



Subject: **CONFINED SPACE ENTRY – CENTRAL HEATING PLANT**

Policy No. 154

**APPLICATION**

New York University  
Central Plant

**PURPOSE**

The purpose of New York University's Confined Space Entry Program is to protect employees from the hazards of entry into permit-required confined spaces and to comply with the Occupational Safety and Health Administration (OSHA) Confined Space Entry Final Rule, 29 CFR 1910.146.

**PART I: GENERAL INFORMATION**

1.0 Definitions

- 1.1 **Confined Space** is a space that 1) is large enough and so configured that an employee can bodily enter and perform assigned work; 2) has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, vaults, sewers and silos are spaces that may have limited means of entry); and 3) is not designed for continuous employee occupancy.
- 1.2 **Permit-Required Confined Space** is a space that: 1) contains or may contain hazardous Atmospheres; 2) contains a material that can engulf an entrant; 3) has an internal configuration that can trap or asphyxiate an entrant; 4) has any other serious health or safety hazard.

2.0 Responsibilities

- 2.1 Responsibilities of the Director of Environmental Services or his or her designee
  - 2.1.1 Developing the Confined Space Entry Program.
  - 2.1.2 Conducting training in the use of personal protective clothing and equipment.
  - 2.1.3 Assisting the Central Plant (the Plant) in conducting employee training in confined space entry.
  - 2.1.4 Conducting periodic audits to evaluate the effectiveness of the Confined Space Entry Program.
- 2.2 Responsibilities of the Director of the Plant or his or her designee
  - 2.2.1 Ensuring that all confined spaces, as defined in Section 1.1, are identified and included in the Confined Space Entry Program.

ISSUE DATE	REPLACES	ORIGINATOR	APPROVAL
11/05	08/02	ENVIRONMENTAL SERVICES	SR. VP OPERATIONS AND ADMINISTRATION

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- 2.2.2 Ensuring that all Plant employees who are included by the Confined Space Entry Program are trained in confined space entry and the use of personal protective clothing and equipment.
- 2.2.3 Ensuring that the Confined Space Entry Program is implemented.
- 2.2.4 Ensuring that personal protective clothing and equipment, atmospheric testing equipment and rescue and retrieval equipment are available to all Plant employees who are included in the Confined Space Entry Program.
- 2.2.5 Enforcing the requirements of the Confined Space Entry Program.
- 2.2.6 Ensuring that outside contractors who perform work in permit-required confined spaces within the Plant comply with the Confined Space Entry Program.

### 3.0 Confined Space Identification

- 3.1 The Director of the Plant or his or her designee will identify all confined spaces located within the Plant. The Director of Environmental Services or his or her designee will review confined spaces identified by the Director of the Plant to determine which confined spaces are permit-required confined spaces. The Director of the Plant will post a warning sign on every identified confined space within the Plant. Confined spaces that may be entered by Plant employees will be identified with a warning sign indicating: DANGER, CONFINED SPACE, ENTER BY PERMIT ONLY. Confined spaces that shall not be entered by Plant employees under any circumstances will be identified with a warning sign indicating: DANGER, CONFINED SPACE, DO NOT ENTER.

### 4.0 Confined Space Entry Permit

- 4.1 A confined space entry permit (Appendix A) must be completed and signed prior to entry into any permit-required confined space. The Plant Supervisor and Plant Manager must sign the confined space entry permit to authorize permit-required confined space entry. (See Appendix B for instructions on preparing a confined space for entry and completing the confined space entry permit.)
- 4.2 The confined space entry permit is a pre-numbered, two-copy form. After the permit is signed, the original copy is posted at the permit-required confined space to be entered until the permit is no longer valid (see Section 4.3). The duplicate copy of the permit must be retained by the Plant Manager. The Plant employee(s) who entered the permit-required confined space must return the original copy of the permit to the Plant Manager when the permit becomes invalid. The Plant Manager must match both copies of the permit and send them to the Environmental Services Department on a daily basis.
- 4.3 A confined space entry permit is valid until the end of the entrant employee's work shift or until the work is completed, whichever ever occurs first; or until an emergency involving or affecting the permit-required confined space occurs.
- 4.4 The Environmental Services Department will evaluate all confined space entry permits daily to ensure compliance with the Confined Space Entry Program and make recommendations for changes as necessary.

### 5.0 General Confined Space Entry Procedures

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- 5.1 When the Plant Manager has determined that a permit-required confined space must be entered, the Plant Supervisor will initiate and complete a confined space entry permit.
  - 5.2 The Plant Manager will assign an employee(s) to enter the permit-required confined space and an attendant to observe outside the permit-required confined space when an employee(s) are inside the permit-required confined space.
  - 5.3 The Plant Supervisor will have the confined space prepared for entry (see Appendix B.) The Plant Supervisor will check that the employee entrant(s) have been equipped with the appropriate safety equipment.
  - 5.4 The Plant Supervisor will sign the confined space entry permit indicating that the permit-required confined space is ready for entry. The Plant Supervisor will contact the Plant Manager to sign the confined space entry permit and authorize entry into the permit-required confined space. The original copy of the confined space entry program is posted at the permit-required confined space. The Plant Manager retains the duplicate copy of the confined space entry permit (see Section 4.0.)
  - 5.5 While work is being performed inside the permit-required confined space, the Plant Supervisor will stay in radio contact with the attendant. The attendant will call the Plant Supervisor when the work is complete or in the event of an emergency.
  - 5.6 The confined space entry permit will remain valid until either of the conditions in Section 4.3 is encountered.
  - 5.7 When the confined space entry permit is no longer valid, the employees involved in the work will return the permit to the Plant Manager. The original copy of the permit will be matched with the duplicate copy retained by the Plant Manager and sent to the Environmental Services Department daily.
  - 5.8 When the work is completed and the involved employees have left the permit-required confined space, all systems will be returned to their original condition. The Plant Manager will check the permit-required confined space and authorize that it be put back into service.
- 6.0 Training
- 6.1 The Director of the Plant is responsible for providing training for building employees in: 1) the requirements of the Confined Space Entry Program; 2) the use of safety equipment; 3) the proper preparation of a confined space for entry; and 4) emergency procedures.
  - 6.2 The Environmental Services Department will assist the Director of the Plant in conducting confined space entry training, particularly in the use of safety equipment.
  - 6.3 Frequency of Training
    - 6.3.1 Training must be conducted before an employee is first assigned duties included in the Confined Space Entry Program.
    - 6.3.2 Training must be conducted before an employee is assigned new or additional duties included in the Confined Space Entry Program.
    - 6.3.3 Training must be repeated whenever there is a change in the Confined Space Entry Program or a change in the hazards associated with permit-required confined space entry in which employees have not received training.

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6.3.4 Training must be repeated whenever there are deviations from the Confined Space Entry Program or detected deficiencies in employees' knowledge or execution of the Confined Space Entry Program.

6.4 The Plant Manager will maintain records of employee training. The records will include the dates of training, subjects covered, names of employees trained and name and signature of the trainer. Copies of training records will be sent to the Environmental Services Department.

## 7.0 Outside Contractors

7.1 Outside contractors must comply with all of the requirements of the New York University Confined Space Entry Program. The Director of the Plant and Plant Manager should inform outside contractors of the requirements of the Confined Space Entry Program during the bidding process. Specifically, the confined space entry permit, required safety equipment and training requirements must be discussed with the outside contractor prior to authorizing entry into a permit-required confined space within the Plant.

7.2 The outside contractor supervisor and New York University Plant Manager will jointly complete and sign the confined space entry permit. When the confined space entry permit is no longer valid, the outside contractor supervisor will contact the Plant Manager. The Plant Manager will match the original copy of the confined space entry permit with the duplicate copy retained by him or her and send the confined space entry permit to the Environmental Services Department (see Section 4.2.)

7.3 The Plant Manager will debrief the outside contractor after the permit-required confined space entry regarding the procedures followed and any hazards encountered. The Plant Manager will record the results of the debriefing and submit a copy to the Environmental Services Department.

## 8.0 Confined Space Entry Program Evaluation

8.1 The Environmental Services Department will conduct a daily evaluation of confined space entry permits. The Environmental Services Department will conduct an annual evaluation of the Confined Space Entry Program and record the results in a written report.

8.2 The Environmental Services Department and the Director of the Plant will periodically evaluate confined space entry procedures and modify the procedures as necessary. Periodic evaluations will be documented.

### **PART II: SPACE SPECIFIC CONFINED SPACE ENTRY PROCEDURES**

#### **II A Boiler**

##### 1.0 Workplace

1.1 High Temperature Hot Water (HTHW) Boiler. There are three identical HTHW boilers located within the Central Plant. The HTHW boilers are horizontal, rectangular vessels with approximate dimensions of 12 feet x 10 feet x 20 feet (W x H x D). Steel tubes filled with high temperature hot water line the sides of the HTHW boilers. Plant employees routinely enter the HTHW boilers through circular manholes that are approximately 3 feet in diameter to weld leaking tubes.

1.2 Steam Boiler. There is one steam boiler located within the Central Plant. The steam boiler is a horizontal, rectangular vessel with approximate dimensions of 12 feet x 10 feet x 20 feet (W x H x D).

The steam boiler consists of a fire side and a water side. Steel tubes filled with high temperature hot water line the sides of the steam boiler. Plant employees routinely enter the fire side of the steam boiler through a square manhole that is approximately 2 feet x 2 feet to weld leaking tubes. The water side of the steam boiler consists of a steam drum and a mud drum. The steam drum is a 48-inch diameter cylinder with an 18-inch x 24-inch elliptical manhole. The mud drum is a 45-inch diameter cylinder with an 18-inch x 24-inch elliptical manhole. Plant employees routinely enter the steam and mud drums to mechanically roll the high temperature hot water tubes that empty into the drums.

## 2.0 Potential Hazards

The recognized hazards associated with the HTHW and steam boilers are the risks that a Plant employee could be:

- Injured due to contact with components of the boiler or the tools being used;
- Injured in the eye due to airborne dust if eye protection is not worn;
- Engulfed in high temperature hot water if inlet and outlet valves are not properly closed and locked out;
- Burned by high temperature hot water, or by contact with hot metal surfaces, such as the boiler floor or steel tubes;
- Overcome by heat stress caused by a warm atmosphere inside the boiler;
- Injured by slipping on a wet boiler surface and falling;
- Electrically shocked by faulty equipment taken into the boiler;
- Burned or overcome by fire or products of combustion caused by the presence of explosive/flammable gases equal to or greater than 10% of the lower flammable limit (LFL);
- Harmed by a concentration of oxygen in the atmosphere equal to or less than 19.5% by volume; or
- Overcome by fumes generated by welding.

## 3.0 Permits

Confined Space Entry Permit. Any Plant employee required or permitted to enter a boiler shall have successfully completed, as a minimum, the permit-required confined space entry training as required by the following sections of these procedures. *A written copy of operating and rescue procedures as required by these procedures shall be at the work site for the duration of the job.* The Confined Space Entry Permit must be completed before approval can be given to enter a boiler. This permit verifies completion of the items listed below. This permit shall be kept at the job site for the duration of the job. If circumstances cause an interruption in the work or a change in the monitor alarm settings for which entry was approved, a new Confined Space Entry Permit must be completed.

## 4.0 Control of Hazards

- 4.1 Engulfment. Lock out high temperature hot water inlet and outlet valves. Affix a tag to the lock to inform others that a permit-required confined space entry is in progress. Drain high temperature hot water tubes.
- 4.2 Burns and heat stress. Vent the boiler using the air combustion blower. If faster cooling is needed, use a portable blower to increase ventilation. Check air and inner surface temperatures in the boiler to assure they are within acceptable limits before entering.
- 4.3 Atmosphere
  - 4.3.1 Testing. The boiler atmosphere shall be tested to determine whether dangerous air contamination and/or an oxygen deficiency exist. Testing shall be performed by the PLANT SUPERVISOR who has successfully completed the gas detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency and LFL concentration. A written

record of the pre-entry test results shall be made and kept at the work site for the duration of the job. The PLANT SUPERVISOR shall certify in writing, based upon the results of the pre-entry testing, that all hazards have been eliminated. Affected Plant employees shall be able to review the testing results.

4.3.2 Space Ventilation. The boiler combustion air blower should be used to increase air circulation. Use portable blowers to augment natural circulation if needed. After a suitable ventilating period, repeat the testing. Entry may not begin until testing has demonstrated that a hazardous atmosphere has been eliminated.

4.4 Fire and Fumes. Carefully prepare the boiler by cleaning surfaces of volatile or combustible coatings within four inches of all welding or torch cutting operations with a non-flammable, non-toxic cleaner. Maintain the oxygen concentration between 19.5% and 23.5% and the LFL concentration below 10% using the air combustion blower and a portable blower, as necessary. All welding and cutting operations shall be done in accordance with the requirements of 29 CFR Part 1910, Subpart Q, the Occupational Safety and Health Administration (OSHA) welding standard. Welding gas tanks shall never be brought into a boiler.

4.5 Electrical Shock. Electrical equipment used in the boiler shall be provided with ground fault interruption (GFI).

4.6 Slips and Falls. Remove residual water before entering the boiler.

4.7 Eye and Skin Injury. Eye protection and gloves shall be worn during entry into the boiler.

## 5.0 Entry Procedures

5.1 Authorization. Only the PLANT MANAGER may authorize an employee to enter a boiler. The PLANT MANAGER must determine that conditions in the boiler meet permit requirements before authorizing entry. If there are no atmospheric hazards present and if the pre-entry tests show there are no dangerous air contamination and/or oxygen deficiency within the boiler and there is no reason to believe that any is likely to develop, entry into the boiler may proceed. Continuous testing of the atmosphere in the immediate vicinity of the entrants shall be accomplished. The entrants shall immediately leave the boiler when any of the gas monitor alarm set points as defined are reached. No entrants shall return to the boiler until the PLANT SUPERVISOR has used a gas detector to evaluate the situation and has determined that it is safe to re-enter.

5.2 Attendant. The PLANT MANAGER shall designate a Plant employee to maintain communication with Plant employees working in a boiler to ensure their safety. The ATTENDANT may not enter the boiler to rescue an entrant or for any other reason, unless authorized by the rescue procedure, and even then, only after calling the rescue team and being relieved as ATTENDANT by another worker.

5.3 Communications and Observation. Communications between ATTENDANT and entrant(s) shall be maintained throughout entry. Methods of communication that may be specified by the permit include voice-powered radio, signaling tugs on a rope, and the ATTENDANT'S observation that work activities (such as welding), which require deliberate operator control, continue normally. The hearing protection required for work within the Plant precludes the use of voice or rapping on boiler walls as a method of communication.

## 6.0 Rescue Procedures

Acceptable rescue procedures include the use of public emergency services and procedures for breaching a boiler.

The permit specifies which procedures are available, but the PLANT MANAGER makes the final decision based on circumstances. Certain injuries may make it necessary to breach the boiler to remove an entrant rather than risk additional injury by removal through the existing manhole; however, the PLANT MANAGER must ensure that no breaching procedure used for rescue would violate terms of the entry permit. For example, if the boiler must be breached by cutting with a torch, the boiler surfaces to be cut must be free of volatile or combustible coatings within four inches of the cutting line and the atmosphere within the boiler must be below the LFL. When dangerous air contamination is attributable to flammable and/or explosive substances, lighting and electrical equipment shall be Class I, Division 1 rated per National Electrical Code and no ignition sources shall be introduced into the boiler.

- 6.1 Employee Injury. In the event of an employee injury, the ATTENDANT shall contact the PLANT SUPERVISOR via radio and request assistance. The PLANT SUPERVISOR shall immediately contact the PLANT MANAGER who shall oversee rescue procedures. The ATTENDANT shall not attempt to enter the boiler to assist an injured employee(s). The ATTENDANT shall only hold the lifeline and attempt to assist the injured employee(s) exit the boiler. If other employees are in the vicinity of the boiler, their assistance shall be requested. If the injured employee(s) is unable to exit the boiler and no other employees are able to assist the ATTENDANT, the PLANT MANAGER shall contact the New York City Fire Department and begin breaching procedures as necessary.
- 6.2 Retrieval Line and Harnesses. The retrieval lines and harnesses generally required under 29 CFR Part 1910.146, the OSHA permit-required confined spaces standard, are usually impractical for use in boilers because the internal configuration of the boiler prevents rescuers from hauling out injured entrants; however, unless the rescue procedure calls for breaching the boiler for rescue, the rescue team shall be trained in the use of retrieval lines and harnesses for removing injured entrants through the boiler manhole.

## **II B Petroleum Bulk Storage Tank (PBST)**

### 1.0 Workplace

- 1.1 Aboveground Petroleum Bulk Storage Tank (PBST). There are 18 aboveground PBSTs located on the Washington Square Campus. Appendix C lists the locations of aboveground PBSTs on the Washington Square Campus, the type of fuel stored and the tank capacities. Not all of the aboveground PBSTs located on the Washington Square Campus are under the control of the Plant; however, Plant employees should be aware of the locations of all University PBSTs in the event that they are required at any time to perform work in or on PBSTs outside of the Plant. The PBSTs located on the Washington Square Campus are horizontal, cylindrical vessels fabricated from steel. A PBST has a vent pipe and a fill pipe connected to its surface that terminates outside of the building in which the PBST is housed. Plant employees infrequently enter aboveground PBSTs through manholes to mechanically repair the heater element. Outside contractors are employed to repair any tank leaks by welding.
- 1.2 Underground Petroleum Bulk Storage Tank (PBST). There are 9 underground PBSTs located on the Washington Square Campus. Appendix C lists the locations of underground PBSTs on the Washington Square Campus, the type of fuel stored and the tank capacities. Not all of the underground PBSTs located on the Washington Square Campus are under the control of the Plant; however, Plant employees should be aware of the locations of all University PBSTs in the event that they are required at any time to perform work in or on PBSTs outside of the Plant. The underground PBSTs are identical in physical configuration to the aboveground PBSTs. The underground PBSTs located on the Washington Square Campus are contained within underground vaults that are accessible through manholes. Plant employees infrequently enter underground PBSTs through manholes to mechanically repair the heater element or supply and return piping. Outside contractors are employed to repair any tank leaks by welding.

## 2.0 Potential Hazards

The recognized hazards associated with PBSTs are the risks that a Plant employee could be:

- Injured due to contact with components of the PBST or the tools being used;
- Injured by breathing fumes from fuel residues;
- Injured in the eye due to airborne dust if eye protection is not worn;
- Engulfed in fuel if inlet and outlet valves are not properly closed and locked out;
- Injured by slipping on a wet PBST surface and falling;
- Electrically shocked by faulty equipment taken into the PBST;
- Burned or overcome by fire or products of combustion caused by the presence of explosive/flammable gases equal to or greater than 10% of the lower flammable limit (LFL); or
- Harmed by a concentration of oxygen in the atmosphere equal to or less than 19.5% by volume.

## 3.0 Permits

**Confined Space Entry Permit.** Any Plant employee required or permitted to enter a PBST shall have successfully completed, as a minimum, the permit-required confined space entry training as required by the following sections of these procedures. *A written copy of operating and rescue procedures as required by these procedures shall be at the work site for the duration of the job.* The Confined Space Entry Permit must be completed before approval can be given to enter a PBST. This permit verifies completion of the items listed below. This permit shall be kept at the job site for the duration of the job. If circumstances cause an interruption in the work or a change in the alarm conditions for which entry was approved, a new Confined Space Entry Permit must be completed.

## 4.0 Control of Hazards

4.1 **Engulfment.** Lock out fuel inlet valve. Affix a tag to the lock to inform others that a permit-required confined space entry is in progress. Drain the PBST by either burning off residual fuel (if PBST is nearly empty) or by pumping fuel into a cross-connected PBST. Lock out fuel outlet valve. Affix a tag to the lock to inform others that a permit-required confined space entry is in progress.

### 4.2 Atmosphere

4.2.1 **Testing.** The PBST atmosphere shall be tested to determine whether dangerous air contamination and/or an oxygen deficiency exist. Testing shall be performed by the PLANT SUPERVISOR who has successfully completed the gas detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency and LFL concentration. A written record of the pre-entry test results shall be made and kept at the work site for the duration of the job. The PLANT SUPERVISOR shall certify in writing, based upon the results of the pre-entry testing, that all hazards have been eliminated. Affected Plant employees shall be able to review the testing results.

4.2.2 **Space Ventilation.** Use a portable blower to augment natural ventilation through the PBST vent pipe. Place a flexible duct attached to the portable blower through the PBST manhole to introduce fresh air into the PBST. After a suitable ventilating period, repeat the testing. Entry may not begin until testing has demonstrated that a hazardous atmosphere has been eliminated.

4.3 **Fire and Fumes.** Carefully prepare the PBST by cleaning surfaces of volatile or combustible coatings within four inches of all mechanical repair operations with a non-flammable, non-toxic cleaner. Maintain

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the oxygen concentration between 19.5% and 23.5% and the LFL concentration below 10% using the portable blower. Use only non-sparking tools.

- 4.4 Electrical Shock. Electrical equipment used in the PBST shall be provided with ground fault interruption (GFI).
- 4.5 Slips and Falls. Residual fuel cannot be suctioned from the floor surface of the PBST. Traction soled footwear shall be worn during entry into a PBST.
- 4.6 Eye and Skin Injury. Eye protection and gloves shall be worn during entry into a PBST.

## 5.0 Entry Procedures

- 5.1 Authorization. Only the PLANT MANAGER may authorize an employee to enter a PBST. The PLANT MANAGER must determine that conditions in the PBST meet permit requirements before authorizing entry. If there are no atmospheric hazards present and if the pre-entry tests show there are no dangerous air contamination and/or oxygen deficiency within the PBST and there is no reason to believe that any is likely to develop, entry into the PBST may proceed. Continuous testing of the atmosphere in the immediate vicinity of the entrants shall be accomplished. The entrants shall immediately leave the PBST when any of the gas monitor alarm set points as defined are reached. No entrants shall return to the PBST until the PLANT SUPERVISOR has used a gas detector to evaluate the situation and has determined that it is safe to re-enter.
- 5.2 Attendant. The PLANT MANAGER shall designate a Plant employee to maintain communication with Plant employees working in a PBST to ensure their safety. The ATTENDANT may not enter the PBST to rescue an entrant or for any other reason, unless authorized by the rescue procedure, and even then, only after calling the rescue team and being relieved as ATTENDANT by another worker.
- 5.3 Communications and Observation. Communications between ATTENDANT and entrant(s) shall be maintained throughout entry. Methods of communication that may be specified by the permit include voice-powered radio, signaling tugs on a rope, and the ATTENDANT'S observation that work activities (such as mechanical repair) which require deliberate operator control, continue normally. Background noise levels in the vicinity of PBSTs preclude the use of voice or rapping on PBST walls as a method of communication.

## 6.0 Rescue Procedures

Acceptable rescue procedures include the use of public emergency services and procedures for breaching a PBST. The permit specifies which procedures are available, but the PLANT MANAGER makes the final decision based on circumstances. Certain injuries may make it necessary to breach the PBST to remove an entrant rather than risk additional injury by removal through the existing manhole; however, the PLANT MANAGER must ensure that no breaching procedure used for rescue would violate terms of the entry permit. For example, if the PBST must be breached by cutting with a torch, the PBST surfaces to be cut must be free of volatile or combustible coatings within four inches of the cutting line and the atmosphere within the PBST must be below the LFL. When dangerous air contamination is attributable to flammable and/or explosive substances, lighting and electrical equipment shall be Class I, Division 1 rated per National Electrical Code and no ignition sources shall be introduced into the PBST.

- 6.1 Employee Injury. In the event of an employee injury, the ATTENDANT shall contact the PLANT SUPERVISOR via radio and request assistance. The PLANT SUPERVISOR shall immediately contact the PLANT MANAGER who shall oversee rescue procedures. The ATTENDANT shall not attempt to enter the PBST to assist an injured employee(s). The ATTENDANT shall only hold the lifeline and

attempt to assist the injured employee(s) exit the PBST. If other employees are in the vicinity of the PBST, their assistance shall be requested. If the injured employee(s) is unable to exit the PBST and no other employees are able to assist the ATTENDANT, the PLANT MANAGER shall contact the New York City Fire Department and begin breaching procedures as necessary.

- 6.2 Retrieval Line and Harnesses. The retrieval lines and harnesses generally required under 29 CFR Part 1910.146, the OSHA permit-required confined spaces standard, are usually impractical for use in PBSTs because the internal configuration of the PBST prevents rescuers from hauling out injured entrants; however, unless the rescue procedure calls for breaching the PBST for rescue, the rescue team shall be trained in the use of retrieval lines and harnesses for removing injured entrants through the PBST manhole.

## **II C Underground Vault or Crawlspace**

### 1.0 Workplaces

- 1.1 Underground Vault. There is an underground vault located beneath the sidewalk in front of Washington Square Village. The underground vault houses high temperature hot water (HTHW) lines. Plant employees routinely enter the underground vault through a rectangular manhole to weld leaking HTHW lines.
- 1.2 Crawlspace. There are five identified crawlspaces on the Washington Square Campus: 1) access tunnel between Bobst Library; 2) crawlspace in south wing of 240 Mercer Street; 3) crawlspace in the Catholic Center; and 4) crawlspace in Vanderbilt Hall Room SB5. Not all of the crawlspaces located on the Washington Square Campus are under the control of the Plant; however, Plant employees should be aware of the locations of all identified crawlspaces in the event that they are required at any time to perform work in crawlspaces outside of the Plant. Additionally, Plant employees should be aware of the potential existence of other crawlspaces located on the Washington Square Campus. Crawlspaces typically house steam or high temperature hot water (HTHW) lines. Plant employees routinely enter a crawlspace through a constricted opening to weld leaking lines.

### 2.0 Potential Hazards

The recognized hazards associated with the underground vault and crawlspaces are the risks that a University employee could be:

- Injured by the tools being used;
- Injured in the eye due to airborne dust if eye protection is not worn;
- Engulfed in high temperature hot water if inlet and outlet valves are not properly closed and locked out;
- Burned by high temperature hot water or steam, or by contact with hot metal surfaces, such as the steam or HTHW lines;
- Overcome by heat stress caused by a warm atmosphere inside the vault or crawlspace;
- Injured by slipping on a wet vault or crawlspace surface and falling;
- Electrically shocked by faulty equipment taken into the vault or crawlspace;

- Burned or overcome by fire or products of combustion caused by the presence of explosive/flammable gases equal to or greater than 10% of the lower flammable limit (LFL);
- Harmed by a concentration of oxygen in the atmosphere equal to or less than 19.5% by volume; or
- Overcome by fumes generated by welding.

### 3.0 Permits

Confined Space Entry Permit. Any Plant employee required or permitted to enter a vault or crawlspace shall have successfully completed, as a minimum, the permit-required confined space entry training as required by the following sections of these procedures. *A written copy of operating and rescue procedures as required by these procedures shall be at the work site for the duration of the job.* The Confined Space Entry Permit must be completed before approval can be given to enter a vault or crawlspace. This permit verifies completion of the items listed below. This permit shall be kept at the job site for the duration of the job. If circumstances cause an interruption in the work or a change in the alarm conditions for which entry was approved, a new Confined Space Entry Permit must be completed.

### 4.0 Control of Hazards

4.1 Engulfment. Lock out steam and/or high temperature hot water (HTHW) valves. Affix a tag to the lock(s) to inform others that a permit-required confined space entry is in progress. Drain water remaining in the section of line to be repaired and/or bleed trapped steam.

4.2 Burns and heat stress. Vent the vault or crawlspace by opening the manhole or door. If faster cooling is needed, use a portable blower to increase ventilation. Check air temperatures in the vault or crawlspace to assure they are within acceptable limits before entering.

### 4.3 Atmosphere

4.3.1 Testing. The vault or crawlspace atmosphere shall be tested to determine whether dangerous air contamination and/or an oxygen deficiency exist. Testing shall be performed by the PLANT SUPERVISOR who has successfully completed the gas detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency and LFL concentration. A written record of the pre-entry test results shall be made and kept at the work site for the duration of the job. The PLANT SUPERVISOR shall certify in writing, based upon the results of the pre-entry testing, that all hazards have been eliminated. Affected Plant employees shall be able to review the testing results.

4.3.2 Space Ventilation. Use portable blowers with flexible ductwork to augment natural circulation if needed. After a suitable ventilating period, repeat the testing. Entry may not begin until testing has demonstrated that a hazardous atmosphere has been eliminated.

4.4 Fire and Fumes. Carefully prepare the HTHW or steam line by cleaning surfaces of volatile or combustible coatings within four inches of all welding or torch cutting operations with a non-flammable, non-toxic cleaner. Maintain the oxygen concentration between 19.5% and 23.5% and the LFL concentration below 10% using the portable blower, as necessary. All welding and cutting operations shall be done in accordance with the requirements of 29 CFR Part 1910, Subpart Q, the Occupational Safety and Health Administration (OSHA) welding standard. Welding gas tanks shall never be brought into a vault or crawlspace.

4.5 Electrical Shock. Electrical equipment used in the vault or crawlspace shall be provided with ground fault interruption (GFI).

4.6 Slips and Falls. Remove residual water before entering the vault or crawlspace.

4.7 Eye and Skin Injury. Eye protection and gloves shall be worn during entry into the vault or crawlspace.

## 5.0 Entry Procedures

5.1 Authorization. Only the PLANT MANAGER may authorize an employee to enter an underground vault or crawlspace. The PLANT MANAGER must determine that conditions in the vault or crawlspace meet permit requirements before authorizing entry. If there are no atmospheric hazards present and if the pre-entry tests show there are no dangerous air contamination and/or oxygen deficiency within the vault or crawlspace and there is no reason to believe that any is likely to develop, entry into the vault or crawlspace may proceed. Continuous testing of the atmosphere in the immediate vicinity of the entrants shall be accomplished. The entrants shall immediately leave the vault or crawlspace when any of the gas monitor alarm set points as defined are reached. No entrants shall return to the vault or crawlspace until the PLANT SUPERVISOR has used a gas detector to evaluate the situation and has determined that it is safe to re-enter.

5.2 Attendant. The PLANT MANAGER shall designate a Plant employee to maintain communication with Plant employees working in a vault or crawlspace to ensure their safety. The ATTENDANT may not enter the vault or crawlspace to rescue an entrant or for any other reason, unless authorized by the rescue procedure, and even then, only after calling the rescue team and being relieved as ATTENDANT by another worker.

5.3 Communications and Observation. Communications between ATTENDANT and entrant(s) shall be maintained throughout entry. Methods of communication that may be specified by the permit include voice-powered radio, signaling tugs on a rope, and the ATTENDANT'S observation that work activities (such as welding), which require deliberate operator control, continue normally.

## 6.0 Rescue Procedures

Acceptable rescue procedures include the use of public emergency services and procedures for breaching a vault or crawlspace wall. The permit specifies which procedures are available, but the PLANT MANAGER makes the final decision based on circumstances. Certain injuries may make it necessary to breach a vault or crawlspace wall to remove an entrant rather than risk additional injury by removal through the existing manhole or door; however, the PLANT MANAGER must ensure that no breaching procedure used for rescue would violate terms of the entry permit. For example, if the vault or crawlspace must be breached by cutting with a torch, the vault or crawlspace surfaces to be cut must be free of volatile or combustible coatings within four inches of the cutting line and the atmosphere within the vault or crawlspace must be below the LFL. When dangerous air contamination is attributable to flammable and/or explosive substances, lighting and electrical equipment shall be Class I, Division 1 rated per National Electrical Code and no ignition sources shall be introduced into the vault or crawlspace.

6.1 Employee Injury. In the event of an employee injury, the ATTENDANT shall contact the PLANT SUPERVISOR via radio and request assistance. The PLANT SUPERVISOR shall immediately contact the PLANT MANAGER who shall oversee rescue procedures. The ATTENDANT shall not attempt to enter the vault or crawlspace to assist an injured employee(s). The ATTENDANT shall only hold the lifeline and attempt to assist the injured employee(s) exit the vault or crawlspace. If other employees are in the vicinity of the vault or crawlspace, their assistance shall be requested. If the injured employee(s) is unable to exit the vault or crawlspace and no other employees are able to assist the ATTENDANT, the PLANT MANAGER shall contact the New York City Fire Department and begin breaching procedures as necessary.

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- 6.2 Retrieval Line and Harnesses. The retrieval lines and harnesses generally required under 29 CFR Part 1910.146, the OSHA permit-required confined spaces standard, are usually impractical for use in vaults and crawlspaces because the internal configuration of the vault or crawlspace prevents rescuers from hauling out injured entrants; however, unless the rescue procedure calls for breaching the vault or crawlspace for rescue, the rescue team shall be trained in the use of retrieval lines and harnesses for removing injured entrants through the vault manhole or crawlspace door.

## **II D Steam Generators**

Plant employees shall not enter steam generators under any circumstances. Steam generators are equipped with warning signs that read "DANGER, CONFINED SPACE, DO NOT ENTER."

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