

5.3.7 The Entry Supervisor shall immediately meet with the controlling entity to provide information on:

- a) Hazards within the space of which the controlling entity was unaware; and
- b) Any unexpected problems occurring during entry.

5.3.8 The Entry Supervisor shall retain any documentation prepared as a result of entry. The Entry Supervisor shall also record any emergencies, evacuations or other unexpected events related to the entry. All documentation will be sent to the Inspector Supervisor (Program Coordinator). A copy of the records for any emergencies, evacuations or other unexpected events shall be sent to the Bureau Chief.

5.4 Program Review

5.4.1 Inspector Supervisors (Program Coordinators) shall review the effectiveness of the Program annually, using the canceled permits and other documentation from the preceding twelve months, Entry Supervisor comments, and other available information.

5.4.2 The Inspector Supervisors (Program Coordinators) may petition the Bureau Chief at any time to make changes in Bureau procedures to address and correct weaknesses in the procedures.

5.5 Entry Procedures for Confined Spaces

5.5.1 Pre-Permit Duties of the Entry Supervisor

- a) The Entry Supervisor shall record on the permit a descriptive identification of the confined space and its location.
- b) The Entry Supervisor shall record on the permit the date of entry, the time of issuance, and the time of expiration. No permit shall be issued for a period longer than eight hours.
- c) The Entry Supervisor shall record on the permit the reason for the entry.
- d) The Entry Supervisor shall survey the confined space without entry and review the work to be performed, to identify the existing or potential hazards. Such hazards shall be recorded on the permit:
 - 1. Gases or vapors that could displace the oxygen or processes that could consume oxygen
 - 2. Flammable gases
 - 3. Any other chemicals, gases, fumes or mists which could be present or released by entry activities

4. A potential for low levels of oxygen from a lack of adequate ventilation
5. A potential for high levels of oxygen
6. Liquids or flowable solids that could engulf an entrant
7. Inwardly converging walls, sloped floors that taper to a smaller cross-section, pits or holes in the floor into which an entrant could stumble into and become wedged and/or other characteristics of the configuration of the space that could trap or asphyxiate an entrant
8. Radiation
9. Bare, exposed, or ungrounded conductive parts of electrical equipment, machinery, wiring, fixtures or installations
10. Unguarded points of operation or moving parts of machinery
11. Any other recognized hazard that could result in accidental injury or occupational illness requiring treatment greater than first aid

5.5.2 The Entry Supervisor shall determine the type of entry that is allowed; permit, non-permit or non-permit alternate entry.

- a) If the pre-entry survey that includes atmospheric testing proves that there are no atmospheric or configuration hazards in the permit space, and that all other identified hazards can be eliminated (as opposed to controlled) from outside the space prior to entry, the Entry Supervisor may reclassify the space as non-permit contingent upon the completion of all hazard elimination activities.
- b) If the pre-entry survey proves that the only hazard existing in the space is atmospheric, the Entry Supervisor may authorize Alternate Entry Procedures under stipulation that:
 1. When the cover is removed from the opening the opening is guarded.
 2. Forced-air ventilation is started.
 3. Atmospheric tests indicate the atmosphere meets the entry requirements.
 4. Forced-air ventilation from a clean source is directed to immediate area where entrants are working.

5. Forced-air ventilation continues for the duration of the entry.
 6. The Attendant performs atmospheric tests once per hour and records them on the Air Monitoring Log on the permit.
 - c) If a non-permit entry is approved, an Attendant is needed. The permit will document the attendants name, position, and employer and document the classification.
 - d) If no other type of entry is obtainable or selected, entry shall be by the permit process.
- 5.5.3 The Entry Supervisor shall determine the actions necessary prior to entry to eliminate or control the hazards and shall record them on the permit:
- a) Notification of the selected rescue personnel shall be required for each permit required entry. (The rescue personnel must be qualified in accordance with this procedure. See 4.2)
 - b) Atmospheric hazards:
 1. If a potential or actual atmospheric hazard exists, testing shall be required:
 - i. Oxygen, flammable gas and carbon monoxide tests shall be conducted.
 - ii. The Entry Supervisor shall obtain and list the Permissible Exposure Limits (PEL) for each identified air contaminant.
 2. The Entry Supervisor shall determine if the atmospheric hazard can be eliminated or controlled by purging, venting, inerting or continuous forced air ventilation.
 3. If the only hazard in a space is a hazardous atmosphere and Alternate Entry Procedures is the desired means of entry, forced air ventilation is required.
 - c) Engulfment hazard elimination or control by blanking, binding, double block and bleed, line breaking or other methods.
 - d) By configuration control. Configuration hazards usually cannot be eliminated.
 - e) Other serious hazards elimination or control by lock-out/tag-out or other means.

- f) The need for traffic control devices to isolate the permit space from vehicular and pedestrian traffic.

5.5.4 The Entry Supervisor shall determine and record the required equipment for entry:

- a) Equipment for the Attendant to summon rescue and the Entry Supervisor is required for all confined space entries.
- b) Equipment designed to test oxygen, flammable gases, and carbon monoxide shall be required for all confined spaces.
- c) Equipment designed to test levels of identified airborne contaminants shall be required where such have been identified.
- d) A forced-air ventilation system is required for Alternate Entry Procedures and shall be required if determined by the Entry Supervisor. The BSB does not provide equipment for forced-air ventilation system. The Entry Supervisor may accept the use of equipment for forced-air ventilation system provided and installed by the controlling entity
- e) Personal protective equipment is required where hazards cannot be effectively eliminated or controlled.
- f) Traffic control equipment is required if the permit space is not effectively isolated from vehicle or pedestrian traffic.
- g) Mechanical rescue equipment is required unless its use creates a greater hazard or would not effectively contribute to rescue. The Entry Supervisor may accept the use of rescue equipment provided and installed by the controlling entity.
 - 1. Body harnesses with retrieval lines attached at the upper back should be used whenever feasible.
 - 2. Wristlets may be used where body harnesses are not feasible.
 - 3. Mechanical retrieval devices shall be used for vertical entries into spaces deeper than five feet. Mechanical devices or fixed-point connection may be used otherwise.
- h) Communication equipment is required where Entrants will be out of voice range with the Attendant.
- i) Other equipment shall be selected as need requires.

5.5.5 The Entry Supervisor shall identify the Authorized Entrants and at least one Attendant, and shall record their names on the permit.

- 5.5.6 The Entry Supervisor shall indicate any other permits issued for simultaneous work within the space and shall indicate the means to contact rescue personnel.
- 5.5.7 The Entry Supervisor shall sign and issue the permit, effective upon the date issued and contingent upon completion of all pre-entry activities, and expiring on the date indicated on the permit.
- 5.5.8 Pre-entry Actions
- a) The Entry Supervisor shall ensure that required equipment is procured and available, and that pre-entry actions are completed prior to entry. The Entry Supervisor may perform these duties or may delegate them to the Attendant and/or other Entrants.
 - b) Each pre-entry requirement successfully met shall be checked off in the block provided on the permit. When all requirements are completed, the Entry Supervisor shall verify the actions by signing the permit.
 - c) Required atmospheric testing shall be performed in the order indicated below after the pre-entry actions to address atmospheric hazards have been performed. Entry may proceed only if the tests indicate:
 - 1. The percentage of oxygen in the permit space is between 19.5% and 23.5%
 - 2. The percentage of flammable gases is at or lower than 10% of the Lower Flammable Limit
 - 3. The carbon monoxide reading is at or lower than 35 parts per million (PPM) of air
 - 4. The amount of other identified air contaminants is at or below the PEL. **NOTE: Provide all authorized entrants the opportunity to observe and concur with the readings taken prior to entry.**
 - d) The permit shall be posted at the point of entry into the space, and each entrant and attendant shall review it to become familiar with the hazards of the space and the acceptable entry conditions.
 - e) Attendants shall:
 - 1. Be stationed outside the confined space at the opening to the space, and remain in place throughout the duration of the entry or until relieved by another designated Attendant.

2. Perform no other duties beyond those stated for Attendants.
3. Maintain an accurate count of Entrants within and without the space, by use of the Entry Log on the permit.
4. Communicate by voice or communication equipment periodically to assure that all is well.
5. Order an immediate evacuation of the space:
 - i. Upon becoming aware of the development of a sign or symptom of an exposure to a dangerous situation
 - ii. Upon becoming aware of the development of a condition out of compliance with the permit
 - iii. Upon failure of an Entrant to answer an attempt at communication
 - iv. If unable to continue the performance of functions as an Attendant.
6. Summon rescue services if needed.
7. Warn unauthorized persons and activities away from the permit space.
8. Summon the Entry Supervisor if unauthorized persons refuse to leave the space.

5.5.9 The Entry Supervisor shall have unauthorized persons removed from the permit space, as needed.

5.6 Completion of Entry

5.6.1 The Attendant shall assure that all Entrants have exited the space.

5.6.2 If the space was evacuated prior to completion of work. The Attendant shall immediately terminate the permit by checking the appropriate box and describing the reasons for evacuation on the permit, then contacting the Entry Supervisor.

a) The Entry Supervisor shall:

1. Immediately notify the Bureau Chief of any injured or overexposed employee in the incident.
2. Determine if reentry is required to complete work, eliminate a created hazard, or return the space to the condition prior to entry.
3. If reentry must be performed:

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- i. Resurvey the space to determine the cause of the evacuation.
 - ii. Issue another permit that includes the elimination or control of the hazard causing the evacuation. Alternate Entry Procedures and Reclassification to Non-Permit Space shall not be approved.
 - 4. If reentry is unnecessary:
 - i. Oversee the completion of the post-entry activities indicated on the permit.
 - ii. End the entry activities.
- 5.6.3 If the entry was successfully completed, the Entry Supervisor shall:
- a) Indicate such by checking the appropriate block on the permit.
 - b) Oversee the completion of post-entry actions indicated on the permit and verify by signing in the appropriate location.
 - c) Add any pertinent information concerning the entry on the permit.
 - d) Return the permit to the Inspector Supervisor.

5.7 Training

5.7.1 All Employees

- a) The Inspector Supervisors shall ensure that all Inspectors receive awareness training on:
 - 1. The identifying characteristics of a confined space
 - 2. The identifying characteristics of a permit space
 - 3. Required actions when working around or near a permit space entry
 - 4. The authority of authorized Attendants and Entry Supervisors
- b) Training shall be required:
 - 1. During orientation
 - 2. Whenever the Inspector Supervisor becomes aware that the employee has failed to follow the instructions provided in the training
- c) The Inspector Supervisor shall document that training has been completed.

5.7.2 Inspector Supervisors as Program Coordinators

- a) The Bureau Chief shall ensure that the Inspector Supervisors receive training in:
 - 1. The requirements of this procedure
 - 2. The duties the Program Coordinator shall perform
- b) Training shall be provided:
 - 1. Within two months after designation as Program Coordinator.
 - 2. Within one month of revisions to Bureau procedures.
- c) The Bureau Chief shall document that training has been completed.

5.7.3 Entry Supervisors, Attendants and Entrants

- a) The Bureau Chief shall ensure that employees designated as Entry Supervisors, Attendants, and/or Entrants receive training in:
 - 1. The requirements of this procedure
 - 2. The duties, authority, and responsibilities of Entry Supervisors, Attendants, Lead Entrants, and Entrants
 - 3. The types of hazards expected to be encountered in confined spaces
 - 4. The performance of pre-entry actions expected to required in confined spaces
 - 5. The qualification of attendants and rescue services
 - 6. The calibrations, use, care and cleaning of equipment expected to be used during entry operations. **NOTE: The entry supervisor has to be competent in the operation and interpretation of empirical data represented by the three/four gas meter(s), and the ability and responsibility to reject any equipment deemed out of calibration. It will also be the responsibility of the program coordinator/entry supervisor to insure that all entrants using a meter for continuous monitoring possess the same qualifications and competency.**
- b) Training shall be provided:

1. Prior to assignment or authorization of duties within permit spaces.
 2. Within one month after revisions of this procedure. Assignment or authorization for permit space entry shall be suspended until training is completed.
 3. Whenever the Inspector Supervisor becomes aware that an employee is deviating from the requirements in this procedure. Assignment or authorization for permit space entry shall be suspended until training is completed.
- c) The Inspector Supervisor shall develop written certification that each affected employee has successfully completed training.
1. Certification shall include:
 - i. Employee name
 - ii. Authorized duty (Inspector Supervisor, Attendant, and/or Entrant)
 - iii. Name of the trainer
 - iv. Synopsis of topics covered.
 2. A copy of the certification shall be provided to the employee and the S&H Director.

6.0 DEFINITIONS

1. *Confined space*—A space that meets all three of the following conditions:
 - a. Large enough for a person to bodily enter and perform work; and
 - b. Has only means of entry/egress that requires a person to enter by a means other than normal walking, such as crawling, squatting, climbing, bending or use of devices; and
 - c. Is not designed for people to continually occupy the space.
2. *Non-permit space*—A confined space that does not contain any actual or potential hazards capable of causing death or serious physical harm.
3. *Permit-Required Confined Space, Permit Space*—A confined space which has one or more of the following characteristics:
 - a. Contains or has the potential to contain a hazardous atmosphere; or
 - b. Contains a material that has the potential for engulfing an entrant; or
 - c. Has an internal configuration that could trap or asphyxiate an entrant, such as inwardly converging walls or a floor that slopes downward and tapers to a smaller cross-section; or

- d. Has been designated as a Permit-Required Confined Space by the owner, operator, or employer responsible for the space.
- 4. *Attendant*—The trained individual stationed outside the Permit Space who monitors the Authorized Entrants and who performs all attendant duties.
- 5. *Entrant*—The trained individual who enters the permit space.
- 6. *Entry Supervisor*—The trained individual with the responsibility to:
 - a. Ensure that acceptable entry conditions are present within a permit space under his/her jurisdiction; and
 - b. Issue a permit authorizing entry; and
 - c. Oversee entry operations; and
 - d. Terminate the entry and permit.
- 7. *Controlling Entity*—The owner or operator of the pressure equipment.
- 8. *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.
- 9. *Hazardous atmosphere*—An atmosphere that may expose employees to the risk of death, incapacitation, impairment of the ability to escape unaided from a permit space, injury, or acute illness. Hazardous atmospheres may be created by conditions such as, but not limited to:
 - a. Flammable gas, vapors, or mists in excess of 10% of the lower flammable limit (LFL).
 - b. Airborne combustible dusts at a concentration that:
 - i. Meets or exceeds its LFL; and/or
 - ii. Obscures vision at a distance of five feet or less.
 - c. Atmospheric oxygen concentration below 19.5% or above 23.5%.
 - d. Atmospheric concentrations at or above the Permissible Exposure Limit (PEL) of substances identified in Subpart Z of 29 CFR 1910.
 - e. Any other atmospheric conditions which are immediately dangerous to life and health.
- 10. *Immediately Dangerous to Life and Health (IDLH)*—Any condition that:
 - a. Poses an immediate or delayed threat to life; and/or
 - b. Would cause irreversible adverse health effects; and/or
 - c. Would interfere with an individual's ability to escape unaided from a permit space.

11. *Conditions of entry*—The conditions that must exist in a permit space to allow employees to safely enter and perform duties within the space.
12. *Blanking or binding*—Absolute closure of a pipe, line or duct by fastening a solid plate 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.
13. *Double block and bleed*—The closure of a line, duct, or pipe by closing and locking/tagging out two in-line valves and opening and locking/tagging out a drain or vent in the line between the two closed valves.
14. *Inerting*—The displacement of the atmosphere in a permit space by a noncombustible gas to such an extent that the resulting atmosphere is noncombustible.
15. *Isolation*—The complete removal of a permit space from service and the complete protection of that space from the release of energy or material.
16. *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.
17. *Alternate Entry Procedures*—The use of continuous forced air ventilation and atmosphere monitoring in lieu of a permit to enter a permit-required confined space that:
 - a. Has an actual or potential hazardous atmosphere that can be demonstrably controlled by continuous forced air ventilation alone; and
 - b. Has no other hazards of any kind.
18. *Emergency*—Any occurrence (including the failure of hazard control or monitoring equipment) or event, internal or external to the permit space, which could endanger entrants.
19. *Entry*—The action of breaking the plane of an opening of a permit space with any part of the body.
20. *Permit*—The written or printed document authorizing entry into a permit space and designating the requirements for entry.
21. *Prohibited condition*—Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.
22. *Testing*—The process by which the hazards that may confront entrants are identified and evaluated. This term includes the specification of tests that are to be performed in the permit space.

7.0 CUSTOMER SERVICE REQUIREMENTS

The purpose of following this procedure is to provide the customer, be it the public, employees of the Bureau, or other state agencies, with the most efficient service, information, training, and assistance possible.

8.0 DATA and RECORD MANAGEMENT

8.1.1 Canceled Permits and other documentation shall be retained by the Supervisor or Program Coordinator not less than one year following the date of entry. Further the entry supervisor or program coordinator shall review the program by using all retained canceled permits during the above period annually based upon the earliest dated cancelled permit through the one year period to insure that the program is functioning properly to protect employees involved in entry operations are protected from hazards associated with permit spaces. Note: Employers may perform a single annual review covering all entries performed during a 12 month period. If no entry is performed during that period, no review is necessary.

8.1.2 Employee training certification shall be retained by the Supervisor for the length of employment or until the creations of a retraining certificate, whichever is shorter.

8.1.3 ***Records shall be maintained in accordance with the Functional Schedule for North Carolina State Agencies as adopted by State Archives, a Division of the North Carolina Department of Natural and Cultural Resources.***