

# Protocol #07

## Confined Space Entry

# DGS Accident and Illness Prevention Program (AIPP)

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### **References**

- The DGS AIPP, including Secretary’s “Safety Program Policy Statement”
- PA Management Directive 530.31 Amended
- PA Code Title 34 Chapter 129
- 29 CFR 1910.146 & appendices
- ANSI Z117.1-2009

## **A. Policy Statement**

The following protocol for confined spaces is official policy for the PA Department of General Services (DGS) and all of its employees. Authority and responsibility for its execution are pursuant to DGS Secretary Topper’s “Safety Program Policy Statement,” PA Management Directive 530.31, PA Code Title 34 Chapter 129 and “Element C” of the DGS Accident & Illness Prevention Program (AIPP). All of these documents are available for review online.

This policy includes material that applies directly to DGS operations. It is closely based upon the OSHA permit-required confined spaces standard.

## **B. Application and Purpose**

This protocol applies to all spaces designated as confined spaces based on the assessments conducted by management.

The purpose of this protocol is to protect DGS employees from injury as they enter, work in, and exit confined spaces.

In addition to following the guidelines included here, employees should observe the fundamentals outlined in all of the elements and protocols within the DGS AIPP.

## **C. Definitions**

**Acceptable entry conditions** means the conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into, work within, and exit from the space.

**Attendant** means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant’s duties assigned in the permit space program.

**Authorized entrant** means an employee who is authorized by management to enter a permit space.

**Blanking or blinding** means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the

bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

**Confined space** means a space that:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work, and
2. Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, manholes, and pits are spaces that may have limited means of entry), and
3. Is not designed for continuous employee occupancy.

NOTE: In 2. above, “limited or restricted means for entry or exit” means the entry / exit is a physical configuration that requires use of the hands for support to enter or exit the space.

**Double block and bleed** means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

**Emergency** means any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

**Engulfment** means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

**Entry** means the action by which a person passes through an opening into a permit-required confined space, including ensuing work activities in that space. Breaking the plane of a confined space’s entryway with any part of one’s body constitutes entry.

**Entry permit (permit)** means the written or printed document that is provided by management to allow and control entry into a permit space and that contains the information specified in section G. of this protocol.

**Entry supervisor** means the person (such as the manager, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this protocol.

NOTE: An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this protocol for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

**Hazardous atmosphere** means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), 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 (LFL);
2. Airborne combustible dust at a concentration that meets or exceeds its LFL;
3. Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;
4. Atmospheric concentration of any substance for which a dose or permissible exposure limit is published in 29 CFR 1910 Subpart G or Subpart Z and which could result in employee exposure in excess of its dose or permissible exposure limit;
5. Any other atmospheric condition that is immediately dangerous to life or health.

**Hot work permit** means management's written authorization to perform operations (for example riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

**Immediately dangerous to life or health (IDLH)** means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

NOTE: Some materials (hydrogen fluoride gas and cadmium vapor, for example) may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12 to 72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

**Inerting** means the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible. This procedure produces an IDLH oxygen-deficient atmosphere.

**Isolation** means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or

ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

**Line Breaking** means the intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

**Management** means DGS personnel with supervisory authority over other employees

**Non-permit confined space** means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

**Oxygen deficient atmosphere** means an atmosphere containing less than 19.5 percent oxygen by volume.

**Oxygen enriched atmosphere** means an atmosphere containing more than 23.5 percent oxygen by volume.

**Permit-required confined space (permit space)** means a confined space that has one or more of the following characteristics:

1. Contains or has a potential to contain a hazardous atmosphere;
2. Contains a material that has the potential for engulfing an entrant;
3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
4. Contains any other recognized serious safety or health hazard.

**Permit-required confined space program (permit space program)** means the overall program for controlling, and, where appropriate, for protecting employees from permit space hazards and for regulating employee entry into permit spaces.

**Permit system** means the written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

**Prohibited condition** means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

**Rescue service** means the personnel designated to rescue employees from permit spaces.

**Retrieval system** means the equipment (including a retrieval line, chest or full-body harness, wristlets if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

**Safety Inspector** means a DGS Fire, Safety, & Environmental Division employee with the job title “Safety Inspector.”

**Testing** means the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

## **D. General Requirements**

**Evaluation of the workplace:** A Safety Inspector must evaluate the workplace to determine if any spaces are permit-required confined spaces (permit spaces).

If permit spaces are identified, management shall inform exposed employees of their existence by posting danger signs at their entrances, or by any other equally effective means of notice. A sign reading “Danger – Permit-required Confined Space, Do Not Enter” or using other similar language will satisfy the sign notice requirement.

**Contractors:** Contractors who must enter permit spaces on DGS owned or controlled property will be provided with hazard information on all such spaces, and shall protect their employees in the same manner or better as described in this protocol for DGS employees. Management will in all situations be responsible to execute this protocol for the protection of DGS employees and shall not delegate that responsibility to any contractor.

**Written permit space program:** If any employees will ever enter permit spaces, this protocol will govern preparations, precautions, and all other activity.

**Partial exemption from requirements if atmosphere hazards are the only hazards:** If management can demonstrate through data available from monitoring and inspection records that

1. the only hazard posed by a permit space is an actual or potential hazardous atmosphere, and
2. that continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry, then

3. that space will be exempt from the requirements of entering permit spaces as long as regular monitoring verifies that it is safe.

The documented monitoring and inspection records used to justify this exemption shall be made available upon request to entrants or their authorized representatives.

If an initial entry of the permit space is necessary to obtain the data required to justify this exemption, that entry will be performed under the permit space entry rules of this protocol.

Not exempted are the requirements for training and employee participation.

**Partial exemption entry requirements:** Entry into permit spaces under the partial exemption described above shall be performed in accordance with the following rules.

1. Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed.
2. When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.
3. Before an employee enters the space, the internal atmosphere shall be tested with a calibrated direct-reading instrument for oxygen content, flammable gases and vapors, and potential toxic air contaminants in that order. Any employee who enters the space, or that employee's authorized representative, shall be provided an opportunity to observe the pre-entry testing required by this paragraph.
4. There may be no hazardous atmosphere within the space whenever any employee is inside the space.
5. Continuous forced air ventilation shall be used as follows:
  - a. An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere.

- b. The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space.
- c. The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space.
- d. The atmosphere within the space shall be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. Any employee who enters the space, or that employee's authorized representative, shall be provided with an opportunity to observe the periodic testing required by this paragraph.

**Partial exemptions - hazardous atmosphere development:** If a hazardous atmosphere is detected during entry

1. Each employee shall leave the space immediately;
2. The space shall be evaluated to determine how the hazardous atmosphere developed; and
3. Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

**Partial exemption pre-entry compliance certification:** A Safety Inspector shall verify that the space is safe for entry and that the pre-entry measures required by this protocol have been taken through a written certification that contains the date, location of the space, and signature of the person providing the certification. The certification shall be made before entry and shall be made available to each employee entering the space or to that employee's authorized representative.

**Reclassify to permit space:** When there are changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, a Safety Inspector shall reevaluate that space and, if necessary, reclassify it as a permit-required confined space.

**Reclassify to confined space:** A space classified by a Safety Inspector as a permit-required confined space may be reclassified as a non-permit confined space under the following procedures:

1. If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated.
2. If it is necessary to enter the permit-required confined space to eliminate hazards, such entry shall be performed in accordance with this protocol as it applies to permit-required confined spaces. If testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated, the permit space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated.

Note: Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards. Refer to the paragraphs on “Partial exemption” for the procedures applicable in that circumstance.

3. A Safety Inspector shall document the basis for determining that all hazards in a permit space have been eliminated, through a certification that contains the date, location of the space, and signature of the person making the determination. The certification shall be made available to each employee entering the space or to that employee’s authorized representative.
4. If hazards arise within a permit space that has been reclassified to a non-permit space, each employee in the space shall exit the space. A Safety Inspector shall then reevaluate the space and determine whether it must be reclassified as a permit space.

## **E. Permit Space Program**

### **Management or Safety Inspectors shall:**

1. Implement the measures necessary to prevent unauthorized entry.
2. Identify and evaluate the hazards of permit spaces before employees enter them.
3. Develop and implement the means, procedures, and practices necessary for safe permit space entry operations, including but not limited to the following:

- a. Specify acceptable entry conditions.
  - b. Provide each authorized entrant or their authorized representative with the opportunity to observe any monitoring or testing of permit spaces.
  - c. Isolate the permit space.
  - d. Purge, inert, flush, or ventilate the permit space as necessary to eliminate or control atmospheric hazards.
  - e. Provide pedestrian, vehicle, or other barriers as necessary to protect entrants from external hazards.
  - f. Verify that conditions in the permit space are acceptable for entry throughout the duration of an authorized entry.
4. Provide and properly maintain the following equipment at no cost to employees, and ensure that employees receive training for and use that equipment properly:
- a. Testing and monitoring equipment needed to comply with the testing and monitoring requirements of this protocol
  - b. Ventilating equipment needed to obtain acceptable entry conditions
  - c. Communications equipment necessary for continuous communication between entrants, attendants, and others as designated by management or a Safety Inspector
  - d. Personal protective equipment to compensate for flaws in the protection provided for workers by engineering and work practice controls
  - e. Lighting equipment sufficient to illuminate the work area to a level at which workers can operate safely and exit quickly in an emergency
  - f. Barriers and shields as required to protect workers from external hazards

- g. Equipment, such as ladders, needed for safe ingress and egress by authorized entrants
  - h. Rescue and emergency equipment that could be needed to extract an entrant if necessary, except for equipment already provided by outside rescue services
  - i. Any other equipment necessary for safe entry into and rescue from permit spaces.
5. Evaluate permit space conditions as follows when entry operations are conducted:
- a. Test conditions in the permit space to determine if acceptable entry conditions exist before entry is authorized to begin, except that, if isolation of the space is infeasible because the space is large or is part of a continuous system (such as a sewer), pre-entry testing shall be performed to the extent feasible before entry is authorized and, if entry is authorized, entry conditions shall be continuously monitored in the areas where authorized entrants are working.
  - b. Test or monitor the permit space as necessary to determine if acceptable entry conditions are being maintained during the course of entry operations.
  - c. When testing for atmospheric hazards, test first for oxygen, then for combustible gases and vapors, and then for toxic gases and vapors.
  - d. Provide each authorized entrant or that employee's authorized representative an opportunity to observe the pre-entry and any subsequent testing or monitoring of permit spaces.
  - e. Reevaluate the permit space in the presence of any authorized entrant or that employee's authorized representative who requests that management conduct such reevaluation because they have reason to believe that the previous evaluation of that space may not have been adequate.
  - f. Immediately provide each authorized entrant or that employee's authorized representative with the results of any testing conducted.
6. Provide at least one attendant outside the permit space into which entry is authorized for the duration of entry operations.

NOTE: Attendants can monitor more than one permit space entry at a time, but must be able at all times to perform the duties outlined in this protocol.

7. If multiple spaces are to be monitored by a single attendant, include in the permit program the means and procedures designed to enable the attendant to respond to an emergency affecting one or more of the permit spaces being monitored without impairing the attendant's effectiveness at monitoring the other spaces.
8. Designate the persons who are to have active roles (as, for example, authorized entrants, attendants, entry supervisors, or persons who test or monitor the atmosphere in a permit space) in entry operations, identify the duties of each such employee, and provide each such employee with the training required to effectively perform those functions.
9. Develop and implement procedures for summoning rescue and emergency services, for rescuing entrants from permit spaces, for providing necessary emergency services to rescued employees, and for preventing unauthorized personnel from attempting a rescue.
10. Develop and implement a system for the preparation, issuance, use, and cancellation of entry permits as required by this protocol.
11. Develop and implement procedures to coordinate entry operations when employees of more than one employer are working simultaneously as authorized entrants in a permits space, so that employees of one employer do not endanger the employees of any other employer.
12. Develop and implement procedures (such as closing off a permit space and canceling the permit) necessary for concluding the entry after entry operations have been completed.
13. Review entry operations when management or a Safety Inspector has reason to believe that the measures taken under the permit space program may not protect employees and revise the program to correct deficiencies found to exist before subsequent entries are authorized.

NOTE: Examples of circumstances requiring the review of the permit space program would include any unauthorized entry into a permit space, detection of a hazard not covered in the permit, detection of a condition prohibited by the permit, an injury or near-miss during entry, changes in the use or configuration of a permit space, and employee complaints about the effectiveness of the program.

14. Review the permit space program and canceled permits within 1 year after each entry and revise the program as necessary to make sure that workers are protected from hazards.

## **F. Permit System**

Before entry is authorized, a Safety Inspector shall document the completion of measures required by section E. of this protocol by preparing an entry permit.

1. Before entry begins, the entry supervisor identified on the permit shall sign the entry permit to authorize entry.
2. The completed permit shall be made available at the time of entry to all authorized entrants or their authorized representatives by posting it at the entry portal or by any other equally effective means so that the entrants can confirm that pre-entry preparations have been completed.
3. The duration of the permit may not exceed the time required to complete the assigned task or job identified on the permit.
4. The entry supervisor shall terminate entry and cancel the entry permit when:
  - a. The entry operations covered by the entry permit have been completed.
  - b. A condition that is not allowed under the entry permit arises in or near the permit space.
5. Management shall retain each canceled entry permit for at least 1 year to facilitate the review of the permit-required confined space program required at section E.14. of this protocol.

## **G. Entry Permit**

**The entry permit that documents compliance with this protocol and authorizes entry into a permit space shall identify:**

1. The permit space to be entered
2. The purpose of the entry
3. The date and the authorized duration of the entry permit
4. The authorized entrants within the permit space by name so that the attendant can determine quickly and accurately which authorized entrants are inside at all times
5. The persons, by name, currently serving as attendants
6. The individual, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry
7. The hazards of the permit space to be entered
8. The measures used to isolate the permit space and to eliminate or control permit space hazards before entry
9. The acceptable entry conditions
10. The results of initial and periodic tests performed in accordance with section E.5. of this protocol, accompanied by the names or initials of the testers and the dates and times of each test performed
11. The rescue and emergency services that can be summoned and the means for summoning those services
12. The communication procedures used by authorized entrants and attendants to maintain contact during the entry
13. Equipment to be provided for entrants and attendants, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment
14. Any other information that needs to be included for the specific circumstances of the particular confined space to be entered in order to ensure worker safety

15. Any additional permits, such as hot work permits, that have been issued to authorize work in the permit space.

## **H. Training**

**Management shall provide training so that all employees whose work is regulated by this protocol acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned to them.**

**Training shall be provided to each affected employee:**

1. Before the employee is first assigned duties governed by this protocol
2. Before there is a change in assigned duties
3. Whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained
4. Whenever management or a Safety Inspector has reason to believe either that there are deviations from the permit space entry procedures required by this protocol or that there are inadequacies in the employee's knowledge or use of these procedures.

**The training shall establish employee proficiency in the duties required by this protocol and shall introduce new or revised procedures, as necessary, for compliance.**

**Management shall certify that the training required by this protocol has been accomplished. The certification shall contain each employee's name, the signatures or initials of the trainers, and the dates of training. The certification shall be available for inspection by employees and their authorized representatives.**

## **I. Duties of Authorized Entrants**

**Management or Safety Inspectors shall ensure that all authorized entrants:**

1. Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of exposure
2. Properly use equipment as required by this protocol

3. Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space as required in this protocol
4. Alert the attendant whenever:
  - a. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or
  - b. The entrant detects a prohibited condition
5. Exit from the space as quickly as possible whenever:
  - a. An order to evacuate is given by the attendant or the entry supervisor
  - b. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation,
  - c. The entrant detects a prohibited condition, or
  - d. An evacuation alarm is activated.

## **J. Duties of Attendants**

### **Management or Safety Inspectors shall ensure that each attendant:**

1. Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of exposure
2. Is aware of possible behavioral effects of hazard exposure in authorized entrants
3. Continuously maintains an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants under this protocol accurately identifies who is in the permit space

4. Remains outside the permit space during entry operations until relieved by another attendant

NOTE: When the employer's permit entry program allows attendant entry for rescue, attendants may enter a permit space to attempt a rescue if they have been trained and equipped for rescue operations as required by this protocol and if they have been relieved as required.

5. Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space
6. Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:
  - a. If the attendant detects a prohibited condition
  - b. If the attendant detects the behavioral effects of hazard exposure in an authorized entrant
  - c. If the attendant detects a situation outside the space that could endanger the authorized entrants
  - d. If the attendant cannot effectively and safely perform all the duties required by this protocol
7. Summons rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards
8. Takes the following actions when unauthorized persons approach or enter a permit space while entry is underway:
  - a. Warn the unauthorized persons that they must stay away from the permit space
  - b. Advise the unauthorized persons that they must exit immediately if they have entered the permit space, and
  - c. Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space

9. Performs non-entry rescues as specified by the employer's rescue procedure
10. Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

## **K. Duties of Entry Supervisors**

### **Management or Safety Inspectors shall ensure that each entry supervisor:**

1. Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of exposure
2. Verifies, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin
3. Terminates the entry and cancels the permit as required by this protocol
4. Verifies that rescue services are available and that the means for summoning them are operable
5. Removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations, and
6. Determines that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained:
  - a. Whenever responsibility for a permit space entry operation is transferred among supervisors or attendants
  - b. At intervals dictated by the hazards and operations performed within the space.

## **L. Rescue and Emergency Services**

### **If management designates rescue and emergency services providers, they shall:**

1. Evaluate a prospective rescuer's ability to respond to a rescue summons in a timely manner, considering the hazard(s) identified

NOTE: The response time intended by the word "timely," as used here will vary according to the specific hazards involved in each entry. For example, DGS AIPP Protocol #28 (Respiratory Protection) requires management to provide a standby person or persons capable of immediate action to rescue employee(s) wearing respiratory protection while in work areas defined as IDLH atmospheres.

2. Evaluate a prospective rescue service's ability, in terms of proficiency with rescue-related tasks and equipment, to function appropriately while rescuing entrants from the particular permit space or types of permit spaces identified
3. Select a rescue team or service from those evaluated that:
  - a. Has the capability to reach the victim(s) within a time frame that is appropriate for the permit space hazard(s) identified
  - b. Is equipped for and proficient in performing the needed rescue services
4. Inform each rescue team or service of the hazards they may confront when called on to perform rescue at the site, and
5. Provide the rescue team or service selected with access to all permit spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.

### **If management designates its own DGS employees to provide permit space rescue and emergency services, they shall take the following measures:**

1. Provide affected employees with the personal protective equipment (PPE) needed to conduct permit space rescues safely and train affected employees so they are proficient in the use of that PPE, at no cost to those employees.

2. Train affected employees to perform assigned rescue duties. Management must also ensure that such employees successfully complete the training required to establish proficiency as an authorized entrant.
3. Train affected employees in basic first aid and cardiopulmonary resuscitation (CPR). Management shall ensure that at least one member of the rescue team or service holding a current certification in first aid and CPR is available.
4. Ensure that affected employees practice making permit space rescues at least once every 12 months by means of simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual permit spaces or from representative permit spaces.

**Non-entry rescue retrieval systems or methods shall be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. Retrieval systems shall meet the following requirements:**

1. Each authorized entrant shall use a chest or full body harness with a retrieval line attached at the center of the entrant's back near shoulder level, above the entrant's head, or at another point which the employer can establish presents a profile small enough for the successful removal of the entrant. Wristlets may be used in lieu of the chest or full body harness if management can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.
2. The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary.
3. A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet deep.

**If an injured entrant is exposed to a substance for which a Safety Data Sheet (SDS) or other similar written information is required to be kept at the worksite, that SDS or written information shall be made available to the medical facility treating the exposed entrant.**

## **M. Employee Participation**

**Management shall consult with affected employees and their authorized representatives on the development and implementation of all aspects of the permit space program required by this protocol.**

**Management shall make available to affected employees and their authorized representatives all information required to be developed by this protocol.**



## **Appendix G – Sewer System Entry**

Sewer entry differs in three vital respects from other permit entries:

1. It is rarely possible to isolate the space to be entered.
2. Because isolation is not complete, the atmosphere may suddenly become lethally hazardous from causes beyond the control of the entrant or employer.
3. Experienced sewer workers are especially knowledgeable in entry and work in their permit spaces because of the frequency of their entries.

### **Sewer System Entry**

Adherence to procedure: Management should designate as entrants only employees who are thoroughly trained in the applicable sewer entry procedures and who demonstrate that they follow these entry procedures exactly as prescribed when performing sewer entries.

Atmospheric monitoring: Entrants should be trained in the use of, and be equipped with, atmospheric monitoring equipment which sounds an audible alarm, in addition to its visual readout, whenever one of the following conditions are encountered or deemed possible –

- (1) Oxygen concentration less than 19.5%
- (2) Flammable gas or vapor at 10% or more of the lower flammable limit (LFL)
- (3) Hydrogen sulfide at or above 50 ppm (Ceiling Limit – evacuate space if without appropriate PPE), or 10 ppm measured as an 8-hour time-weighted average, or 15 ppm (30-minute Short Term Exposure Limit).
- (4) Carbon monoxide at or above 200 ppm (Evacuate if without appropriate PPE NIOSH 15-minute STEL), or 50 ppm measured as an 8-hour time-weighted average (OSHA).

Atmospheric monitoring equipment needs to be calibrated according to the manufacturer's instructions.

If actual or potential contaminants are NOT YET identified: The oxygen sensor/broad range sensor is best suited for initial use in situations where the actual or potential contaminants have not been identified, because broad range sensors, unlike substance-specific sensors, enable management to obtain an overall reading of the hydrocarbons (flammables) present in the space. However, such sensors only indicate that a hazardous threshold of a class of chemicals has been exceeded. They do not measure the levels of contamination of specific substances.

If actual or potential contaminants ARE identified: Substance-specific devices are best suited for use where actual or potential contaminants have been identified. The measurements obtained with substance-specific devices are of vital importance to management when decisions are made concerning the measures necessary to protect entrants (such as ventilation or personal protective equipment) and the setting and attainment of appropriate entry conditions. However, the sewer environment may suddenly and unpredictably change, and the substance-specific devices may not detect the potentially lethal atmospheric hazards which may enter the sewer environment.

The selected testing instrument should be carried and used by the entrant in sewer line work to monitor the atmosphere in the entrant's environment, and in advance of the entrant's direction of movement, to warn the entrant of any deterioration in atmospheric conditions. Where several entrants are working together in the same immediate location, one instrument, used by the lead entrant, is acceptable.

This guidance is provided to be appropriate and useful in most sewer entry situations, but management must consider unique circumstances, including the possibility of unpredictability of the atmosphere in sewer permit spaces.

Surge flow and flooding: Sewer crews should develop and maintain liaison, to the extent possible, with the local weather bureau and fire and emergency services in their area so that sewer work may be delayed or interrupted and entrants withdrawn whenever sewer lines might be suddenly flooded by rain or fire suppression activities, or whenever flammable or other hazardous materials are released into sewers during emergencies by industrial or transportation accidents.

Special equipment: Entry into large bore sewers (30" diameter or greater) may require the use of special equipment. Such equipment might include such items as atmosphere monitoring devices with automatic audible alarms, escape self-contained breathing apparatus (ESCBA) with at least 10 minute air supply (or other NIOSH-approved self-rescuer), and waterproof flashlights, and may also include boats and rafts, radios and rope stand-offs for pulling around bends and corners as needed. Management will provide such equipment as appropriate if it determines that it is needed.

# **Appendix B – Atmospheric Testing Procedures**

## **Pennsylvania DGS – AIPP Protocol #07**

### **Confined Space Entry**

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Atmospheric testing is required for two distinct purposes: evaluation of the hazards of the permit space and verification that acceptable entry conditions for entry into that space exist.

(1) Evaluation testing – The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity to identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Evaluation and interpretation of these data, and development of the entry procedure, should be done by or reviewed by, a technically qualified professional (e.g., OSHA consultation service, or certified industrial hygienist, registered safety engineer, certified safety professional, certified marine chemist, etc.) based on evaluation of all serious hazards.

(2) Verification testing – The atmosphere of a permit space which may contain a hazardous atmosphere should be tested for residues of all contaminants identified by evaluation testing using permit specified equipment to determine that residual concentrations at the time of testing and entry are within the range of acceptable entry conditions. Results of testing (i.e., actual concentration, etc.) should be recorded on the permit in the space provided adjacent to the stipulated acceptable entry condition.

(3) Duration of testing – Measurement of values for each atmospheric parameter should be made for at least the minimum response time of the test instrument specified by the manufacturer.

(4) Testing stratified atmospheres – When monitoring for entries involving a descent into atmospheres that may be stratified, the atmospheric envelope should be tested a distance of approximately 4 feet (1.22 m) in the direction of travel and to each side. If a sampling probe is used, the entrant's rate of progress should be slowed to accommodate the sampling speed and detector response.

(5) Order of testing – A test for oxygen is performed first because most combustible gas meters are oxygen dependent and will not provide reliable readings in an oxygen deficient atmosphere. Combustible gases are tested for next because the threat of fire or explosion is both more immediate and more life threatening, in most cases, than exposure to toxic gases and vapors. If tests for toxic gases and vapors are necessary, they are performed last.

*The above is 29 CFR 1910.146 App B verbatim and in its entirety.*



# PA DGS - Confined Space – Inspector’s Record

**Permit date:**    /    /        **Work shift:** 1<sup>st</sup>  2<sup>nd</sup>  3<sup>rd</sup>         **Expires:**    /    /

Time started: \_\_\_\_\_ Time Permit Expires: \_\_\_\_\_

Permit space to be entered (name and location): \_\_\_\_\_

Purpose of entry: \_\_\_\_\_

### Names of trained, authorized individuals

- Entry supervisor: \_\_\_\_\_ Signature: \_\_\_\_\_
- Entry attendant: \_\_\_\_\_
- Authorized entrants: \_\_\_\_\_
- Authorized entrants: \_\_\_\_\_

### Emergency Responder Advanced Notification

Emergency responder: \_\_\_\_\_ Phone number: \_\_\_\_\_

Contact person: \_\_\_\_\_ Time: \_\_\_\_\_

### Pre-entry requirements

Requirements	Yes	No	N/A	Requirements	Yes	No	N/A
Lockout - tagout/de-energize	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fire Safety work permit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pipes(s) broken or capped or blanked	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fall arrest harness/lifeline/tripod	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Purge or flush or drain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Personal protective equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ventilation:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Hardhat</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secure area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Gloves</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safe lighting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Safety glasses</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-sparking tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Respirator, type</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communication method:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Other PPE:</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Contractor employees involved	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Other PPE:</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional info or equipment required for safety: \_\_\_\_\_

Space-monitoring results: Initial Readings		Upper Level	Middle	Lower Level	Notes
<b>Monitor constantly, report every 15 Minutes</b>	<b>Permissible entry levels</b>	Time: Initial:	Time: Initial:	Time: Initial:	
Percent oxygen	19.5% to 23.5%				
Combustible gas	Less than 10% LEL				
Other toxic gas					
Other toxic gas					
<b>Gas Tester Name</b>	<b>Instrument Used</b>	<b>Model / Type</b>	<b>Serial Number</b>		

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Possible atmospheric hazards	Yes	No	N/A
Lack of oxygen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Combustible gases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Combustible vapors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Combustible dusts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Toxic gases/vapors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Possible non-atmospheric hazards			
Noise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemical contact	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrical hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mechanical exposure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Temperature extreme	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engulfment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entrapment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other non-atmospheric hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Pre-entry checklist

Entry is not permitted until these items are completed.

OK	Needs action	
<input type="checkbox"/>	<input type="checkbox"/>	Before entering the permit space, the supervisor or designee must notify the rescue team.
<input type="checkbox"/>	<input type="checkbox"/>	A minimum of two employees must be assigned to work involving permit space entry. One employee must remain outside the permit space at all times.
<input type="checkbox"/>	<input type="checkbox"/>	The surrounding area must be surveyed to show that it is free of hazards such as drifting vapors from tanks, piping, sewers, or vehicle exhaust.
<input type="checkbox"/>	<input type="checkbox"/>	Other required permits, such as hot work permits, are obtained.
<input type="checkbox"/>	<input type="checkbox"/>	Entrant to attendant communication procedure is in place.
<input type="checkbox"/>	<input type="checkbox"/>	Gas monitor calibration tests and functional test (fresh air calibration) have been performed this shift on the gas monitor.
<input type="checkbox"/>	<input type="checkbox"/>	The atmosphere will be continuously monitored while the space is occupied, if required by entry procedure.

## This permit has been terminated for the following reason:

Work completed       Canceled      Time: \_\_\_\_\_      Note: \_\_\_\_\_

Supervisor's signature \_\_\_\_\_ Time: \_\_\_\_\_ Date: / /

# PA DGS - Confined Space – Inspector's Record *pg. 3*

## Space Monitoring Results – Continued:

Space-monitoring results:		Upper Level	Middle	Lower Level	Notes
Monitor constantly, report every 15 minutes	Permissible entry levels	Time: Initial:	Time: Initial:	Time: Initial:	
Percent oxygen	19.5% to 23.5%				
Combustible gas	Less than 10% LEL				
Other toxic gas					
Other toxic gas					
Gas Tester Name	Instrument Used	Model / Type	Serial Number		

Space-monitoring results:		Upper Level	Middle	Lower Level	Notes
Monitor constantly, report every 15 minutes	Permissible entry levels	Time: Initial:	Time: Initial:	Time: Initial:	
Percent oxygen	19.5% to 23.5%				
Combustible gas	Less than 10% LEL				
Other toxic gas					
Other toxic gas					
Gas Tester Name	Instrument Used	Model / Type	Serial Number		

Space-monitoring results:		Upper Level	Middle	Lower Level	Notes
Monitor constantly, report every 15 minutes	Permissible entry levels	Time: Initial:	Time: Initial:	Time: Initial:	
Percent oxygen	19.5% to 23.5%				
Combustible gas	Less than 10% LEL				
Other toxic gas					
Other toxic gas					
Gas Tester Name	Instrument Used	Model / Type	Serial Number		

Space-monitoring results		Upper Level	Middle	Lower Level	Notes
Monitor constantly, report every 15 minutes	Permissible entry levels	Time: Initial:	Time: Initial:	Time: Initial:	
Percent oxygen	19.5% to 23.5%				
Combustible gas	Less than 10% LEL				
Other toxic gas					
Other toxic gas					
Gas Tester Name	Instrument Used	Model / Type	Serial Number		

# Appendix D – PA DGS - Permit Space Entrant / Attendant Log

Permit Space Description and Location:	
Permit Space Entry Permit No.:	
Date:	

**Special Instructions for Attendants:**


**Attendant(s)**

On Duty Time	Signature	Off Duty Time	Signature

**Entrant(s)**

Enter Time	Signature	Exit Time	Signature

## Pennsylvania DGS - Permit Space Entrant / Attendant Log (cont'd)

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### Duties of Authorized Attendants

- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
- Be aware of possible behavioral effects of hazard exposure in authorized Entrants;
- Continuously maintain an accurate count of authorized Entrants in the permit space and accurately identify who is in the permit space;
- Communicate with authorized Entrants as necessary to monitor Entrant status and to alert Entrants of the need to evacuate space;
- Monitor activities inside and outside the space to determine if it is safe for Entrants to remain in the space and order the authorized Entrant to evacuate the permit space immediately under any of the following conditions:
  - Detection of a prohibited condition;
  - Detection of behavioral effects of hazard exposure in an authorized Entrant;
  - Detection of a situation outside the space that could endanger the authorized Entrants; or
  - If the Attendant cannot effectively and safely perform all of his/her required duties.
- Summon rescue and other emergency services as soon as the Attendant determines the authorized Entrant may need assistance to escape from permit space hazards;
- Take the following actions when an unauthorized person approach or enter a permit space while entry is underway:
  - Warn the unauthorized person that they must stay away from the permit space.
  - Advise the unauthorized persons that they must exit immediately if they have entered the permit space; and
  - Inform the authorized Entrants and the Entry Supervisor if unauthorized persons have entered the permit space;
- Perform non-entry rescue as specified by the plan.
- Perform no duties that might interfere with the Attendant's primary duty to monitor and protect the authorized Entrants.
- Wear a distinctive color (e.g., orange) vest at all times while performing the duties of an Attendant.

# **Appendix E - Confined Space Classification Summary Sheet**

DGS AIPP Protocol #07

Confined spaces can be dangerous. Working safely in and around them can be complicated, especially when older buildings are involved. A detailed “Confined Space Protocol” exists to protect DGS employees who must enter such areas. If confined space entry is part of your job, it is very important that you become familiar with Protocol #07 of DGS’ Accident & Illness Prevention Program.

There are two types of confined spaces:

1. Non-permit-required confined spaces, referred to as “confined spaces” and
2. Permit-required confined spaces, referred to as “permit spaces”

Permit spaces are marked with signs that say:

“DANGER CONFINED SPACE No. \_\_\_\_ Entry Permit Required – Call \_\_\_\_\_”

Non-permit-required confined spaces need not be marked with signs.

If you believe that an unidentified confined space exists, please contact your supervisor or Safety Coordinator immediately. It is urgent that all confined spaces be identified, classified, and marked with signs if they are permit spaces.

## **This is how confined spaces are classified:**

Confined Space – three characteristics must all be present:

1. They are large enough and so configured that an employee can bodily enter and perform assigned work, and
2. They have limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, manholes, and pits are spaces that may have limited means of entry), and
3. They are not designed for continuous employee occupancy.

***NOTE:*** According to ANSI, “restricted entry and exit” means the entry / exit is a physical configuration that requires use of the hands for support to enter or exit the space.

Permit-required confined space (permit space) – a confined space that has one or more of the following characteristics:

1. Contains or has a potential to contain a hazardous atmosphere, or
2. Contains a material that has the potential for engulfing an entrant, or
3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section, or
4. Contains any other recognized serious safety or health hazard.

[Reviewed & updated: 1-04-21]

## **Appendix F** – Reclassifying from Permit Space to Confined Space

DGS AIPP Protocol #07

There are two general scenarios in which a Permit Space may be re-classified to a Confined Space. This is a summary of how DGS AIPP Protocol #07 governs these situations.

### **The 2 scenarios when re-classification is possible:**

1. The only hazard posed by a permit space is an actual or potential hazardous atmosphere.
2. The permit space poses no actual or potential atmospheric hazards and all other hazards within the space are eliminated without entry into the space.

### **Procedure for Scenario 1:**

- a) If continuous forced air ventilation alone is sufficient to maintain a permit space safe for entry, management will develop and keep data that supports that position.
- b) All of the requirements pertaining to this scenario contained in P-07 will be followed. These include pre-entry atmospheric tests as specified.
- c) If entry into the space is necessary in order to conduct the atmospheric tests needed, that entry will be handled as a permit space entry until the atmosphere is certified safe.
- d) Breaking the plane of the entryway into a confined space with any part of one's body constitutes entry for the purposes of P-07 procedures.

If all 4 of these items, a through d, are in order, then the space may be reclassified to Confined from Permit for as long as monitoring indicates that the space remains safe for entrants.

### **Procedure for Scenario 2:**

- a) All hazards have been eliminated without entering the space.
- b) If entry into the space is required to eliminate its hazards, that entry will be handled as a permit space entry until hazard elimination is complete and the space is certified safe.
- c) Management shall document the basis for determining that all hazards in a permit space have been eliminated through a certification that contains the date, location of the space, and the signature of the person making the determination of safety. This certification shall be made available to each employee entering the space or to that employee's authorized representative.

If all 3 of these items, a through c, are in order, then the space may be reclassified to Confined from Permit for as long as the hazards remain eliminated.

*Note 1 – Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards. It is a risk reduction technique.*

*Note 2 – If hazards of any sort arise during an entry, occupants shall immediately exit.*