NATIONAL MALL

Confined Space Entry Program

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REFERENCE

OSHA 29 CFR 1910.146

PURPOSE

This program is designed to eliminate or minimize the risk to workers who enter or work in confined spaces, through the development of safe work procedures and worker education and training.

POLICY

The Contractor will develop and maintain a Confined Space Entry Program to ensure the wellbeing of workers required to enter or work in confined spaces.

SCOPE

This program applies to all workers who may have to enter a confined space or be involved in a confined space entry.

DEFINITIONS

Adjacent Piping	A device such as a pipe, line, duct or conduit which is connected to a confined space or is so located as to allow a substance from within the device to enter the confined space.
Blank	A solid plate installed through the cross-section of a pipe, usually at a flanged connection.
Blanking or Blinding	The absolute closure of adjacent piping, by fastening across its bore a solid plate or cap that completely covers the bore and that is capable of withstanding the maximum pressure of the adjacent piping.
Blind	A solid plate installed at the end of a pipe which has at that point been physically disconnected from a piping system.
Clean Respirable Air	When used to describe the atmosphere inside a confined space, means an atmosphere which is equivalent to clean, outdoor air and which contains: (a) about 20.9% oxygen by volume, (b) no measurable flammable gas or vapor as determined using a combustible gas measuring instrument, and (c) no air contaminant in concentrations exceeding either 10% of its applicable exposure limit in Part 5 of the Regulation (Chemical Agents and Biological Agents) or an acceptable ambient air quality standard established by an authority having jurisdiction over environmental air standards, whichever is greater.

Confined Space	Except as otherwise determined by the Board, means an area, other than an underground working, that: (a) is enclosed or partially enclosed, (b) is not designed or intended for continuous human occupancy, (c) has limited or restricted means for entry or exit that may complicate the provision of first aid, evacuation, rescue or other emergency response service, and (d) is large enough and so configured that a worker could enter to perform assigned work.
Disconnecting	Means physically disconnecting adjacent piping from a confined space to prevent its contents from entering the space in the event of discharge.
Double Block and Bleed	The closure of adjacent piping by locking out a drain or vent in the open position in the line between 2 locked out valves in the closed position.
Enclosed Space	An area that has many of the characteristics of a confined space but does not meet the complete definition. Enclosed spaces may be as hazardous as confined spaces, and written procedures may be required for entry.
Engulfment	Being buried by free-flowing loose granular materials such as sawdust or earth or being drowned in liquids.
Harmful Substance	A WHMIS controlled product, a substance referred to under Section 5.48, or a substance which may have a harmful effect on a worker in a confined space.
Isolation	Separating piping from a confined space so that there is no chance that the materials in the pipe can enter the confined space. Methods include disconnecting, blanking, blinding, double block and bleed, engineered systems, and alternate procedures acceptable to OSHA.
Hazard Identification	A review of the hazards created by the design, location, or use of the confined space.
High Hazard Atmosphere	An atmosphere that may expose a worker to risk of death, incapacitation, injury, acute illness or otherwise impair the ability of the worker to escape unaided from a confined space, in the event of a failure of the ventilation system or respirator.

Low Hazard Atmosphere	An atmosphere which is shown by pre-entry testing or otherwise known to contain clean respirable air immediately prior to entry to a confined space and which is not likely to change during the work activity, as determined by a qualified person after consideration of the design, construction and use of the confined space, the work activities to be performed, and all engineering controls required by this Regulation.
Moderate Hazard Atmosphere	An atmosphere that is not clean respirable air but is not likely to impair the ability of the worker to escape unaided from a confined space, in the event of a failure of the ventilation system or respirator.
Prior Representative Sampling	Documented atmospheric testing of a confined space or a number of similar confined spaces in circumstances that will ensure that the results are statistically significant.
Program Administrator	The person who has been assigned the overall responsibility for administration of the Confined Space Entry Program.
Risk Assessment	An analysis of the risk of injury to workers who are performing work in a confined space.

RESPONSIBILITIES

National Mall will:

- Identify every confined space, or group of similar confined spaces, in the workplace.
- Implement a Confined Space Entry Program.
- Assign an administrator for the program.
- Ensure hazard identifications and risk assessments are completed for each of the confined spaces, or group of similar confined spaces.
- Provide training for workers.
- Ensure that there are written procedures for entry into all of the confined spaces.

Chief of Facility Management will administer the Confined Space Entry Program. The Administrator's responsibilities include:

- Maintaining the inventory of confined spaces or group of similar confined spaces.
- Maintaining a record of hazard identifications and risk assessments.
- Ensuring that completed entry permits will be kept for a period of one year after the expiry of the permit.
- Maintaining the written procedures for entry into confined spaces.
- Ensuring that qualified persons perform the hazard identifications and risk assessments.
- Ensure that written procedures are developed to eliminate or minimize the hazards or risks to workers.

Supervisors will:

- Ensure that pre-entry testing is performed where it is required.
- Ensure that workers follow proper procedures and have all the required personal protective equipment.
- Complete and sign Confined Space Entry Permits where they are required.
- Ensure that testing equipment is calibrated, and ventilation equipment has the proper capacity.
- Ensure that workers are trained in the confined space entry procedures and take all required precautions.

Workers Conducting Air Monitoring and Testing must understand:

- The limitations and reliability of the test equipment.
- How to calibrate the equipment.
- How to use sampling techniques that are safe.
- How to interpret data relative to the history of the confined spaces.

- How to document test results.

Workers will:

- Follow the confined space entry procedures.
- Not enter a confined space unless they have been trained and have all of the proper equipment.
- Where a space requires an entry permit, not enter the space until their names are on the permit, and the supervisor signs the permit. (Confined Space Entry Permit is located in Appendix C).
- Ensure that atmospheric testing is conducted less than 20 minutes prior to entry, where atmospheric testing is required.

Contractors will:

- Ensure they have copies of the confined space inventory and hazard identification for the space(s) they are working on.
- Complete a risk assessment for the work they perform in confined spaces.
- Develop safe work procedures based on the hazard identification and risk assessments.

PROGRAM DETAILS

Identification of Confined Spaces

Each confined space that requires special precautions is identified on an inventory. This inventory is maintained by Chief of Facility Management office. (An example of a Confined Space Inventory Form is provided in Appendix F).

Each confined space that does not require entry has a warning sign posted at the entry stating that it is a confined space and that entry is not allowed. A confined space identification chart is provided in Appendix A**.**

Hazard Identification and Risk Assessments

Hazard identification and risk assessments must be conducted and documented for each confined space or group of similar confined spaces. There are two types of risk assessment that must be completed: Initial and Pre-Entry Assessments.

Initial Hazard Identification, Risk Assessment, and Classification

Use the Risk Assessment and Classification Form in Appendix B. This form must be completed by a qualified person as part of the initial identification and classification process. It must be done for all confined spaces or groups of similar spaces in the National Mall.

This initial assessment is done in order to identify confined spaces, provide an initial classification of the spaces, and to aid in maintaining the confined space inventory. Use the Confined Space Risk Assessment and Classification Form for this purpose. The completed forms will be reviewed, and the space classification confirmed by the Confined Space Administrator and/or by the Manager responsible for the space. The hazard identification and initial risk assessment must include the following information:

- Location of the space.
- The conditions that may exist prior to entry due to the confined space's design, location or use, and those which may develop during work activity inside the space.
- Atmospheric hazards including the potential for oxygen enrichment and deficiency, flammable gas, vapor or mist, combustible dust, and other hazardous atmospheres.
- Physical hazards such as noise, electric shock, deteriorating structural components, slick, wet surfaces, etc.
- Lockout and isolation requirements.
- The potential for engulfment and entrapment.
- Layout of the space, which may include a floor plan/schematic drawing.

Hazard identification will be redone (and the risk assessments will be revalidated) whenever a significant change in the risk is likely to result from any of the following:

- installation or modification of a space.
- a change in equipment operating conditions.
- a change in the atmosphere or working environment.
- a change in working arrangements or procedures.

Pre-Entry Assessment

The second hazard identification and risk assessment is done by workers just prior to entering the space using the Confined Space Entry Permit found in Appendix C. This assessment is done to identify any changes that may have taken place in the confined space since the initial assessment and since the last entry. It takes into account the type of work to be done and any equipment or materials that will be used in the space during the entry. The Confined Space Entry Permit / Form will be used for this purpose.

The information on the form must include, but not necessarily be limited to, the following:

- The nature of the confined space, e.g. manhole, pump station, chamber, box culvert, water, sewer or storm main, etc.
- The work required to be done, e.g. maintenance, valve shut-off.
- Any potentially harmful substances that may be used in the work process and procedures to eliminate or minimize the risk to workers.
- The hazards involved and the associated risks, e.g. hazardous atmosphere present.
- Emergency and rescue procedures.
- Gas detector readings.

Lockout

Lockout is used to eliminate or minimize hazardous energy in confined spaces. Lockout procedures have been established for all work being performed in confined spaces. The National Mall uses locks to render machinery or equipment inoperable and to isolate energy sources in accordance with the organization's written lockout program and procedures. The lockout procedures and all lockout points are identified and documented as part of the hazard identification and risk assessment process.

Isolation and Control of Harmful Substances

If there is piping entering and/or exiting the space that contains or has contained a harmful substance, it must be controlled by either disconnecting the adjacent piping or isolating it using blanks or blinds that are either certified by a professional engineer or have been manufactured in accordance with ANSI standards.

If the harmful substance in the piping is not a gas or vapor or a volatile liquid, then in addition to either disconnecting the adjacent piping or isolating it using blanks or blinds, a double block and bleed system may be used. (Double block and bleed involve closing two

valves in the line, and opening a drain valve between them.)

Opening piping to install blanks and blinds is dangerous if the piping contains harmful materials. Workers must follow written safe work procedures when installing blanks and blinds. The written procedures include the procedure to depressurize the line and drain the system. Proper personal protective equipment including respirators, if required, must be part of the written procedures, as well as lockout procedures and monitoring for air contaminants.

Municipal Water Systems

If a substance in the piping is harmful only because of the temperature, pressure or quantity of the substance, e.g. a municipal water system, then the harmful substance must be controlled by either:

- disconnecting the adjacent piping, or
- isolating it using blanks or blinds as per Regulation 9.20, or
- using a double block and bleed system as per Regulation 9.21, or
- by isolating the adjacent piping in a manner that a professional engineer has certified will make the confined space safe for a worker to carry out the intended work, or
- if there is no head pressure in the adjacent piping, by de-energizing and locking out each pressure source for the adjacent piping and depressurizing the adjacent piping.

The Alternative Measures section below also applies to this section with regards to controlling the flow of non-hazardous fluid by closing a valve or using inflatable rubber bladders.

Municipal Sanitary Sewers

Where the gases from a gravity-flow municipal or domestic sanitary sewer system or storm sewer system may enter the space, a worker may enter if:

- The space is protected from the ingress of gases by use of a p-trap.
- The atmosphere in the space has been tested immediately before entry and the testing confirms clean, respirable air.
- The integrity of the p-trap has been confirmed immediately prior to entry.
- The atmosphere is continuously monitored while the worker is in the space and confirms the space contains clean, respirable air.

Alternative Measures

Where normal isolation practices are not practicable in a municipal sewage system (including storm drains systems) an evaluation will be conducted by a qualified person to determine the alternate measures required in order to safely enter the space without isolating the liquid flow. Alternate measures may include simply closing a valve instead of blanking, blinding or double block and bleed. The alternate measures, including occupational hygiene and safety precautions other than or in addition to isolation, will be submitted to the Chief of Facility Management office to determine acceptability prior to entering the space.

Alternate measures for fluid control may include inserting inflatable rubber bladders into pipes, or simply closing valves or gates. If possible, to lockout the device then a lockout system must be implemented, e.g. for closing valves.

Communication

One of the most important components of any Confined Space Entry Program is communication. Workers can be placed at significant risk if:

- A confined space is improperly identified due to poor communication,
- The procedures are improperly followed, or
- Help is delayed.

There are several pieces of information that must be communicated to the workers involved in the entry. Each worker involved in the entry must know or be aware of:

1. whether the space is on the inventory.
2. the results of the hazard identification.
3. the results of the risk assessment on the work that they are going to perform in the confined space.
4. the precautions that are required for this confined space.
5. his/her responsibilities and who else in the organization is responsible for confined spaces, and what those responsibilities are.
6. the requirement for a permit, the whereabouts of the permit, and that their name is on the permit.
7. the requirements for lockout and where the lockout points are.
8. who the attendant is and the method of communication with that person.

Each class of confined space has different requirements for communication between the standby person and the worker(s) in the space:

1. **Low Hazard Atmosphere Communication:**

   In a confined space with a low hazard atmosphere, there must be continuous means of summoning the standby person. Also, the attendant must:

   - check on the wellbeing of workers inside the space at least every 20 minutes, and
   - have a means to immediately summon rescue personnel.

2. **Moderate Hazard Atmosphere Communication:**

   In a confined space with a moderate hazard atmosphere, there must be a continuous means of summoning the standby person. Also, the attendant must:

   - be **stationed at or near the entrance to the space,**
   - visually observe or otherwise check the wellbeing of the workers inside the space <u>at least</u> every 20 minutes or more often if required,
   - have a means to immediately summon rescue personnel.

3. **High Hazard Atmosphere Communication:**

In a confined space with a high hazard atmosphere, or potential for engulfment or entrapment, there must be a continuous means of summoning the attendant. Also, the attendant must:

- be **stationed at the entrance to the space,**
- continuously monitor the wellbeing of the workers in the space,
- be equipped and capable of immediately commencing the rescue of the workers in the space.

Atmospheric Testing and Monitoring

All confined spaces must be continuously monitored for the presence of contaminants and safe oxygen levels prior to and during entry. This must be done by a trained worker using calibrated equipment and in accordance with written procedures. A record of the tests must be kept using the Confined Space Entry Permit / Form.

Atmospheric testing will ensure that:

a. the confined space contains a safe oxygen level - between 19.5% and 23.5%.

b. the atmospheric contaminants in the confined space are reduced to below the relevant permissible exposure levels, e.g. Hydrogen sulfide less than 10 ppm, Carbon Monoxide less than 25 ppm.

c. the concentration of flammable contaminant in the atmosphere is below 20% of its LEL.

In addition to regular atmospheric testing for contaminants such as hydrogen sulfide and carbon monoxide, testing for other contaminants should be done based on the information recorded in the confined space risk assessment for the specific confined space that is to be entered. Some possible contaminants include, but are not limited to:

Gas or Contaminant	Possible Locations
Hydrogen Sulfide (H_2S)	Sewers
Carbon Monoxide (CO)	Sewers
Ammonia (NH_3)	Arenas
Chlorine (Cl)	Pools
Methane (CH_4) (Explosives)	Sewers
Ozone (O_3)	Pools
Petroleum Hydrocarbons	Various

The worker doing the testing must always assume that the space has a dangerous atmosphere until it is proven otherwise. Testing must be done in the following order:

1. **At the opening of the space** – Where possible, test above a manhole cover or access hatch prior to opening.

2. **Before ventilating -** After removing the cover to the space test at various levels of the space, i.e. at least every 5 feet, and record.
3. Testing after ventilation can give false security to the workers because they will not know if a hazard existed prior to the ventilation and therefore may not look for the source of the contaminants.
4. **Monitor continuously** - while workers are in the space.

Record the results of the monitoring at least every 20 minutes, more when a contaminant is known to be or could possibly be in the space.

Pre-entry atmospheric testing is not required in a confined space with a low hazard atmosphere if:

1. the location and control of the space ensures a more hazardous atmosphere could not inadvertently develop,
2. such testing is not required to verify the effectiveness of an isolation or other pre-entry control,
3. prior documented representative sampling shows the space contains clean respirable air, and
4. the written procedures do not require such testing.

Atmospheric testing will be completed within 20 minutes before workers enter the space and prior to each re-entry if all workers leave the space for more than 20 minutes.

Atmospheric Hazards

Oxygen Hazards

Hazards due to oxygen can occur as a result of oxygen enrichment or oxygen deficiency. Oxygen naturally occurs in the atmosphere at approximately 20.9 percent of the total volume of air.

Oxygen enrichment can occur as a result of chemical processes or as a result of leakage from a tanked source such as welding equipment. When the percentage of oxygen in the air is greater than 23 percent, it significantly increases the rate of chemical reactions and can cause an explosive atmosphere.

Oxygen deficiency can occur as a result of:

- rusting of metal consumes oxygen.
- bacterial action such as found in sewage systems consumes oxygen.
- chemical processes in the space.
- displacement by other gases such as Carbon Dioxide and some fire extinguishing agents.
- operation of open flame heaters or internal combustion engines, as well as any other burning activities that use oxygen.

Oxygen can also be displaced by acetylene, methane, propane and natural gas.

When the percentage of oxygen in the air is less than 19.5 percent, it can result in disorientation and unconsciousness. At oxygen levels less than 6 percent, unconsciousness occurs in a matter of minutes, followed by death.

Flammable Hazards

Flammable gases and vapors can result in explosions. Decaying organic matter can produce methane gas. Natural gas can be present due to leaks in the building or home heating gas distribution system. Gasoline can be found in storm drains as a result of inadvertent or intentional disposal. Acetylene can leak from tank or piping systems for welding. Flammable gases and vapors can become explosive when they are mixed with air in concentrations over a certain range. In some circumstances airborne dust can create an explosive atmosphere, e.g. fine wood dust, coal dust.

Where workers must enter a confined space, the concentration of flammable gases and vapors in the space will be maintained below 20 percent of the lower explosive limit. If any flammable or explosive gas, vapors or liquids are present, all sources of ignition will be eliminated prior to entry, including cutting, grinding and burning activities.

Non-sparking tools will be used, and equipment will be grounded to prevent static electricity.

Only intrinsically safe electrical equipment will be used in confined spaces where there is a possibility of a flammable atmosphere.

Carbon Monoxide Hazards

Carbon monoxide is a colorless, odorless, tasteless gas that results from the incomplete combustion of hydrocarbon fuels, e.g. gasoline, diesel. It is commonly produced by internal combustion engines and may be produced by the decomposition of organic matter. It can cause workers to become disoriented and can cause death. Carbon monoxide is the same weight as air and therefore can be found in the breathing zone. It has an 8-hour exposure limit of 25 ppm and a 15-minute ceiling exposure limit of 100 ppm.

Hydrogen Sulfide (H_2S) Hazards

Hydrogen sulfide is a gas that is produced by the decomposition of organic matter. It can be found in sewage systems, but also in stagnant areas in storm drains. It smells like rotten eggs, but even low levels of hydrogen sulfide can paralyze the sense of smell. Hydrogen sulfide can be fatal at very low levels. This gas is heavier than air and will collect in low areas, but it can be moved by strong air currents and so may be at the top of the space as well. Hydrogen sulfide has a ceiling permissible concentration of 10 ppm.

Permits

There are certain situations, as outlined below, in which a confined space entry permit is required. If a permit is required, no worker is allowed to enter the space until the permit

has been filled out and signed by the supervisor.

A permit is required:

- If the hazard assessment shows that the confined space has the potential for a high hazard atmosphere. A high hazard atmosphere means an atmosphere that may expose a worker to risk of death, incapacitation, injury, acute illness or otherwise impair the ability of the worker to escape unaided from a confined space, in the event of a failure of the ventilation system or respirator.

- If there is a potential for entrapment. Entrapment can be caused by structural failure, such as rusting of the floor of a culvert, or hazardous adjacent activities such as a location next to a chlorine plant that might require evacuation. It can also be caused by the design of the space.

- If there is a potential for engulfment. This refers to being buried by loose materials, or being drowned by fluids. This risk occurs whenever free flowing solid or liquid materials are present in enclosures.

- If lockout is required either prior to entering the space or while work is being done in the space.

- If isolation is required, for example:
    - If piping into the space must be disconnected
    - If blanks, or blinds must be installed, or
    - If a double block and bleed system is used

The confined space entry permit:

- Describes the type of the work being done in the space.
- Describes the ventilation system being used.
- Records the results of the atmospheric testing.
- Lists the precautions that must be taken to minimize the risk to workers entering and working in the space.
- Names each worker that is in the space.
- Outlines the provision for rescue.
- Identifies the expiry time of the permit.
- Must be re-authorized and signed by the supervisor if there is a change in the work crew or supervisor.

An example of a Confined Space Entry Permit is included in Appendix C. Completed permits are kept by Chief of Facility Management for a minimum period of one year.

Cleaning and Purging

Whenever possible, Chief of Facility Management will ensure that a confined space contains clean respirable air. If the confined space does not contain clean respirable air, cleaning, purging, or venting will be used to control the hazardous atmosphere.

Purging residual gases in the space may precede cleaning of residual materials within the space. Purging is the removal of a dangerous atmosphere in a confined space by a fluid such as water or non-flammable gas such as nitrogen or carbon dioxide. Prior to entry, the purge gas will be displaced with ventilation, and the atmosphere will be tested to ensure that clean respirable air exists.

Ventilation

All confined spaces will be continuously ventilated while workers are inside the space except in:

- an atmosphere intentionally inert, or
- a low hazard atmosphere where the following conditions are met:
    - the atmosphere is continuously monitored and shown to contain clean respirable air, and
    - the space has an internal volume greater than 1.8m^3 (64 cu ft) per occupant, is occupied for less than 15 minutes, and the work inside the space generates no contaminants other than exhaled air.

The ventilation blower is to be situated up wind of the entry point so as to draw clean air, free of dust, exhaust fumes, etc. The standby worker must be aware of changes in wind direction, etc., and adjust the air intake as required. The discharge end of the hose is to be located such that incoming air movement is obtained at the waist level of the worker at the lowest level in the confined space. In the event of a failure of the ventilation system, the space must be vacated immediately.

The ventilation system will adequately ventilate every occupied area within the space.

Be aware of:

- Obstructions within the space that could result in pockets of dead air or affect airflow.
- Short-circuiting of the airflow that can occur when air intakes are too close to air outlets on the ventilation system.

The ventilation system will push air into the space rather than pull it out, except for the use of local exhaust systems. The ventilation system will be able to maintain any contaminants below their exposure limits.

Contaminants produced by the work will be controlled at the source by a local exhaust ventilation system if practicable. This includes internal combustion engines as well as activities such as welding. The exhaust will be positioned well away from the intake for the ventilation air. Typical airflow for welding is 100 to 200 cubic feet per minute with the hood less than six inches away from the arc. Air arc gouging will require up to 2000 cubic feet per minute.

When spray painting, the ventilation rate must be high enough to ensure that the

permissible concentration of the chemicals listed in the Material Safety Data Sheet, is not exceeded. Also, the ventilation system must be high enough to ensure that flammability limits are not exceeded if there is a flammable component to the paint or chemical.

Other processes, which may require local exhaust may include but are not limited to:

- Painting
- Applying epoxy
- Grinding, or burning galvanized metal

Natural Ventilation

If natural ventilation is used, the rate of air flow through the space must be monitored and must be sufficient to maintain the concentration of any contaminants below their exposure levels. Natural ventilation will not be used if there is a high hazard atmosphere, or if the natural ventilation could draw other contaminants into the space. Natural ventilation typically would be used in low hazard atmospheres such as air plenum intakes, attic crawl spaces, etc.

Equipment

Air Monitoring (Gas Detectors)

The portable gas detector is one of the most important tools used by personnel required to enter confined spaces or areas where contaminated atmospheres may exist or may develop.

All gas detectors must be certified, calibrated according to the manufacturer's instructions, and bump-tested prior to use.

Everyone involved in confined space entry, i.e. the entry worker, the standby worker and the supervisor must know how to operate the gas detector used in any confined space entry they are involved in. It is imperative that the worker using the portable gas detector be trained, familiar with, and practiced in the use, functions and operating procedures of the gas detector he/she may use.

Testing

Before a gas detector is used, it must be bump tested. This must be done by a worker who has been trained in the procedure.

Most gas detectors are equipped to self-diagnose automatically when the power is turned on. The user should observe this diagnosis with particular attention paid to the battery condition. The battery voltage must be within certain limits for the instrument to function properly.

Ventilation Equipment

Ventilation equipment includes blowers, hoses and saddle vents where applicable. Blowers are required to be used unless the natural ventilation in the space has been measured and found to be adequate as described above. Each blower must be identified as to its capacity (cubic feet per minutes - cfm) and must be able to provide at least 50 cfm for each worker in the space.

Rescue and Retrieval Equipment

When entering any type or classification of confined space workers must wear a full body harness. In spaces with moderate or high hazard atmospheres, or those where there is a risk of entrapment, engulfment or any other recognized serious health or safety hazard, the harness must be connected to a lifeline that is connected to the winch. The standby worker must be trained in how to use the rescue equipment to remove a person from the space in an emergency.

Lifelines must have an ultimate strength of 6,000 pounds and be kept free of knots or splices except at the ends. Only stainless-steel lines will be used where hot work is being done.

Personal Protective Equipment

The conditions in the confined space will dictate the requirements for personal protective equipment. PPE may include: safety headgear, safety goggles, face shield, gloves, safety footwear, disposable suits, and earplugs or muffs. Intrinsically safe flashlights and tools must also be required if a flammable atmosphere is, or could be, present.

Electrical Tools and Equipment

Electrical tools and equipment used in the confined space will be grounded or double insulated. Generators located outside the confined space must be equipped with ground fault circuit interrupters (GFCI).

Other Tools and Equipment

Torches and hoses used for welding, brazing or cutting will be removed from the confined space when not in use. No welding, brazing or cutting will be allowed if flammable or explosive gases, vapors or liquids are present.

Communications Equipment

It is essential to have an appropriate means of communication between the person working inside a confined space (the entry worker) and the person stationed outside (the standby worker).

It should be noted that radio frequency and wireless devices do not work effectively in confined spaces such as tanks or sewers where there is metal or concrete shielding between the interior of the space and the outside. When visual monitoring of the worker is not possible because of the design of the confined space or location of the entry hatch, a voice or alarm-activated explosion proof type of communication system may be necessary, particularly for rescue operations.

Another consideration is that, in some instances, electrical communication may introduce an ignition source in a flammable atmosphere.

Basic equipment includes a mobile or portable radio and/or a cell phone in order to provide:

- a system of communication between the attendant and entry person.
- a system of communication between the attendant and an outside source such as Yard Dispatch and/or 911.

All communications equipment must be tested prior to entry to ensure proper operation and that a contact person is available.

Rescue

Rescue plans will be in place before workers enter a confined space. The rescue plan will consider:

- The specific hazards of the confined space
- Any obstacles to rescue
- The type of rescue equipment that must be in place before the confined space entry
- Communication, and
- First aid

For spaces with a high hazard atmosphere rescue personnel will be stationed at or near the entrance to the confined space whenever a worker is in the space. For all other situations the standby person will have the means to summon emergency rescue personnel and/or conduct an outside rescue using the lifeline and lifting device that is in place. A sample Confined Space Rescue Guideline is provided in Appendix D.

The following paragraphs are provided as examples of possible rescue situations. The organization utilizing this document must determine which of the following paragraphs best suits their circumstances and remove the rest of the paragraphs as necessary.

The Contractor will ensure that rescue services are available when a worker enters a confined space. Prior to entering the space, rescue personnel will be notified that work is taking place in a confined space. Rescue personnel will monitor the incoming line to ensure that they receive the signal if rescue is required.

The Contractor will rely on its internal rescue team and the use of lifting devices and harnesses to ensure that workers can be rescued from the confined space without it being necessary for any other worker to enter the confined space. The attendant will call 911 to activate the rescue.

Contractor will rely on its internal rescue team who has been trained in the use of self-contained breathing apparatus and rescue procedures. The attendant will call 911 to activate the rescue team.

Contractor has entered into a written agreement with Local Fire Rescue Department to provide rescue services from confined spaces on a 24-hour a day basis. In the event that there is a requirement for rescue, the attendant will call 911 to activate the rescue service.

A sample of a Confined Space Entry and Rescue Checklist is provided in Appendix E.

TRAINING REQUIREMENTS

Goal

To train workers in the hazards of confined spaces and inform them of procedures to eliminate or minimize the risks associated with confined space entries.

Objectives

Workers involved in confined space entry will:

- be familiar with the OSHA Regulations regarding confined spaces
- understand the criteria for a confined space
- be able to identify confined spaces
- understand how to perform hazard identification and risk assessments
- know how to conduct pre-entry testing based on written procedures
- understand the typical air contaminants found in municipal confined spaces
- understand the hazards associated with the space
- know how to complete the confined space entry form / permit
- understand ventilation requirements and be able to properly set up the ventilation system
- understand and be able to follow the safety precautions required by the written procedures

Summary of Training

- Confined space policy
- OSHA Regulations and definitions
- Hazard identification and risk assessment
- Pre-entry atmospheric testing
- Communication required for confined space entry
- Use of the confined space entry forms / permits
- Equipment required for confined space
- Rescue procedures for confined space

PROGRAM MAINTENANCE

The Chief of Facility Management office will ensure that the inventory of confined spaces is kept current and that hazard and risk assessment information provided to contractors is correct and current.

All hazard identifications and risk assessments are maintained as part of the inventory.

Maintenance of the inventory is the responsibility of the Chief of Facility Management.

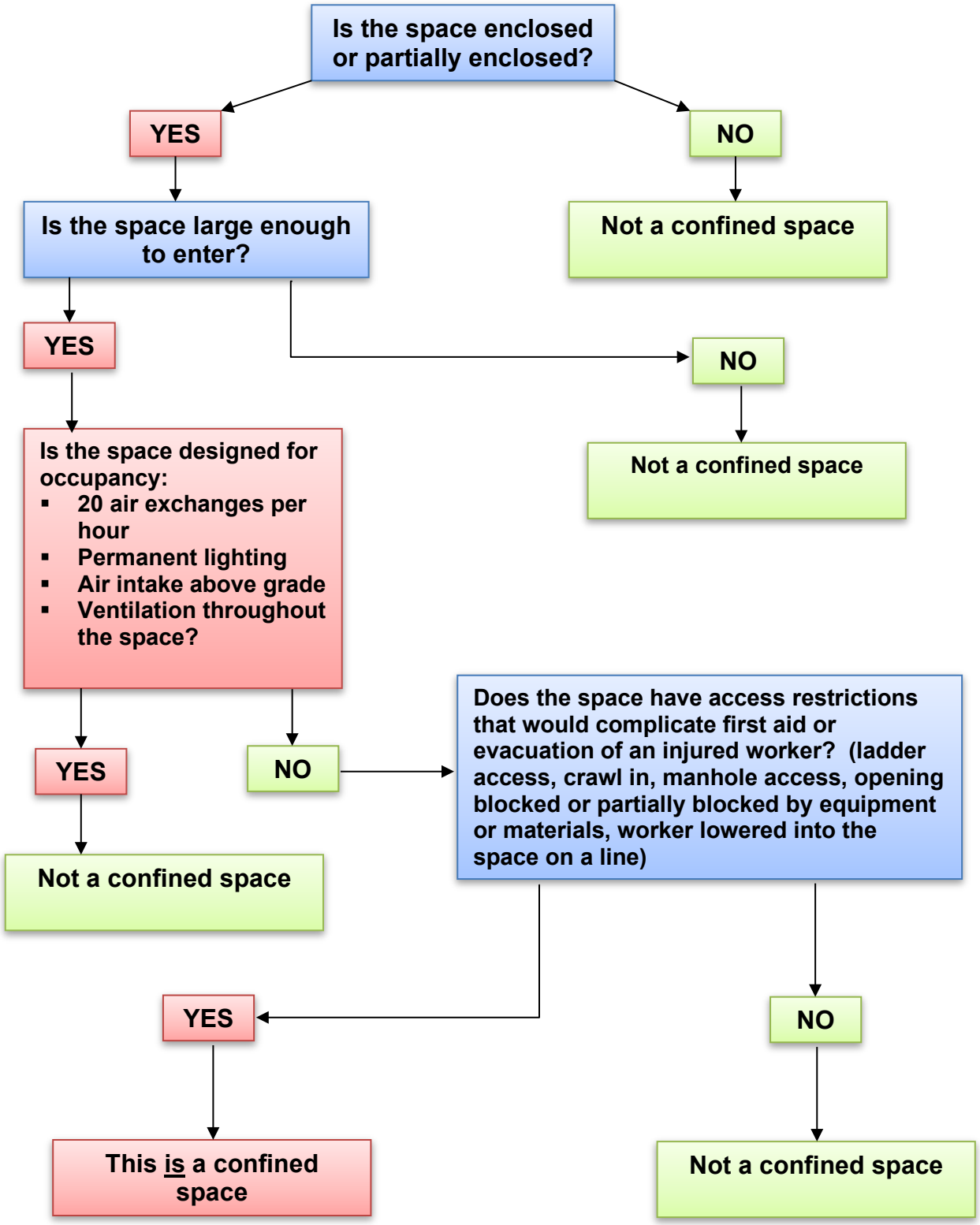
DOCUMENTATION

Documentation for the confined space entry program includes:

- Completed inventory of confined spaces
- Completed hazard identifications and risk assessments for each space or group of similar confined spaces
- Records of pre-entry testing
- Completed entry permits – must be kept for at least one year
- Rescue procedures

APPENDICES

Appendix A: Confined Space Identification Chart



Appendix B: Risk Assessment and Classification Form

National Mall

CONFINED SPACE ENTRY PROGRAM
Risk Assessment & Classification Form

Classification	
Type A - Low	o
Type B - Moderate	o
Type C - High	o
Space I.D. #	

Date of assessment: _____
Name of person(s) doing assessment: _____
_____

Location of space (address and/or description of physical location): _____
_____

Description of Space

Description of space: _____
_____
_____

Wet Well ..... ☐ Dry Well ..... ☐ Valve Chamber ☐ Outlet/Inlet ..... ☐ Tank ..... ☐
PRV Chamber .. ☐ Manhole ..... ☐ Box culverts..... ☐ Pump station ..... ☐ Pipeline ..... ☐
Pool filtration..... ☐ Chemical storage ..... ☐

Other..... ☐ Specify: _____

Type of Access: Door..... ☐ Regular Hatch ..... ☐ Large Hatch ..... ☐ Manhole cover ☐
Ladder..... ☐ Stairs ..... ☐

Possible Content Hazards: _____
_____
_____

Possible atmospheric hazards: _____
_____

Who usually enters the confined space?

Sewers/Sanitation ..... ☐ Waterworks..... ☐ Contractor ..... ☐

Other - Specify: _____
_____
_____

Frequency of entry:

Daily .. ☐ Weekly .... ☐ Monthly ... ☐ Yearly ... ☐
Other .. ☐ Specify: _____

Typical reasons for entering the space:

Inspection ..... ☐ Clearing Blockage... ☐ Minor Repair..... ☐ Cleaning .. ☐ Meter Reading.... ☐
Removal ..... ☐ Electrical repair ..... ☐ Mechanical repair... ☐ Painting.... ☐ Debris removal ... ☐

Other..... ☐ Specify: _____

External or internal connections to the space: _____
_____
_____

Operations/businesses nearby that may affect the space: _____
_____
_____

How will nearby operations/businesses affect the space? _____
_____
_____

Hazards				
	Potential Hazards	**Specific Hazards for This Space**	**Hazard Control as Part of Entry Procedures**	**PPE Required**
1.	**Isolation & Lockout** ▪ Piping coming into the space may have to be isolated, block and bleed… ▪ Equipment, e.g. electrical must be isolated & locked out			
2.	**Ventilation** - Limited or no ventilation			
3.	**Toxic materials** - Ensure MSDS available on site; Ventilation and/or respiratory eqpt to be used			
4.	**Toxic Gases** - Gases in the space may be toxic, irritating, asphyxiating, or flammable.			
5.	**Oxygen Deficiency** – e.g. rusting construction components, new concrete, excessive organic growth.			
6.	**Outside Contaminant Sources** - Nearby sources may affect workers in the space			
7.	**Limited or restricted entry/egress** ▪ small access point,			
	▪ equipment placement			
	▪ Material placement			
8.	**Internal configuration hazards** - Specific rescue procedures may be required			
9.	**Below grade** heavier than air contaminants may settle			
10.	**Fall Hazard** – Excessive height or depth			
11.	**Slipping Hazards** ▪ wet floor- risk of slip			
	▪ sloping floor – risk of slip			
12.	**Electrical Hazards** – e.g. Near power lines			
13.	**Deteriorating construction components**: ▪ Concrete - spalling or cracking			
	▪ Wood - rotting			
14.	**Entrapment/Engulfment** ▪ Rotting materials, e.g. wood.			
	▪ Upstream fluids - risk of drowning			
	▪ Internal baffles - may also restrict ventilation			
15.	**Internal pinch points** - risk of crushing			
16.	**Dust** - may be flammable or irritating, or restrict vision			
17.	**Temperature** - may be too hot or too cold			
18.	**Noise** – Hearing protection may be required			
19.	**Other**			

Isolation and Lockout

Describe any internal mechanical and electrical equipment:

_____

_____

_____

Is Isolation/Lockout and/or Blanking/Blinding/Bleeding required and reasonably possible to do? Explain:

_____

_____

_____

_____

List of lockout points (for more space use Comments section on Page 4):

_____ _____

_____ _____

_____ _____

Size and Configuration of Space

No. of Levels of Space: _____ **Depth of space:** to 1st level**:** _____ Total depth**:** _____

Entry/Exit:

Number of entry points: _____

Number of exit points: _____

Size & Type of opening: _____

Location of opening: _____

Rescue Considerations

Horizontal .. ☐ Entrapment ... ☐ Piping ..... ☐ Multi-level ..... ☐ Other ... ☐

Comments: _____

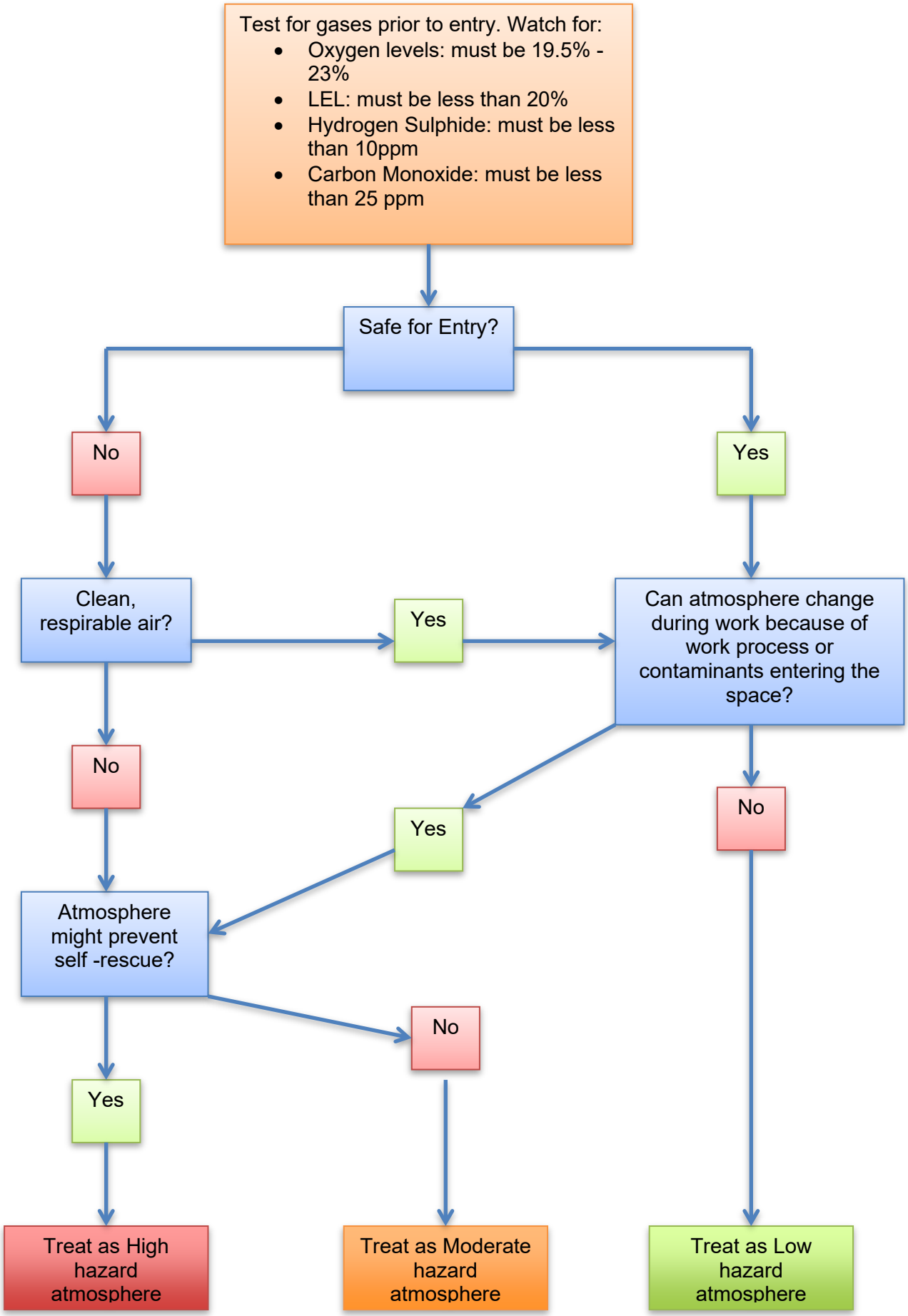
_____

_____

_____

Photo or Drawing of Confined Space

Preliminary Assessment Flow Chart


Test for gases prior to entry. Watch for:
• Oxygen levels: must be 19.5% - 23%
• LEL: must be less than 20%
• Hydrogen Sulphide: must be less than 10ppm
• Carbon Monoxide: must be less than 25 ppm
Safe for Entry?
No
Yes
Clean, respirable air?
Yes
Can atmosphere change during work because of work process or contaminants entering the space?
No
Yes
No
Atmosphere might prevent self -rescue?
No
Yes
Treat as High hazard atmosphere
Treat as Moderate hazard atmosphere
Treat as Low hazard atmosphere

Appendix C: Confined Space Entry Permit

National Mall CONFINED SPACE ENTRY PERMIT
(Permit expires at end of shift)

Date of Entry: _____ **Time of Entry:** _____ **Name of Standby Person:**_____

Location/Designation of Space: _____

Describe Space: _____

Describe Work To Be Done: _____

Confined Space Entry Permit must be completed, signed and posted at the entrance when any of the following occur:

- Lockout is required prior to entry
- Blanking or blinding is required to isolate the space prior to entry
- The space has piping coming into it which cannot be blanked or blinded
- There is risk of entrapment or of being buried/drowned
- Air quality would prevent self-rescue if ventilation or other equipment failed
- Ventilation is not provided or is not measured
- Ventilation cannot keep contaminants below permissible concentrations

Ventilation Method: Mechanical ventilation ☐ Natural ventilation ☐

Capacity of air mover or measured natural ventilation _____ cfm. or m^3

Gas Test Monitor Calibrated _____

Pre-Entry Air Testing Results: Name of tester _____ Signature of tester: _____

Contaminant	Time	Time	Time	Time
Oxygen (%)				
Carbon Monoxide (ppm)				
Hydrogen Sulfide (ppm)				
Flammables (%)				

High Hazard Precautions:

No entry allowed if:

- Flammables greater than 20% of lower explosive limit (LEL)

No entry without high hazard precautions if:

- Oxygen greater than 23.5 or less than 19.5 %
- Hydrogen Sulfide greater than 5 ppm
- Carbon monoxide greater than 25 ppm
- Flammables greater than 10% of LEL
- Ventilation not supplied or not measured
- Risk of entrapment or being buried/drowned (see back of form for high hazard precautions)

Workers Entering Space:

Note: No worker to enter space until permit completed and signed. (Supervisor Signature) _____

Legend: Write an X in the boxes under Status each time the named worker has EXITED the Confined Space (X) i.e. for coffee, lunch and each break. Write an / each time the named worker had ENTERED the Confined Space (/).

Name of Worker	Status														

National Mall CONFINED SPACE ENTRY PERMIT – Page 2 of 2
(Permit expires at end of shift)

Design, location, or use of space creates hazard:

Low ☐ Medium ☐ High ☐ Air Quality ☐ Entrapment ☐ Being Buried/drowned ☐

Description of Hazard: _____

Work creates hazard: Low ☐ Medium ☐ High ☐ Air Quality ☐ Entrapment ☐ Being Buried/drowned ☐

Description of Hazard: _____

PROCEDURES TO REDUCE OR ELIMINATE RISK:

Ventilation ☐ Cleaning ☐ Low voltage lights ☐ Fall prevention ☐ Purging ☐

Blocking or Blinding (must list locations) ☐ Lifting equipment ☐ Lockout ☐ Fire Extinguisher ☐

Ground fault interrupters ☐ PSSP ☐ Other ☐

Other precautions: _____

_____

PERSONAL PROTECTIVE EQUIPMENT:

Hardhats/Bump hats ☐ Eye Protection ☐ Footwear ☐ Gloves ☐ Respiratory Protection ☐ Full Body Harness ☐
Arc Flash ☐

SPECIAL PRECAUTIONS FOR HIGH RISK ATMOSPHERE (All must be in place)	**RESCUE PROCEDURES**
☐ Self Contained Breathing Apparatus	☐ Lifeline
☐ Lifeline with attendant	☐ Tripod (or other approved person lift device)
☐ Attendant equipped for rescue	☐ Rescue Team
☐ Continuous air monitoring	☐ Other Agency

DUTIES AND RESPONSIBILITIES OF STANDBY PERSON:

LOW HAZARD ATMOSPHERE	MODERATE HAZARD ATMOSPHERE	HIGH HAZARD ATMOSPHERE
The attendant must: 1. Be present 2. Must have means of continuously communicating with workers inside the space 3. Must check on the wellbeing of workers inside the space at least every 20 minutes 4. Must be able to summon the Rescue Team immediately	The attendant must 1. Be present 2. Must remain at or near the entrance 3. Must check on the wellbeing of the workers inside the space at least every 20 minutes or more often as required by the nature of the work 4. Must have a means of summoning workers inside the space 5. Must be able to summon the Rescue Team immediately	The attendant must: 1. Be capable of effecting immediate rescue 2. Be stationed at the entrance. 3. Continuously attend the space and cannot have any other duties 4. Observe visually the wellbeing of the workers inside the space continuously. 5. Ensure there is a means of summoning the workers inside the space. 6. Ensure continuous gas testing is conducted 7. Be trained in rescue techniques. 8. Prevent entanglement of lifeline or other equipment.

Site Safety Briefing Conducted On: _____, _____, _____

Names: _____, _____, _____

Appendix D: Sample Confined Space Rescue Guidelines

The rescue team supervisor shall ensure that an initial risk assessment is completed. This includes:

- Identifying external hazards (traffic etc.)
- Evaluating status of persons inside space
- Identifying potential contaminants
- Testing atmospheric conditions
- Identifying life safety threats to rescuers
- Ensuring communication system is in place
- Ensuring PPE and other equipment is being used as required

The confined Space Entry Rescue Checklist shall be completed for this purpose.

The rescue team supervisor shall then formulate the rescue plan, allocate tasks and assess further manpower requirements. He shall also ensure that all applicable parts of the general entry and/or the rescue procedures are met.

ACTIONS:

- On attending the scene, a risk assessment must be completed immediately. The Rescue Planning Checklist can be used for this purpose.

- If a single rescuer enters the space, a standby person who is trained to perform rescue and is equipped to enter the space, will be situated immediately outside the space. The standby person shall be in constant voice communication with the rescuers inside the space at all times. In addition, another person must be immediately available to be the standby person in case the standby person must enter the space to aid in rescue operations.

- Testing and ventilation of the space: Prior to entry, the space must be tested for contaminants. Entry without breathing apparatus requires the atmospheric conditions to be within the following parameters:
    - Oxygen concentration not less than 19.5% and not greater than 23%
    - Lower flammable limit less than 20%
    - Carbon Monoxide less than 25 PPM
    - Hydrogen sulfide less than 10 PPM
    - Other toxins less than 10% of prescribed level(s)

- If atmospheric parameters are not acceptable and/or cannot be met through mechanical ventilation of the space, all entry personnel shall use SCBA or a supplied air system with escape bottles.

- If atmospheric conditions are unknown, all entry personnel shall use SCBA or a supplied air system with escape bottles.

- If ventilation is employed, positive pressure must be maintained inside the space. Ventilation supply air must be circulated throughout the entire space.

- Where atmospheric LEL cannot be maintained below 50% by ventilation of the space or other means, appropriate measures will be taken to control ignition hazards, or no entry will be made.

- In addition to appropriate personal protective equipment, persons entering a confined space will wear a rescue harness. A lifeline shall be used where a high hazard atmosphere is present. Lifelines are not required if obstructions or other conditions make their use impractical or unsafe. Provision shall be made to prevent the entanglement of lines and equipment.

- At least two additional rescuers shall be equipped with and dressed into any equipment required to enter the space and assist the initial entry personnel.

- Where a mechanical lifting device is required for retrieval of persons inside the space, rescue equipment will consist of the following minimum equipment:

    - A suitable fixed anchor or tripod system for attachment of the lifting device
    - A manual winch or similar lifting device
    - A rescue diaper (and lifeline if required) to enable hauling the incapacitated worker(s) to the surface or exit hatch
    - A spine board or similar device as required for spinal immobilization.

- Motorized winches, cranes or other equipment of this nature shall not be used for rescue or retrieval of personnel.

Appendix E: Confined Space Entry and Rescue Checklist

MANPOWER DEPLOYMENT	PERSON ASSIGNED
Rescue Supervisor	
Risk Assessment	
Gas Testing/Ventilation	
Entry Rescue	
Medical	
Equipment	

Approach Hazards:	Assessed	Controlled

Other Entry Hazards:	Assessed	Controlled
Lockouts/blanking required		
Electrical		
Fire/explosion		
Entrapment/engulfment		

Victim's Status:	Walking Wounded	Incapacitated	Life Threatening	Deceased

Atmospheric Testing Results				
	TEST 1	TEST 2	TEST 3	TEST 4
O_2				
LEL				
CO				
H_2S				
Other/specify:				
Other/specify:				

For entry without use of breathing apparatus:	• Oxygen >19.5% and <23% • LEL <50% • Carbon Monoxide <25 PPM • Other Toxins <10% of PEL
If atmospheric parameters are not acceptable and/or cannot be met:	All entry personnel must use breathing apparatus
Atmospheric conditions unknown:	

Confined Space Entry And Rescue Checklist – page 2 of 2

Gas testing	☐ Gas detector ☐ Extension tube and pump ☐ Extra batteries
Ventilation	☐ Supply air ventilator CFM _____ ☐ Vent tube ☐ Exhaust ventilator CFM _____
PPE	☐ Harness ☐ Lifeline ☐ SCBA ☐ Extra bottles ☐ Air-line breathing apparatus ☐ Compressor/cascade system ☐ Air-lines ☐ Escape bottle ☐ Portable radios/hardwire telephone/cellular phone
High-Angle	☐ Pulleys ☐ Gibbs cams ☐ Figure-8 ☐ Carabiners ☐ Webbing
Access	☐ Portable ladder ☐ Lowering system – figure 8/lifeline
Retrieval	☐ Tripod or anchor ☐ Manual winch system ☐ Rescue diaper
Fire guard	☐ Portable extinguishers ☐ Non-sparking tools ☐ Explosion-proof ventilators
Heavy rescue-extrication	☐ Air bags ☐ Shoring ☐ Hurst jaws ☐ Power saw ☐ Pry bars ☐ Come-along

Appendix F: Sample Confined Space Inventory Form

Description	Location	Access Point	Hazard Identification Completed	Hazard Rating	Gas Detection Required
Grit tank	Wastewater	Manhole	Yes	Low	No
Primary clarifier	Tank farm	Man-way	Yes	Low	No
Skimming sump	Tank farm	Hatch	Yes	Moderate	Yes
Bio-filter	Tank farm	Hatch	Yes	Moderate	Yes
Gallery sump	Tank farm	Manhole	Yes	Moderate	Yes
Valve chamber	Lagoon	Manhole	Yes	Moderate	Yes
Chlorine tank	Lagoon	Hatch	Yes	High	Yes
Elevator pit	Arena	Ladder	Yes	Low	No
Meter chamber	Low road	Hatch	Yes	Low	No
Valve chamber	Low road	Manhole	Yes	Low	No
Sanitary pump	High road	Hatch	Yes	Moderate	Yes
Sanitary air valve	High road	Hatch	Yes	Moderate	Yes