The University of Michigan
Utility Tunnel Safety Program

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and
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# UTILITY TUNNEL SAFETY PROGRAM

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**APPENDIX A**
Map of Campus Utility Tunnels (REMOVED FOR SECURITY)

**APPENDIX B**
Sections of Campus Utility Tunnels Considered Confined Spaces
UNIVERSITY OF MICHIGAN
UTILITY TUNNEL SAFETY PROGRAM
FOR THE PLANT DIVISION

I. PURPOSE AND SCOPE

A. Purpose: To provide safety procedures for employees working in the campus utility tunnels.

B. Scope: All Campus Utility Tunnels, except sections specifically designated as “confined spaces”. Sections of the Tunnels designated as confined spaces, can only be entered in accordance with the University’s Confined Space Entry Program.

II. DEFINITIONS

A. Combustible Gas - an airborne concentration of gas or vapor which may present the risk of fire or explosion if an ignition source of sufficient energy is introduced. This term is synonymous with "flammable vapor" and "explosive gas".

B. Confined Space - 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 and exit (for example, tanks, tunnels, vessels, silos, storage bins, hoppers, vaults, and pits).
   3. Is not designed for continuous employee occupancy (for example, tanks, tunnels, vessels, silos, storage bins, hoppers, vaults, and pits).

C. Hazardous Atmosphere - atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self rescue, injury, or acute illness from one or more of the following causes:
   1. Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit.
   2. Airborne combustible dust that is at or approaching its lower flammable limit. This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet or less.
   3. Atmospheric oxygen concentration below 19.5% or above 23.5%.
   4. Any chemical or substance which may be at concentrations above the published federal or state permissible exposure limit. If chemical contamination other that (para. 1-3, above) above are suspected to be present, contact Occupational Safety and Environmental Health (OSEH).
D. Hazardous Substance - a substance or mixture of substances, which may cause death, injury or illness.

E. Hot Work Operations - cutting, welding, brazing, torch soldering, or high speed grinding of materials.

F. Hot Work Permit - specific written authorization to perform hot work operations.

G. Lower Explosive Limit (LEL) - percent of concentration required to explode upon introduction of spark or flame. Note: 100% LEL is the lowest concentration of a combustible gas in air that will explode due to the introduction of open spark or flame.

H. Oxygen Deficient Atmosphere - an atmosphere containing less than 19.5% oxygen by volume.

I. Oxygen Enriched Atmosphere - an atmosphere containing more than 23.5% oxygen by volume.

J. Point of Reference (POR) - a number assigned to a specific location within the tunnels to aide in determining locations.

K. Work Induced Hazard - a hazard created due to nature of work, such as welding (generates fumes) and painting (generates solvents in the atmosphere).

III. RESPONSIBILITIES

A. Plant Departments

1. Management
   a. Each supervisor shall insure their employees are adequately trained regarding tunnel safety, and following the procedures of this program.
   b. Each supervisor shall effectively enforce compliance of these procedures, including the use of disciplinary action, for any violations or deviations from the procedures outlined in this program.
   c. Each supervisor shall ensure that the equipment required for compliance with this procedure is in proper working order and made available for use by their employees.

2. Employees
   a. Employees shall comply with the procedures of this program.
   b. Employees shall consult with their supervisor, OSEH, or other knowledgeable personnel, when there are questions regarding their safety.
c. Employees shall check out, use, and maintain safety and personal protective equipment when required by their work activities or this program.

d. Employees shall report any job related injuries or illness to their supervisor and seek prompt medical treatment, if necessary.

B. Occupational Safety and Environmental Health

1. OSEH shall provide technical assistance when called upon.

2. OSEH shall provide training when requested.

3. OSEH shall conduct inspections to insure worker safety and compliance with this program.

IV. PROCEDURE

A. General.

1. All open hatches into the tunnels at ground level will be guarded to prevent falls. Guards used will be placed far enough from the hatch entrance or be of a physically significant nature to warn unsuspecting pedestrians and vehicles. Flashing warning lights will be used if the opening is in a vehicle traffic area.

2. Supervisors will insure they know the locations of their workers and work parties within the tunnels, by point of reference (POR), the names of the workers in the group, the length of time expected to be in the tunnel, tunnel entry and exit locations, and the work to be performed in the tunnel.

3. All work performed in the tunnels will be conducted by a minimum of two workers together. Except as provided below, workers in the tunnels will move and work in pairs, as a minimum. Work groups larger than two workers are considered to meet the “pairs” requirement.

4. All workers entering the tunnels will have a working flashlight, or other portable light source, for use in case of loss of normal permanent lighting in the tunnels.

5. Workers may enter the tunnels alone only for the purpose of conducting short, specific visual inspections, to conduct communication with a work group already in the tunnels, or in case of an emergency. When a worker does enter the tunnels alone, they must have radio communications with their supervisor, or their designee, and the worker must make radio contact when entering and exiting the tunnel. An expected exit time will be set and if exit confirmation is not received by this time, then the supervisor will attempt to locate the worker as soon as possible.

6. Anytime a worker, or group of workers, is considered “overdue” or missing, appropriate emergency procedures will be implemented (see Emergency and Rescue Procedures below).
7. Because of the problems with radio communication to and from the tunnels, and the potential risks involved with working in the tunnels, supervisors must know exactly where their workers are within the tunnels, and insure they have safely exited the tunnels at the end of their shift.

8. At the end of the work shift, supervisors will get positive confirmation of safe exit from the tunnels from each of their workers working in the tunnels that day.

B. Tunnel Access Restrictions

1. Only authorized personnel following the procedures outlined in this program are allowed into the tunnels. Students, faculty, staff, the public, and outside contractors, unless performing official business of or for the University, are not to be given access to the tunnels.

2. Work conflicts between different University departments or between University personnel and outside contractors will be resolved in a fair and equitable manner and in conformance with the procedures of this program, and other safety programs of the University, by OSEH.

3. Any time someone is observed within the tunnels that is not authorized, or is not conforming to the procedures of this program, the Dept. of Public Safety (DPS) should be notified as soon as possible (763-1131, or radio channel 1A).

C. Ventilation and Heat Stress

1. As many hatches as possible around the work area will be opened to provide as much natural ventilation as possible. Forced air ventilation will be used when ever possible, and especially in areas with extreme heat stress conditions.

2. In work areas where additional work induced hazards are present, such as hot work (welding, cutting, torch work, or high speed grinding of metal), painting, or using solvents, forced air ventilation is required in addition to the natural ventilation specified above. When work induced air hazards are present, continuous air monitoring will be conducted to insure adequate ventilation.

3. The tunnels are typically a very hot and humid work area and heat stress is a significant risk. New workers must be allowed time to acclimate to their new work environment. All workers must be given adequate rest periods and supplied with cool water to keep adequately hydrated. All work should conform to the University’s Heat Stress Program.

D. Hot Work

1. Forced air ventilation is required for all hot work. Fans/ventilators shall be used adjacent to the work area. If the air exhaust is not through an alternate access, necessary precautions will be taken so the exhaust is not affecting another work party that may be in the area. Note: Pressurized sources of oxygen shall never be used for ventilating purposes.
2. Continuous air monitoring shall be conducted throughout the hot work. At a minimum, monitoring will be done for oxygen, flammable gases and vapors, and carbon monoxide.

3. All hot work will conform to the procedures outlined in the University’s Hot Work Safety Program, including the use of a hot work permit.

4. If at any time the employees performing the work experience headaches, dizziness or any other signs or symptoms that they did not have prior to working within the tunnel, they are to exit the tunnel immediately and contact their supervisor.

5. If possible, hot work will not be conducted so as to block the main means of worker exit from the tunnel. Ideally, the hot work will be conducted at the farthest extreme from the main worker exit from the tunnel, with all workers located between the hot work and the exit. Ventilation should be set up so air is moving any welding fumes away from workers.

E. Emergency and Rescue Procedures

1. Rescue

Rescue measures may be necessary if an employee in the tunnels becomes incapacitated and is unable to exit without assistance. Under these circumstances the following rescue plan is to be used:

a. At the first indication of a problem all workers in the work group should leave the tunnel, assisting each other as needed. When all workers have exited the tunnel, an assessment of the condition of each worker should be made and additional medical assistance sought if necessary (see the University’s First Aid and Personal Injury Procedure).

b. If all workers in a group cannot exit the tunnels, then radio the Department of Public Safety (DPS) on channel 1A and request assistance. If radio communication with DPS cannot be achieved from that location within the tunnel, then one worker should exit the tunnel or move to a location within the tunnel where radio communication can be achieved. Inform DPS of the nature of the emergency, the location, and any other pertinent information. Insure that DPS knows exactly how to find your location before reentering the tunnel or breaking radio communication. If there is an unsafe condition within the tunnel, do not reenter the tunnel until other rescue personnel have arrived.

c. The DPS will contact other rescue agencies, as necessary.

2. Emergencies

a. Anytime there is a non-worker related emergency in the tunnels, all workers should exit the tunnel by way of the shortest and safest route.
b. When making an emergency exit from the tunnels, workers should attempt to shut off, or otherwise put their equipment in a safe mode, before leaving, if possible.

c. In order to insure their ability to exit the tunnels in case of an emergency, at least two exit routes should be planned for every work group. Emergency exit routes should be confirmed as usable prior to any work beginning.

F. Signs, Markings and Labels

1. Piping, wiring, utilities and other services.

All piping, wiring, utilities and other services running through the tunnels should be labeled or marked. Markings can follow a color system for identification. Services that could create a health hazard, such as high voltage electrical or high pressure steam or compressed gas lines, should be marked on the line at set intervals for easy identification.

2. PORs and Exits

a. PORs and exits are marked.

b. Exits through ground level hatches that may be dangerous to open from inside the tunnels, such as hatches located in roads, are marked with danger signs.

3. Hot work areas and other areas with work induced hazards

Work areas where hot work or other work induced hazards may be present will be posted to warn others entering the work area of the possible hazards.
APPENDIX A

Removed for Security
Confined Spaces in the Utility Tunnels

The following sections of the Campus Utility Tunnels are considered confined spaces:

- From POR 212 northeast to North Hall.
- From POR 614 south to the President’s Residence.
- From the condensate meters just east of POR 811 south to the Kelsey Museum.
- From Lorch Hall mechanical room northeast to main north-south tunnel near POR 717.

Entrance into these areas must follow the procedures of the Plant Division Confined Space Entry Program. These spaces should be evaluated in accordance with the Confined Space Entry Program prior to entering, and permit procedures followed, if necessary.