

# Appendix C:

## Purdue University Tunnel System

### C.1 Introduction

The tunnel system on campus consists of approximately six miles of underground passageways. The tunnels supply, steam lines, compressed air, electrical power, and data lines to the majority of buildings on campus. The tunnel system is a controlled access work area and only authorized personnel are allowed to enter. Non Purdue employees such as contractors will be advised of the conditions of and for occupying the tunnel system by a representative of Construction Health and Safety (REM).

#### C.1.1 Confined Space Classification

The walkable tunnels on campus are classified as non-permit required confined spaces. Normal activities performed in the tunnel include routine inspection/walkthroughs, meter reading, and cleaning of nonhazardous debris. During normal operation conditions, the walkable tunnel system;

- is large enough to permit bodily entry;
- has limited means of entry/egress (most entry points require entrants to climb down a ladder, climb over pipes, or travel extended distances to exit);
- is not designed for continuous human occupancy;
- has mechanical ventilation system to provide fresh air to occupants and reduce the likelihood of a hazardous atmosphere to develop;
- does not contain a material with a potential to engulf and entrant;
- does not have an internal configuration in which an entrant could become trapped (there is more than one exit point in each section of walkable tunnel); and
- there are no other recognized serious safety or health hazards.

Areas of the tunnel with cross section dimensions less than 22" wide or 48" tall are classified as permit required confined spaces. Dimensions are measured from wall to wall and floor to ceiling. Even during normal operations, these non-walkable sections of the tunnel system;

- have the potential for a hazardous atmosphere (the mechanical ventilation system does not adequately ventilate these spaces);

- have a small enough cross section that entrants could become trapped by pipes in the area; and
- usually have a dead end at one end.

Entry into the walkable tunnel system will follow the practices/procedures set forth in this policy.

Entry into any non-walkable section of tunnel system shall follow permit required entry requirements.

### **C.1.2 Conditions/Activities that Reclassify the Tunnel as a Permit Required Confined Space**

The tunnel system, like any confined space is a dynamic environment. There are certain conditions and activities that may introduce hazards to entrants. Work activities must be evaluated to determine if they would present hazards which would cause the space to be reclassified as a permit required space. The following is a list of conditions or activities that would reclassify the tunnel as a permit required confined space. If any of these conditions is met, the area may only be entered using permit entry procedures. This is not an all-encompassing list of activities which would require reclassification.

- Damaged Utility lines present
- Hot work (cutting, welding, brazing)
- Hot Tapping
- Energized electrical work
- Purging or bleeding lines
- Introduction of more than one gallon of any type of chemical at any one time

## **C.2 Required Training Prior to Entry in the Tunnel System**

Before entering the tunnels for the first time, Purdue employees are required to complete the following training programs.

- **Asbestos Awareness** – Available through the REM department.
- **Confined Space** – Available through the REM department.
- Personal Protective Equipment
- Steam Tunnel Entry
- Heat Stress

Additional training may be needed, based on specific tasks being performed while in the steam tunnel. Additional training may include but is not limited to high voltage/electrical, lockout/tagout, and bloodborne pathogen.

## C.3 Tunnel System Entry Requirements

### C.3.1 Preplanning for Work in Steam Tunnels

Employees must notify their supervisor prior to entering the tunnel system. The supervisor shall verify that the employee has received the proper training to enter the tunnels. Entry into the tunnel system must be coordinated with Utilities Operations staff, Purdue Police, or Purdue Fire Department personnel. The supervisor and employee shall also discuss the scope of work to be performed while in the tunnel. Certain activities can create additional hazards within the tunnel which may reclassify the area as a permit required confined space. Entry preplanning shall include an assessment of all potential hazards, means and methods of hazards control, and emergency action plans including but not limited to:

- Identities and locations of energized steam, gas, and electrical lines
- Locations of exposed hot surfaces
- Signs of symptoms of heat exhaustion and heat stroke
- Means of communication
- Hazards created by work activity (note: certain activities will reclassify the space as a permit required space)
- External Hazards
- Means to control hazards (lockout/tagout)
- Required equipment
- Steam line de-energization and lockout procedures
- Potential emergency situations and response

### C.3.2 Entry Points

Where possible, authorized individuals must enter the tunnel system through entry doors in the lower levels of campus buildings. Upon entry, doors must be closed and secured. If necessary, authorized individuals may also gain entrance to the tunnel system by properly opening an access lid. The access lid must be adequately guarded to prevent accidental or unauthorized entry. Prior to or immediately following removal of a manhole lid or opening of a hatch use one of the following methods to prevent an accidental fall through the opening:

- Use a portable railing to surround the opening; or
- Use an 8 ft. fence to completely surround the opening or work area

It is the entrant's responsibility to maintain security at access points to prevent unauthorized entry into tunnels.

### **C.3.3 Proper Clothing and Equipment**

It is required to wear long pants to protect lower extremities from burns and cuts when crossing steam lines and walking in tight quarters. Required equipment includes a communication device (radio or cell phone) and a flashlight.

Work in the tunnel may require additional equipment and protective clothing (e.g., safety foot wear, safety glasses, hardhat, and leather gloves).

### **C.3.4 Electrical Safety**

Plugging into light fixtures using screw in type adaptors or other means is not allowed. The lighting electrical system cannot be used to provide power to any auxiliary electrical device, which includes but is not limited to tools, radios, or auxiliary lights.

### **C.3.5 Security**

The following departments have keys for permanent access to the tunnel system:

- Utilities Distribution
- Purdue Police Department
- Purdue Fire Department

If employees from other departments need to access the tunnel, they must coordinate entry with one of these departments and may be issued a temporary key. Non-Purdue employees (contractors) will never be issued a key to the tunnels. If a section of the tunnel is to be part of a construction site, the contractor may remove the existing lock and secure access points with their own lock. Lockable barriers must also be placed within the tunnel at all access points to the construction area. Contractors are responsible for security of sections of tunnel within the construction site.

Prior to entering the tunnels employees must notify the Purdue Police department, informing them the time and the location. All access points must be either secured or

continuously monitored during entry into the tunnels to prevent unauthorized entry. Upon leaving the tunnels, they must notify Purdue Police that they have exited the tunnels.

Any authorized personnel occupying the tunnels outside of normal university working hours (7:30 am - 4:00 pm) are required to obey the following:

- Notify Utilities Distribution (47421) preferably 24 hours prior to entry
- Notify Purdue Police before entering and after exiting the tunnels
- Work in pairs, or execute a check-in policy; Entrant contacts someone in their organization once every hour for the duration of the entry

### **C.3.6 Contractor Work in Tunnels**

Contractors whose scope of work involves work in the tunnel system will be informed of all conditions of and for occupying the tunnel system. The contractor will assume overall responsibility for the construction site. It is the contractor's responsibility to secure the worksite by doing the following:

- Isolate portions of the tunnel within their scope of work by installing lockable barriers within the tunnel to prevent unauthorized entry into the area
- If entry doors from buildings lead into the construction site of the tunnel, post signs that alert others that the door opens into a construction site
- Post 24 hour emergency contact numbers at each entrance into the tunnel construction site
- If Purdue employees must access the tunnel construction site, the contractor must notify the employees of conditions and escort them within the area

If the contractor encounters additional hazards within the tunnel or performs work creates an additional hazard (as defined in section B.1.2), the contractor must:

- Bring additional hazards to the university's attention
- Coordinate with Purdue to reassess and reclassify the space as a permit required confined space for the duration of the project or until hazards are abated
- Perform entry into the space that complies with applicable regulations (29 CFR 1910.146 or 29 CFR 1926.800)

## **C.4 General Tunnel Entry Procedure**

### **C.4.1 Non-Permit Entry**

Any entry into the tunnel system that does not require a permit must comply with the following procedure

- Notify the Purdue Police department prior to entering the tunnel
- Enter the tunnel through an access door in the basement of a building, if the tunnel must be access through an outdoor floor hatch, it must be guarded appropriately
- After entering, immediately close and secure the access door
- Perform assigned duties
- Exit the tunnel through a building access door, or properly guarded floor hatch
- Immediately close and secure the door
- Notify Purdue Police that you have exited the tunnel

#### **C.4.2 Permit Required Entry**

Entry into areas of the tunnel classified as permit required confined spaces must comply with all requirements of the University's Permit Required Confined Space Program. Below is a general procedure for such entries.

- Notify the Purdue Police and Fire departments as far in advance of the entry as possible.
- Review the specific space evaluation form and work to be done in the space to determine how to control all of the hazards within the space
- Assign entry team duties and fill out the entry permit
- Perform pre entry atmospheric testing
- Notify the Purdue Police and Fire departments prior to entering the space
- Perform continuous atmospheric monitoring
- Attendant and entrant must stay in constant communication
- After work is complete and entrant has exited the space, notify the Purdue Police and Fire departments to cancel the permit

Access to areas around work that reclassifies an area non-permit space of the tunnel to a permit space must comply with the following procedure. (Dimensions of the area to be classified as permit space are dependent on hazards created and should be determined by a qualified individual prior to work being performed). If there is any doubt as to the tunnel's classification, it must be treated as a permit required confined space.

- Notify the Purdue Police and Fire departments as far in advance of the work as possible.

- Review the specific work to be done in the space to determine how to control all of the hazards within the space
- Assign entry team duties and fill out the entry permit
- Control as many hazards as possible (LO/TO, blocking and bleeding lines, etc.)
- Notify the Purdue Police and Fire departments prior beginning work
- Perform continuous atmospheric monitoring
- Attendant and entrant must stay in constant communication
- After work is complete and entrant has exited the space, notify the Purdue Police and Fire departments to cancel the permit