

RESOLUTION NO. 93-10

**A RESOLUTION OF THE CITY OF Spring Hill ADOPTING
A PERMIT REQUIRED CONFINED SPACE PROGRAM.**

WHEREAS, the *Occupational and Safety Health Administration (OSHA)* is requiring cities to develop and implement a written permit space entry program, AND

WHEREAS, the requirements are to protect employees from the hazards of entry into permit-required confined spaces, AND

WHEREAS, the City of Spring Hill has a number of employees who are required to enter spaces that are considered toxic, explosive or asphyxiative, AND

WHEREAS, the City of Spring Hill is required to identify all permit-required spaces in their workplaces, prevent unauthorized entry into them, and protect authorized workers from hazards through a permit space entry program,

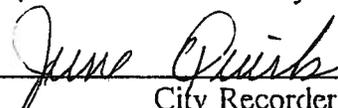
NOW, THEREFORE BE IT RESOLVED BY THE BOARD OF MAYOR AND ALDERMEN OF THE CITY OF Spring Hill, TENNESSEE, that employees required to enter confined spaces, which includes public works, water and wastewater, and emergency medical rescue personnel, should at all times have access to proper protective equipment, and should exercise great caution in situations when entering such spaces as defined by the standard, AND

BE IT FURTHER RESOLVED THAT THE BOARD OF MAYOR AND ALDERMEN OF THE CITY OF Spring Hill, TENNESSEE do hereby adopt a Permit-Required Confined Space Program which shall be the official policy regarding permit-required confined space entry. A copy of the policy shall be kept in the City Recorder's office and distributed to all employees in high risk occupations.

Passed and approved by the Board of Mayor and Aldermen of the City of Spring Hill on this 18th day of October, 1993.



Mayor



City Recorder

PERMIT-REQUIRED CONFINED SPACE PROGRAM

SECTION I - GENERAL INFORMATION.

A. Purpose.

It is the responsibility of the City of Spring Hill to provide employees a place of employment which is free from recognized hazards that may cause death or serious physical harm. In providing services to the citizens of the City of Spring Hill employees may be required to enter spaces considered hazardous.

The purpose of this policy is to establish a comprehensive set of procedures and practices to protect employees from the hazards of entry into permit-required confined space.

B. Coverage.

The policy is intended to protect all workers from toxic, explosive or asphyxiating atmospheres and from possible engulfment from small particles such as liquids, grain or sawdust. Those high risk occupations include but are not limited to:

1. Paramedics and Emergency Medical Technicians;
2. Public Works Employees;
3. Water and Wastewater Workers;
4. Any other employee deemed to be at high risk per the permit required confined space determination.

C. Administration.

This Permit-Required Confined Space program shall be administered by Billy J. Hendricks who shall be responsible for coordinating all activities surrounding confined spaces. The Administrator shall be responsible for coordinating activities with all city department and outside contractors where necessary. The Administrator shall also be responsible for evaluating the workplace to determine if any spaces are permit-required confined spaces.

There shall also be designated an Entry Supervisor for each confined space site. The Entry Supervisor shall be responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operation, and for terminating entry as required.

Each confined space entry site must also have Attendants and Authorized Entrants. The Attendant is 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. The Authorized Entrant is the employee who is authorized to enter a permit space.

D. Definitions.

1. Acceptable entry conditions - 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 and work within the space.
2. Confined space - a space that:
 - (a). is large enough and so configured that an employee can bodily enter and perform assigned work; and
 - (b). has a limited or restricted means for entry or exit; and
 - (c). is not designed for continuous employee occupancy.
3. Engulfment - 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.
4. Entry - the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the body breaks the plane of an opening into the space.
5. Entry permit - the written or printed document that is provided by the employer to allow and control entry into a permit space and that contains the information specified by the standard.
6. Hazardous atmosphere - an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue, injury, or acute illness from either flammable gas, vapor or mist in excess of 10 percent of its lower flammable limit (LFL); airborne combustible dust at a concentration that meets or exceeds its LFL; atmospheric oxygen concentration below 19.5% or above 23.5%; atmospheric concentration of any substance for which a dose or a permissible exposure limit is considered toxic and hazardous by OSHA; or any other atmospheric condition that is immediately dangerous to life or health.

7. Non-permit confined space - 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.
8. Permit-required confined space - a confined space that has one or more of the following characteristics:
 - (a) contains or has a potential to contain a hazardous atmosphere;
 - (b) contains a material that has the potential for engulfing an entrant;
 - (c) 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
 - (d) contains any other recognized serious safety or health hazard.
9. Permit-required confined space program - the employer's overall program for controlling, and, where appropriate, for protecting employees from permit space hazards and for regulating employee entry into permit spaces.
10. Permit system - the employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.
11. Testing - 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. (Testing allows the employer to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to and during entry.)

SECTION II - GENERAL POLICIES AND PROCEDURES.

A. Policy Statement.

In compliance with the Permit-Required Confined Space Entry standards, the City of Spring Hill, shall identify all permit-required confine spaces in the workplace, prevent unauthorized entry into them, protect authorized workers from hazards, establish entry procedures, establish appropriate training for authorized entrants, entry supervisors, and attendants, and document compliance.

B. General Guidelines.

1. Where permit spaces are located, notice of danger shall be posted where appropriate. Signs reading "Danger - Permit-Required Confined Space, Do Not Enter" will be posted.
2. It shall be a violation of the City of Spring Hill's safety procedures for employees to enter confined spaces without proper authorization. Violation of this policy shall result in disciplinary action up to and including possible termination.
3. If the city can demonstrate that the only hazard posed by the permit space is an actual or potential hazardous atmosphere and if it can be demonstrated that continuous forced air ventilation alone is sufficient to maintain the permit space safe for entry and if monitoring and inspection data supports such conditions, then entry can be made according to the following requirements:
 - (a) any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed;
 - (b) 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.
 - (c) 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.
 - (d) there may be no hazardous atmosphere within the space whenever any employee is inside the space.
 - (e) continuous forced air ventilation shall be used and the atmosphere within the space shall be periodically tested as necessary to ensure the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere or the forced air ventilation is 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, or the air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space.
 - (f) 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.

- (g) if a hazardous atmosphere is detected during entry each employee shall leave the space immediately, the space shall be evaluated to determine how the hazardous atmosphere developed; and measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.
 - (h) the city shall verify that the space is safe for entry and that the measures have been taken through a written certification that contains the date, the location of the space, and the 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.
4. The city shall provide the following equipment as needed at no cost to employees, and shall maintain the equipment properly, and ensure that employees use the equipment properly;
- (a) testing and monitoring equipment;
 - (b) ventilating equipment needed to obtain acceptable entry conditions;
 - (c) communications equipment necessary for compliance;
 - (d) personal protective equipment
 - (e) lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency;
 - (f) barriers and shields
 - (g) equipment such as ladders, needed for safe entry and exit ;
 - (h) rescue and emergency equipment
 - (i) any other equipment necessary for safe entry into and rescue from permit spaces.
5. The city shall evaluate permit space conditions when entry operations begin by:
- (a) testing conditions in the permit space to determine if acceptable entry conditions exist before entry is authorized to begin,
 - (b) testing or monitoring the permit space as necessary to determine if acceptable entry conditions are being maintained during the course of entry operations; and

6. When testing for atmospheric hazards, test first for oxygen, then for combustible gases and vapors, and then for toxic gases and vapors.
7. The City shall provide at least one attendant outside the permit space into which entry is authorized for the duration of entry operations.
8. When multiple spaces are to be monitored by a single attendant, the appropriate communication equipment shall be available to enable the attendant to respond to an emergency affecting one or more of the permit spaces being monitored without distraction from the attendant's responsibilities.
9. If at any time there is any questionable action or non-movement by the worker inside, a verbal check will be made. If there is no response, the worker will be moved immediately. *Exception:* If the worker is disabled due to falling or impact, he/she shall not be removed from the confined space unless there is immediate danger to his/her life.
10. Chest harnesses with attached life-line shall be used by all workers entering the space with the free end of the line secured outside the entry opening. The attendant (standby worker) shall attempt to remove a disabled worker via his lifeline. The attendant is not permitted to enter the space to perform rescue.
11. When practical, confined spaces shall be entered through side openings - those within 3 1/2 feet(1.07 m) of the bottom. When entry must be made through a top opening, the safety belt shall be of the approved harness type that suspends a person upright and an approved hoisting device or similar apparatus shall be available for lifting workers out of the space.
12. In any situation where the use of harness equipment may endanger the worker, use of a hoisting device or safety belt and attached lifeline may be discontinued.
13. When dangerous air contamination is attributable to flammable and/or explosive substances, lighting and electrical equipment shall be Class 1, Division 1 rated per National Electrical Code and no ignition sources shall be introduced into the area.
14. Continuous gas monitoring shall be performed during all confined space operations. If alarm conditions change adversely, entry personnel shall exit the confined space and a new confined space permit issued.
15. A permit-required confined space may be reclassified as a non-permit space if:
 - (a) the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space;

- (b) if testing and inspection during that entry demonstrates that the hazards within the space have been eliminated, the permit space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated.
- 16. When there are changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, the employer shall reevaluate that space and if necessary reclassify it as a permit-required confined space.
- 17. A space classified by the city as a permit required confined space may be reclassified as a non-permit confined space 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 .
- 18. When the city arranges to have employees of another employer (contractor) perform work that involves permit space entry, the city shall:
 - (a) inform the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with this permit space entry program;
 - (b) apprise the contractor of the elements, including the hazards identified and the city's experience with the space, that make the space in question a permit space;
 - (c) Apprise the contractor of any precautions or procedures that the host employer has implemented for the protection of employees in or near permit spaces where contractor personnel will be working;
 - (d) coordinate entry operations with contractor, when both city employees and contractor personnel will be working in or near permit spaces;
 - (e) debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations.

SECTION V - PRE-ENTRY

A. Policy Statement.

Before entry is authorized, the Coordinator shall document the completion of measures to insure safe permit space entry operations by specifying acceptable entry conditions, isolating the permit space, ventilating the space to eliminate or control atmospheric hazards, providing barriers as necessary and verifying that conditions in the permit space are acceptable for entry.

B. General Guidelines.

1. Equipment Preparation prior to isolation of the equipment requiring an entry is required. Every effort must be made to clean and purge the area of any hazardous contents. This should be done until atmospheric testing indicates levels are below any concentration that could cause a physical or health hazard.
2. Equipment Isolation is to be accomplished by utilization of appropriate lock-out/tag-out and line-breaking procedures
3. Testing before entry for oxygen levels, flammability, and/or any contaminants that have a potential to be present is required. The test must be performed by qualified personnel using equipment that has been checked for proper functions.
4. Testing must be performed throughout the entire portion of the space that workers will occupy during the entry. This testing shall be done without the use of ventilation systems. The atmosphere must be tested at various levels since some gases and vapors are lighter or heavier than air which can result in a layering effect.
5. The following conditions must be met before the atmosphere is considered safe:
 - (a) An "LFL" reading of 0 through 10%.
 - (b) An oxygen level between 19.5% and 23.5%.
 - (c) An airborne combustible dust at a concentration that obscures vision at a distance of greater than five feet.
 - (d) An atmospheric concentration of a substance less than the permissible exposure limit.
6. Entry into the confined space is prohibited until these condition ar all met, or until special protective measures are provided.

7. Testing must be performed just prior to commencement of the entry and before re-entry if workers have left the site for an extended time period (15-20 minutes).

SECTION V - PERMIT SYSTEM

A. Policy Statement.

Before entry into a confined space is authorized, a entry permit form must be completed documenting compliance with the standard and authorizing entry into the space. The entry permit shall identify the space; the purpose of entry; the date and duration of entry; authorized entrants; attendants; entry supervisory; the hazards of the permit space and measures to isolate/eliminate the hazards. The permit shall also contain the results of initial and periodic test accompanied by the names of the testers.

The permit shall also contain the rescue and emergency services that can be summoned and the means for summoning those services in addition to a list of personal protective and communication equipment

B. General Guidelines.

1. Before entry is authorized, the city must document the completion of an entry permit. Before entry begins, the entry supervisor identified on the permit must sign the entry permit to authorize entry.
2. The completed permit shall be made available at the time of entry to all authorized entrants, by posting it at the entry portal.
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; or
 - (b) a condition that is not allowed under the entry permit arises in or near the permit space.

SECTION VII - SEWER SYSTEM ENTRY

A. Policy Statement.

Though sewer entry differs from other permit entries because of the difficulty in completely isolating the space, the provision of the Standards continue to apply.

B. General Guidelines.

1. Only employees who are thoroughly trained in the city's sewer entry procedures can be named entrants.
2. Entrants must be trained in the use of atmospheric monitoring equipment.
3. The confined space administrator shall develop and maintain liaison with the local weather bureau and fire and emergency services so that sewer work can be delayed or interrupted whenever sewer lines might be flooded by rain or fire suppression activities, or when flammable or other hazardous materials are released into sewers during emergencies by industrial or transportation accidents.
4. Because conditions are subject to change, employees who enter sewers systems must conduct continuous atmospheric monitoring of the space at the employees work location.

SECTION VII - TRAINING

A. Policy Statement.

All employees of the City of Spring Hill, who may encounter confined spaces in the course of their work, must be made aware of the appropriate procedures and controls for entry and that unauthorized entry into such spaces is forbidden. They must be made to realize that an unauthorized entry could be fatal; and that their senses may be unable to detect and evaluate the severity of atmospheric hazards.

B. General Guidelines.

1. The city shall provide training so that all employees acquire the understanding, knowledge and skills necessary for the safe performance of the duties assigned them. Training shall contain hazard recognition, use of personal protective equipment; self-rescue techniques; any special work practices or procedures needed to perform work in the confined space safely, lockout/tagout procedures for equipment and use of atmospheric equipment

2. Training shall be provided to each affected employee before the employee is first assigned duties under this policy; before there is a change in the assigned duties; whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained and whenever the city has reason to believe either that there are deviations from the permit space entry procedures or that there are inadequacies in the employee's knowledge or use of the procedures.
3. Training shall establish employee proficiency in the duties required and shall introduce new and revised procedures as necessary for compliance with this program.
4. The city will certify that training 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.
5. Any employee required or permitted to pre-check or enter an enclosed/confined space shall have successfully completed, as a minimum, the training as required by this sections of these procedures.
6. Employees may not perform any entry space tasks until the employee has been certified as possessing the appropriate skills.
 - a. Authorized Entrants must be trained to recognize confined space hazards, including information on the mode of exposure, signs or symptoms, and consequences of exposure; proper use of personal protective equipment; use of communication equipment; and procedures for exiting a permit space.
 - b. Attendants must be trained to remain outside entry spaces during operations; perform non-entry rescue; recognize existing and potential hazards; use of communication devices; when to order evacuation of a permit space; and when to summon rescue and other emergency services.
 - c. Entry Supervisors must be trained to recognize space hazards; verification of emergency plans, tests, permits, procedures and equipment; when to terminate entry and when to cancel permits.

SECTION VIII - RESCUE AND EMERGENCY

A. Policy Statement.

It is the responsibility of the City to ensure that rescue services personnel are provided with and trained in the proper use of personal protective and rescue equipment, first aid and CPR.

B. General Guidelines.

1. In the event of an emergency or situation requiring emergency medical attention, the City of Spring Hill will utilize the emergency services of Spring Hill (the City Fire Department and Ambulance services). and Maury County AMB.
2. The designated Attendant shall be the individual responsible for monitoring activities inside and outside the confined space and summoning rescue and other emergency services. If necessary, the attendant shall perform non-entry rescue as appropriate.
3. Member of rescue and emergency services shall be trained to use properly, the personal protective equipment and rescue equipment necessary for making rescues from permit spaces.
4. Each member shall be trained in basic first-aid and in cardiopulmonary resuscitation (CPR).
5. Each member of the rescue service shall 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. Each member shall be trained in basic first-aid and in cardiopulmonary resuscitation. At least one member of the rescue service holding current certification in first aid and in CPR shall be available.
6. When retrieving injured or unconscious workers, members of the rescue unit shall use a chest or full body harness, with retrieval lines attached at the center of the entrant's back. The other end of the retrieval line shall be attached at a mechanical device in such a manner that rescue can begin as soon as the rescuer becomes aware.
7. A mechanical retrieval device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet deep.
8. Material Safety Data Sheets (MSDS) maintained by the city shall be made available to medical facilities treating entrants exposed to hazardous materials.

Document #3

Sample Permit Required Confined Space Evaluation

- I. **Work Place -**
- II. **Potential Hazards -** Employees could be exposed to the following hazards:
 - a. **Engulfment -**
 - b. **Presence of toxic gases**
 - c. **Presence of explosive/flammable gases**
 - d. **Oxygen deficiency**
- III. **Entry Without Permit/Attendant**
 - a. **Certification -** Confined spaces may be entered without the need for a written permit or attendant provided that: 1) the space is determined not to be a permit required confined space, or 2) the space can be maintained in a safe condition for entry by mechanical ventilation alone. All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise.

The Confined Space Pre-Entry Check List must be completed by the LEAD WORKER before entry into a confined space. This list verifies completion of items listed below. This check list shall be kept at the job site for duration of the job. If circumstances dictate an interruption in the work, the permit space must be re-evaluated and a new check list must be completed.

- b. **Control of atmospheric and engulfment hazards**
 - 1. **Pumps and lines**
 - 2. **Surveillance**

3. **Testing** - The atmosphere within the space will be tested to determine whether dangerous air contamination and/or oxygen deficiency exists. An alarm only type gas monitor may be used. Testing shall be performed by the LEAD WORKER who has successfully completed the Gas Detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency, LFL, and hydrogen sulfide concentration. A written record of the pre-entry test results shall be made and kept at the work site for the duration of the job. The supervisor will certify in writing, based upon the results of the pre-entry testing, that all hazards have been eliminated. Affected employees shall be able to review the testing results. The most hazardous conditions shall govern when work is being performed in tow adjoining, connecting spaces

4. **Entry procedures** - If there are no non-atmospheric hazards present and if the pre-entry tests show there is no dangerous air contamination and/or oxygen deficiency within the space and there is no reason to believe that any is likely to develop, entry into an work within may proceed. Continuous testing of the atmosphere in the immediate vicinity of the workers within the space shall be accomplished. The workers will immediately leave the permit space when any of the gas monitor alarm set points are reached as defined. Workers will not return to the area until a SUPERVISOR who has completed the gas detector training has used a direct reading gas detector to evaluate the situation and has determined that it is safe to enter.

5. **Rescue** -

IV. **Entry Permit Required**

- a. **Permits** - Confined Space Entry Permit.

- b. **Control of atmospheric and engulfment hazards**
 1. **Surveillance** -

 2. **Testing** - The confined space atmosphere shall be tested to determine whether dangerous air contamination and/or oxygen deficiency exists. A direct reading gas monitor shall e used. Testing shall be performed by the SUPERVISOR who has successfully completed the gas detector training for the monitor he/she will use. The minimum parameters to be monitored are oxygen deficiency, LFL and hydrogen sulfide concentration.

3. **Space ventilation** - Mechanical ventilation systems, where applicable shall be set at 100% outside air. Where possible, open additional manholes to increase air circulation. Use portable blowers to augment natural circulation if needed. After a suitable ventilating period, repeat the testing. Entry may not begin until testing has demonstrated that the hazardous atmosphere has been eliminated.
4. **Entry procedures** - The following procedure shall be observed under any of the following conditions: 1) testing demonstrates the existence of dangerous or deficient conditions and additional ventilation cannot reduce concentrations to safe levels; 2) the atmosphere tests are safe but unsafe conditions can reasonably be expected to develop; 3) it is not feasible to provide for ready exit from spaces equipped with automatic fire suppression systems and it is not practical or safe to deactivate such systems; or 4) an emergency exists and it is not feasible to wait for pre-entry procedures to take effect.
5. **Rescue** -

Document #4

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 employer's 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 employer's 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.

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.

Note: Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

(c) *General requirements.* (1) The employer shall evaluate the workplace to determine if any spaces are permit-required confined spaces.

Note: Proper application of the decision flow chart in Appendix A to §1910.146 would facilitate compliance with this requirement.

(2) If the workplace contains permit spaces, the employer shall inform exposed employees, by posting danger signs or by any other equally effective means, of the existence and location of and the danger posed by the permit spaces.

Note: A sign reading "DANGER—PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" or using other similar language would satisfy the requirement for a sign.

(3) If the employer decides that its employees will not enter permit spaces, the employer shall take effective measures to prevent its employees from entering the permit spaces and shall comply with paragraphs (c)(1), (c)(2), (c)(6), and (c)(8) of this section.

(4) If the employer decides that its employees will enter permit spaces, the employer shall develop and implement a written permit space entry program that complies with this section. The written program shall be available for inspection by employees and their authorized representatives.

(5) An employer may use the alternate procedures specified in paragraph (c)(5)(ii) of this section, for entering a permit space under the conditions set forth in paragraph (c)(5)(i) of this section.

(i) An employer whose employees enter a permit space need not comply with paragraphs (d) through (f) and (h) through (k) of this section, provided that:

(A) The employer can demonstrate that the only hazard posed by the permit space is an actual or potential hazardous atmosphere;

(B) The employer can demonstrate that continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry;

(C) The employer develops monitoring and inspection data that supports the demonstrations required by paragraphs (c)(5)(i)(A) and (c)(5)(i)(B) of this section;

(D) If an initial entry of the permit space is necessary to obtain the data required by paragraph (c)(5)(i)(C) of this section, the entry is performed in compliance with paragraphs (d) through (k) of this section;

(E) The determinations and supporting data required by paragraphs (c)(5)(i)(A), (c)(5)(i)(B), and (c)(5)(i)(C) of this section are documented by the employer and are made available to each employee who enters the permit space under the terms of paragraph (c)(5) of this section; and

(F) Entry into the permit space under the terms of paragraph (c)(5)(i) of this section is performed in accordance with the requirements of paragraph (c)(5)(ii) of this section.

Note: See paragraph (c)(7) of this section for reclassification of a permit space after all hazards within the space have been eliminated.

(ii) The following requirements apply to entry into permit spaces that meet the conditions set forth in paragraph (c)(5)(i) of this section.

(A) Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed.

(B) 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.

(C) Before an employee enters the space, the internal atmosphere shall be tested, with a calibrated direct-reading instrument, for the following conditions in the order given:

(1) Oxygen content,

(2) Flammable gases and vapors, and

(3) Potential toxic air contaminants.

(D) There may be no hazardous atmosphere within the space whenever any employee is inside the space.

(E) Continuous forced air ventilation shall be used, as follows:

(1) An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere;

(2) 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;

(3) The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space.

(F) 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.

(G) 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.

(11) The employer shall verify that the space is safe for entry and that the measures required by paragraph (c)(5)(ii) of this section have been taken, through a written certification that contains the date, the location of the space, and the 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.

(6) When there are changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, the employer shall reevaluate that space and, if necessary, reclassify it as a permit-required confined space.

(7) A space classified by the employer as a permit-required confined space may be reclassified as a non-permit confined space under the following procedures:

(i) 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.

(ii) If it is necessary to enter the permit space to eliminate hazards, such entry shall be performed under paragraphs (d) through (k) of this section. 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. Paragraph (c)(5) covers permit space entry where the employer can demonstrate that forced air ventilation alone will control all hazards in the space.

(iii) The employer shall document the basis for determining that all hazards in a permit space have been eliminated, through a certification that contains the date, the location of the space, and the signature of the person making the determination. The certification shall be made available to each employee entering the space.

(iv) If hazards arise within a permit space that has been declassified to a non-permit space under paragraph (c)(7) of this section, each employee in the space shall exit the space. The employer shall then reevaluate the space and determine whether it must be reclassified as a permit space, in accordance with other applicable provisions of this section.

(8) When an employer (host employer) arranges to have employees of another employer (contractor) perform work that

involves permit space entry, the host employer shall:

(i) Inform the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with an permit space program meeting the requirements of this section;

(ii) Apprise the contractor of the elements, including the hazards identified and the host employer's experience with the space, that make the space in question a permit space;

(iii) Apprise the contractor of any precautions or procedures that the host employer has implemented for the protection of employees in or near permit spaces where contractor personnel will be working;

(iv) Coordinate entry operations with the contractor, when both host employer personnel and contractor personnel will be working in or near permit spaces, as required by paragraph (d)(11) of this section; and

(v) Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations.

(9) In addition to complying with the permit space requirements that apply to all employers, each contractor who is retained to perform permit space entry operations shall:

(i) Obtain any available information regarding permit space hazards and entry operations from the host employer;

(ii) Coordinate entry operations with the host employer, when both host employer personnel and contractor personnel will be working in or near permit spaces, as required by paragraph (d)(11) of this section; and

(iii) Inform the host employer of the permit space program that the contractor will follow and of any hazards confronted or created in permit spaces, either through a debriefing or during the entry operation.

(d) *Permit-required confined space program.* Under the permit-required confined space program required by paragraph (c)(4) of this section, the employer 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:

(i) Specifying acceptable entry conditions;

(ii) Isolating the permit space;

(iii) Purging, inerting, flushing, or ventilating the permit space as necessary to eliminate or control atmospheric hazards;

(iv) Providing pedestrian, vehicle, or other barriers as necessary to protect entrants from external hazards; and

(v) Verifying that conditions in the permit space are acceptable for entry throughout the duration of an authorized entry.

(4) Provide the following equipment (specified in paragraphs (d)(4)(i) through (d)(4)(ix) of this section) at no cost to employees, maintain that equipment properly, and ensure that employees use that equipment properly:

(i) Testing and monitoring equipment needed to comply with paragraph (d)(5), of this section;

(ii) Ventilating equipment needed to obtain acceptable entry conditions;

(iii) Communications equipment necessary for compliance with paragraphs (h)(3) and (i)(5) of this section;

(iv) Personal protective equipment insofar as feasible engineering and work practice controls do not adequately protect employees;

(v) Lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency;

(vi) Barriers and shields as required by paragraph (d)(3)(iv) of this section;

(vii) Equipment, such as ladders, needed for safe ingress and egress by authorized entrants;

(viii) Rescue and emergency equipment needed to comply with paragraph (d)(9) of this section, except to the extent that the equipment is provided by rescue services; and

(ix) 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:

(i) 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;

(ii) Test or monitor the permit space as necessary to determine if acceptable entry conditions are being maintained during the course of entry operations; and

(iii) When testing for atmospheric hazards, test first for oxygen, then for combustible gases and vapors, and then for toxic gases and vapors.

Note: Atmospheric testing conducted in accordance with Appendix B to §1910.146 would be considered as satisfying the requirements of this paragraph. For permit space operations in sewers, atmospheric testing conducted in accordance with Appendix B, as supplemented by Appendix E to §1910.146, would be considered as satisfying the requirements of this paragraph.

(6) Provide at least one attendant outside the permit space into which entry is authorized for the duration of entry operations;

Note: Attendants may be assigned to monitor more than one permit space provided the duties described in paragraph (i) of this section can be effectively performed for each permit space that is monitored. Likewise, attendants may be stationed at any location outside the permit space to be monitored as long as the duties described in paragraph (i) of this section can be effectively performed for each permit space that is monitored.

(7) If multiple spaces are to be monitored by a single attendant, include in the permit program the means and procedures to enable the attendant to respond to an emergency affecting one or more of the permit spaces being monitored without distraction from the attendant's responsibilities under paragraph (i) of this section;

(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 by paragraph (g) of this section;

(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 section;

(11) Develop and implement procedures to coordinate entry operations when employees of more than one employer are working simultaneously as authorized entrants in a permit space, so that employ-

ees 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 the employer 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; and

Note: Examples of circumstances requiring the review of the permit-required confined space program are: any unauthorized entry of a permit space, the detection of a permit space hazard not covered by the permit, the detection of a condition prohibited by the permit, the occurrence of an injury or near-miss during entry, a change in the use or configuration of a permit space, and employee complaints about the effectiveness of the program.

(14) Review the permit-required confined space program, using the canceled permits retained under paragraph (c)(6) of this section within 1 year after each entry and revise the program as necessary, to ensure that employees participating in entry operations are protected from permit space hazards.

Note: Employers may perform a single annual review covering all entries performed during a 12-month period. If no entry is performed during a 12-month period, no review is necessary.

Appendix C to §1910.146 presents examples of permit entry programs that are considered to comply with the requirements of paragraph (d) of this section.

(c) *Permit system.* (1) Before entry is authorized, the employer shall document the completion of measures required by paragraph (d)(3) of this section by preparing an entry permit.

Note: Appendix D to §1910.146 presents examples of permits whose elements are considered to comply with the requirements of this section.

(2) Before entry begins, the entry supervisor identified on the permit shall sign the entry permit to authorize entry.

(3) The completed permit shall be made available at the time of entry to all authorized entrants, 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.

(4) The duration of the permit may not exceed the time required to complete the assigned task or job identified on the permit in accordance with paragraph (f)(2) of this section.

(5) The entry supervisor shall terminate entry and cancel the entry permit when:

(i) The entry operations covered by the entry permit have been completed; or

(ii) A condition that is not allowed under the entry permit arises in or near the permit space.

(6) The employer shall retain each canceled entry permit for at least 1 year to facilitate the review of the permit-required confined space program required by paragraph (d)(14) of this section. Any problems encountered during an entry operation shall be noted on the pertinent permit so that appropriate revisions to the permit space program can be made.

(f) *Entry permit.* The entry permit that documents compliance with this section and authorizes entry to 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 or by such other means (for example, through the use of rosters or tracking systems) as will enable the attendant to determine quickly and accurately, for the duration of the permit, which authorized entrants are inside the permit space;

Note: This requirement may be met by inserting a reference on the entry permit as to the means used, such as a roster or tracking system, to keep track of the authorized entrants within the permit space.

(5) The personnel, 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;

Note: Those measures can include the lockout or tagging of equipment and procedures for purging, inerting, ventilating, and flushing permit spaces.

(9) The acceptable entry conditions;

(10) The results of initial and periodic tests performed under paragraph (d)(5) of this section, accompanied by the names or initials of the testers and by an indication of when the tests were performed;

(11) The rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services;

Appendix B to §1910.146—Procedures for Atmospheric Testing

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, 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.

Appendix C to §1910.146—Examples of Permit-required Confined Space Programs Example 1.

Workplace. Sewer entry.

Potential hazards. The employees could be exposed to the following:

Engulfment.

Presence of toxic gases. Equal to or more than 10 ppm hydrogen sulfide. If the presence of other toxic contaminants is suspected, specific monitoring programs will be developed.

Presence of explosive/flammable gases. Equal to or greater than 10% of the lower flammable limit (LFL).

Oxygen Deficiency. A concentration of oxygen in the atmosphere equal to or less than 19.5% by volume.

A. Entry Without Permit/Attendant Certification.

Confined spaces may be entered without the need for a written permit or attendant provided that: 1.) the space is determined *not* to be a permit required confined space, or 2.) the space can be maintained in a safe condition for entry by mechanical ventilation alone. All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. Any employee required or permitted to pre-check or enter an enclosed/confined space shall have successfully completed, as a minimum, the training as required by the following sections of these procedures. *A written copy of operating and rescue procedures as required by these procedures shall be at the work site for the duration of the job.* The Confined Space Pre-Entry Check List must be completed by the LEAD WORKER before entry into a confined space. This list verifies completion of items listed below. This check list shall be kept at the job site for duration of the job. If circumstances dictate an interruption in the work, the permit space must be re-evaluated and a new check list must be completed.

Control of atmospheric and engulfment hazards.

Pumps and Lines. All pumps and lines which may reasonably cause contaminants to flow into the space shall be disconnected, blinded and locked out, or effectively isolated by other means to prevent development of dangerous air contamination or engulfment. Not all laterals to sewers or storm drains require blocking. However, where experience or knowledge of industrial use indicates there is a reasonable potential for contamination of air or engulfment into an occupied sewer, then all affected laterals shall be blocked. If blocking and/or isolation requires entry into the space the provisions for entry into a permit-required confined space must be implemented.

Surveillance. The surrounding area shall be surveyed to avoid hazards such as drifting vapors from the tanks, piping, or sewers.

Testing. The atmosphere within the space will be tested to determine whether dangerous air contamination and/or oxygen deficiency exists. An alarm only type gas monitor may be used. Testing shall be performed by the LEAD WORKER who has successfully completed the Gas Detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency, LFL, and hydrogen sulfide concentration. A written record of the pre-entry test results shall be

made and kept at the work site for the duration of the job. The supervisor will certify in writing, based upon the results of the pre-entry testing, that all hazards have been eliminated. Affected employees shall be able to review the testing results. The most hazardous conditions shall govern when work is being performed in two adjoining, connecting spaces.

Entry Procedures. If there are no non-atmospheric hazards present and if the pre-entry tests show there is no dangerous air contamination and/or oxygen deficiency within the space and there is no reason to believe that any is likely to develop, entry into and work within may proceed. Continuous testing of the atmosphere in the immediate vicinity of the workers within the space shall be accomplished. The workers will immediately leave the permit space when any of the gas monitor alarm set points are reached as defined. Workers will not return to the area until a SUPERVISOR who has completed the gas detector training has used a direct reading gas detector to evaluate the situation and has determined that it is safe to enter.

Rescue. Arrangements for rescue services are not required where there is no attendant. See the rescue portion of section B., below, for instructions regarding rescue planning where an entry permit is required.

B. Entry Permit Required

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

Control of atmospheric and engulfment hazards.

Surveillance. The surrounding area shall be surveyed to avoid hazards such as drifting vapors from tanks, piping or sewers.

Testing. The confined space atmosphere shall be tested to determine whether dangerous air contamination and/or oxygen

deficiency exists. A direct reading gas monitor shall be used. Testing shall be performed by the SUPERVISOR who has successfully completed the gas detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency, LFL and hydrogen sulfide concentration. A written record of the pre-entry test results shall be made and kept at the work site for the duration of the job. Affected employees shall be able to review the testing results. The most hazardous conditions shall govern when work is being performed in two adjoining, connected spaces.

Space Ventilation. Mechanical ventilation systems, where applicable, shall be set at 100% outside air. Where possible, open additional manholes to increase air circulation. Use portable blowers to augment natural circulation if needed. After a suitable ventilating period, repeat the testing. Entry may not begin until testing has demonstrated that the hazardous atmosphere has been eliminated.

Entry Procedures. The following procedure shall be observed under any of the following conditions: 1.) Testing demonstrates the existence of dangerous or deficient conditions and additional ventilation cannot reduce concentrations to safe levels; 2.) The atmosphere tests as safe but unsafe conditions can reasonably be expected to develop; 3.) It is not feasible to provide for ready exit from spaces equipped with automatic fire suppression systems and it is not practical or safe to deactivate such systems; or 4.) An emergency exists and it is not feasible to wait for pre-entry procedures to take effect.

All personnel must be trained. A self contained breathing apparatus shall be worn by any person entering the space. At least one worker shall stand by the outside of the space ready to give assistance in case of emergency. The standby worker shall have a self contained breathing apparatus available for immediate use. There shall be at least one additional worker within sight or call of the standby worker. Continuous powered communications shall be maintained between the worker within the confined space and standby personnel.

If at any time there is any questionable action or non-movement by the worker inside, a verbal check will be made. If there is no response, the worker will be moved immediately. **Exception:** If the worker is disabled due to falling or impact, he/she shall not be removed from the confined space unless there is immediate danger to his/her life. Local fire department rescue personnel shall be notified immediately. The standby worker may only enter the confined space in case

of an emergency (wearing the self contained breathing apparatus) and only after being relieved by another worker. Safety belt or harness with attached lifeline shall be used by all workers entering the space with the free end of the line secured outside the entry opening. The standby worker shall attempt to remove a disabled worker via his lifeline before entering the space.

When practical, these spaces shall be entered through side openings—those within 3 1/2 feet (1.07 m) of the bottom. When entry must be through a top opening, the safety belt shall be of the harness type that suspends a person upright and a hoisting device or similar apparatus shall be available for lifting workers out of the space.

In any situation where their use may endanger the worker, use of a hoisting device or safety belt and attached lifeline may be discontinued.

When dangerous air contamination is attributable to flammable and/or explosive substances, lighting and electrical equipment shall be Class 1, Division 1 rated per National Electrical Code and no ignition sources shall be introduced into the area.

Continuous gas monitoring shall be performed during all confined space operations. If alarm conditions change adversely, entry personnel shall exit the confined space and a new confined space permit issued.

Rescue. Call the fire department services for rescue. Where immediate hazards to injured personnel are present, workers at the site shall implement emergency procedures to fit the situation.

Example 2.

Workplace. Meat and poultry rendering plants.

Cookers and dryers are either batch or continuous in their operation. Multiple batch cookers are operated in parallel. When one unit of a multiple set is shut down for repairs, means are available to isolate that unit from the others which remain in operation.

Cookers and dryers are horizontal, cylindrical vessels equipped with a center, rotating shaft and agitator paddles or discs. If the inner shell is jacketed, it is usually heated with steam at pressures up to 150 psig (1034.25 kPa). The rotating shaft assembly of the continuous cooker or dryer is also steam heated.

Potential Hazards. The recognized hazards associated with cookers and dryers are the risk that employees could be: 1. Struck or caught by rotating agitator; 2. Engulfed in raw material or hot, recycled fat;

3. Burned by steam from leaks into the cooker/dryer steam jacket or the condenser duct system if steam valves are not properly closed and locked out;

4. Burned by contact with hot metal surfaces, such as the agitator shaft assembly, or inner shell of the cooker/dryer;

5. Heat stress caused by warm atmosphere inside cooker/dryer;

6. Slipping and falling on grease in the cooker/dryer;

7. Electrically shocked by faulty equipment taken into the cooker/dryer;

8. Burned or overcome by fire or products of combustion; or

9. Overcome by fumes generated by welding or cutting done on grease covered surfaces.

Permits. The supervisor in this case is always present at the cooker/dryer or other permit entry confined space when entry is made. The supervisor must follow the pre-entry isolation procedures described in the entry permit in preparing for entry, and ensure that the protective clothing, ventilating equipment and any other equipment required by the permit are at the entry site.

Control of hazards. Mechanical. Lock out main power switch to agitator motor at main power panel. Affix tag to the lock to inform others that a permit entry confined space entry is in progress.

Engulfment. Close all valves in the raw material blow line. Secure each valve in its closed position using chain and lock. Attach a tag to the valve and chain warning that a permit entry confined space entry is in progress. The same procedure shall be used for securing the fat recycle valve.

Burns and heat stress. Close steam supply valves to jacket and secure with chains and tags. Insert solid blank at flange in cooker vent line to condenser manifold duct system. Vent cooker/dryer by opening access door at discharge end and top center door to allow natural ventilation throughout the entry. If faster cooling is needed, use a portable ventilation fan to increase ventilation. Cooling water may be circulated through the jacket to reduce both outer and inner surface temperatures of cooker/dryers faster. Check air and inner surface temperatures in cooker/dryer to assure they are within acceptable limits before entering, or use proper protective clothing.

Fire and fume hazards. Careful site preparation, such as cleaning the area within 4 inches (10.16 cm) of all welding or torch cutting operations, and proper ventilation are the preferred controls. All welding and cutting operations shall be done in accordance with the requirements of 29 CFR Part 1910, Subpart Q. OSHA's

welding standard. Proper ventilation may be achieved by local exhaust ventilation, or the use of portable ventilation fans, or a combination of the two practices.

Electrical shock. Electrical equipment used in cooker/dryers shall be in serviceable condition.

Slips and falls. Remove residual grease before entering cooker/dryer.

Attendant. The supervisor shall be the attendant for employees entering cooker/dryers.

Permit. The permit shall specify how isolation shall be done and any other preparations needed before making entry. This is especially important in parallel arrangements of cooker/dryers so that the entire operation need not be shut down to allow safe entry into one unit.

Rescue. When necessary, the attendant shall call the fire department as previously arranged.

Example 3.

Workplace. Workplaces where tank cars, trucks, and trailers, dry bulk tanks and trailers, railroad tank cars, and similar portable tanks are fabricated or serviced.

A. During fabrication. These tanks and dry-bulk carriers are entered repeatedly throughout the fabrication process. These products are not configured identically, but the manufacturing processes by which they are made are very similar.

Sources of hazards. In addition to the mechanical hazards arising from the risks that an entrant would be injured due to contact with components of the tank or the tools being used, there is also the risk that a worker could be injured by breathing fumes from welding materials or mists or vapors from materials used to coat the tank interior. In addition, many of these vapors and mists are flammable, so the failure to properly ventilate a tank could lead to a fire or explosion.

Control of hazards.

Welding. Local exhaust ventilation shall be used to remove welding fumes once the tank or carrier is completed to the point that workers may enter and exit only through a manhole. (Follow the requirements of 29 CFR 1910, Subpart Q, OSHA's welding standard, at all times.) Welding gas tanks may never be brought into a tank or carrier that is a permit entry confined space.

Application of interior coatings/linings. Atmospheric hazards shall be controlled by forced air ventilation sufficient to keep the atmospheric concentration of flammable materials below 10% of the lower flammable limit (LFL) (or lower explo-

sive limit (LEL), whichever term is used locally). The appropriate respirators are provided and shall be used in addition to providing forced ventilation if the forced ventilation does not maintain acceptable respiratory conditions.

Permits. Because of the repetitive nature of the entries in these operations, an "Area Entry Permit" will be issued for a 1 month period to cover those production areas where tanks are fabricated to the point that entry and exit are made using manholes.

Authorization. Only the area supervisor may authorize an employee to enter a tank within the permit area. The area supervisor must determine that conditions in the tank trailer, dry bulk trailer or truck, etc. meet permit requirements before authorizing entry.

Attendant. The area supervisor shall designate an employee to maintain communication by employer specified means with employees working in tanks to ensure their safety. The attendant may not enter any permit entry confined space to rescue an entrant or for any other reason, unless authorized by the rescue procedure and, and even then, only after calling the rescue team and being relieved by as attendant by another worker.

Communications and observation. Communications between attendant and entrant(s) shall be maintained throughout entry. Methods of communication that may be specified by the permit include voice, voice powered radio, tapping or rapping codes on tank walls, signalling tugs on a rope, and the attendant's observation that work activities such as clipping, grinding, welding, spraying, etc., which require deliberate operator control continue normally. These activities often generate so much noise that the necessary hearing protection makes communication by voice difficult.

Rescue procedures. Acceptable rescue procedures include entry by a team of employee-rescuers, use of public emergency services, and procedures for breaching the tank. The area permit specifies which procedures are available, but the area supervisor makes the final decision based on circumstances. (Certain injuries may make it necessary to breach the tank to remove a person rather than risk additional injury by removal through an existing manhole. However, the supervisor must ensure that no breaching procedure used for rescue would violate terms of the entry permit. For instance, if the tank must be breached by cutting with a torch, the tank

surfaces to be cut must be free of volatile or combustible coatings within 4 inches (10.16 cm) of the cutting line and the atmosphere within the tank must be below the LFL.

Retrieval line and harnesses. The retrieval lines and harnesses generally required under this standard are usually impractical for use in tanks because the internal configuration of the tanks and their interior baffles and other structures would prevent rescuers from hauling out injured entrants. However, unless the rescue procedure calls for breaching the tank for rescue, the rescue team shall be trained in the use of retrieval lines and harnesses for removing injured employees through manholes.

B. Repair or service of "used" tanks and bulk trailers.

Sources of hazards. In addition to facing the potential hazards encountered in fabrication or manufacturing, tanks or trailers which have been in service may contain residues of dangerous materials, whether left over from the transportation of hazardous cargoes or generated by chemical or bacterial action on residues of non-hazardous cargoes.

Control of atmospheric hazards. A "used" tank shall be brought into areas where tank entry is authorized only after the tank has been emptied, cleansed (without employee entry) of any residues, and purged of any potential atmospheric hazards.

Welding. In addition to tank cleaning for control of atmospheric hazards, coating and surface materials shall be removed 4 inches (10.16 cm) or more from any surface area where welding or other torch work will be done and care taken that the atmosphere within the tank remains well below the LFL. (Follow the requirements of 29 CFR 1910, Subpart Q, OSHA's welding standard, at all times.)

Permits. An entry permit valid for up to 1 year shall be issued prior to authorization of entry into used tank trailers, dry bulk trailers or trucks. In addition to the pre-entry cleaning requirement, this permit shall require the employee safeguards specified for new tank fabrication or construction permit areas.

Authorization. Only the area supervisor may authorize an employee to enter a tank trailer, dry bulk trailer or truck within the permit area. The area supervisor must determine that the entry permit requirements have been met before authorizing entry.

Appendix D - 1B

Confined Space Entry Permit (Pre-Entry/Entry Check List)

Date and Time Expires: _____

Issued: _____

Job site: _____

Equipment to be worked on: _____

Pre-Entry (See Safety Procedure) _____

1. Atmospheric Checks:

| | | |
|-----------|-------|----------|
| Time | _____ | % |
| Oxygen | _____ | % L.F.L. |
| Explosive | _____ | % L.F.L. |
| Toxic | _____ | PPM |

2. Source isolation (No Entry):

| | | | |
|-------------------------|-----|-----|-----|
| Pumps or lines blinded, | () | () | () |
| discarded, or blocked | () | () | () |

3. Ventilation Modification:

| | | | |
|--------------------------|-----|-----|-----|
| Mechanical | () | () | () |
| Natural Ventilation only | () | () | () |
| Atmospheric check after | () | () | () |

4. Isolation and Ventilation:

| | | |
|-----------|-------|-------------------------|
| Oxygen | > | 19.5 % |
| Explosive | < | 10 % |
| Toxic | < | 10 PPM H ₂ S |
| Time | _____ | |

If conditions are in compliance with the above requirements and there is no reason to believe conditions may change adversely, then proceed to the permit space pre-entry check list. Complete and post with this permit. If conditions are not in compliance with the above requirements or there is reason to believe that conditions may change adversely, proceed to the Entry Check-List portion of this permit.

We have reviewed the work authorized by this permit and the information contained here-in. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the 'No' column. This permit is not valid unless all appropriate items are completed.

Permit and Check List Prepared By: (Supervisor) _____
Approved By: (Unit Supervisor) _____
Reviewed By: (Confined Space Operations Personnel): (Printed name & signature) _____

This permit to be kept at job site. Return job site copy to Safety Office following job completion.
Copies: White Original (Safety Office) Yellow (Unit Supervisor) Hazardous site

Job Supervisor: _____

Work to be performed: _____

Entry (See Safety Procedure)

1. Entry, standby, and back up persons: Yes No

Successfully completed required training? () ()

Is it current? () ()

2. Equipment: () ()

Direct reading gas monitor - () ()

tested () ()

Safety harnesses and lifelines () ()

for entry and standby persons () ()

Hoisting equipment () ()

Powered communications () ()

SCBA's for entry and standby () ()

persons () ()

Protective Clothing () ()

All electric equipment listed () ()

Glass I, Division I, Group D () ()

and Non-sparking tools () ()

3. Rescue Procedure: () ()

PERMIT VALID FOR 8 HOURS ONLY. ALL COPIES OF PERMIT WILL REMAIN AT JOB SITE UNTIL JOB IS COMPLETED
 SITE LOCATION and DESCRIPTION _____
 PURPOSE OF ENTRY _____
 SUPERVISOR(S) in charge of crews _____ Type of Crew Phone # _____

* BOLD DENOTES MINIMUM REQUIREMENTS TO BE COMPLETED AND REVIEWED PRIOR TO ENTRY*
 REQUIREMENTS COMPLETED DATE TIME REQUIREMENTS COMPLETED DATE TIME
 Lock Out/De-energize/TTY-out _____ Full Body Harness w/"D" ring _____
 Line(s) Broken-Capped-Blanked _____ Emergency Escape Retrieval Equip _____
 Purge-Flush and Vent _____ Lifelines _____
 Ventilation _____ Fire Extinguishers _____
 Secure Area (Post and Flag) _____ Lighting (Explosive Proof) _____
 Breathing Apparatus _____ Protective Clothing _____
 Resuscitator - Inhalator _____ Respirator(s) (Air Purifying) _____
 Standby safety personnel _____ Burning and Welding Permit _____
 Note: Items that do not apply enter N/A in the blank.
 ** RECORD CONTINUOUS MONITORING RESULTS EVERY 2 HOURS

CONTINUOUS MONITORING** Permissible
 TEST(S) TO BE TAKEN Energy Level _____
 PERCENT OF OXYGEN 19.5% to 23.5% _____
 LOWER FLAMMABLE LIMIT Under 10% _____
 CARBON MONOXIDE +35 PPM _____
 Aromatic Hydrocarbon + 1 PPM * 5PPM _____
 Hydrogen Cyanide (Skin) * 4PPM _____
 Hydrogen Sulfide +10 PPM * 15PPM _____
 Sulfur Dioxide + 2 PPM * 5PPM _____
 Ammonia * 35PPM _____
 * Short-term exposure limit: Employee can work in the area up to 15 minutes.
 + 8 hr. Time weighted Avg.: Employee can work in area 8 hrs (longer with appropriate respiratory protection).

REMARKS: _____
 GAS TESTER NAME & CHECK # INSTRUMENT(S) USED MODEL &/OR TYPE SERIAL &/OR UNIT # _____
 SAFETY STANDBY PERSON(S) CHECK # NAME OF SAFETY STANDBY PERSON(S) CHECK # _____
 SAFETY STANDBY PERSON IS REQUIRED FOR ALL CONFINED SPACE WORK
 SUPERVISOR AUTHORIZING ENTRY _____ AHBULANCS 2800 FIRE 2900
 ALL ABOVE CONDITIONS SATISFIED _____ Safety 4901 Gas Coordinator 4529/5387
 DEPARTMENT _____ phone _____ Original to Department Pink Copy to Safety

Appendix E to §1910.146—Sewer System Entry

Sewer entry differs in three vital respects from other permit entries; first, there rarely exists any way to completely isolate the space (a section of a continuous system) to be entered; second, because isolation is not complete, the atmosphere may suddenly and unpredictably become lethally hazardous (toxic, flammable or explosive) from causes beyond the control of the entrant or employer, and third, experienced sewer workers are especially knowledgeable in entry and work in their permit spaces because of their frequent entries. Unlike other employments where permit space entry is a rare and exceptional event, sewer workers' usual work environment is a permit space.

(1) *Adherence to procedure.* The employer should designate as entrants only employees who are thoroughly trained in the employer's sewer entry procedures and who demonstrate that they follow these entry procedures exactly as prescribed when performing sewer entries.

(2) *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 is encountered: oxygen concentration less than 19.5 percent; flammable gas or vapor at 10 percent or more of the lower flammable limit (LFL); or hydrogen sulfide or carbon monoxide at or above their PEL (10 ppm or 50 ppm, respectively); or, if a broad range sensor device is used, at 100 ppm as characterized by its response to toluene. Normally, the oxygen sensor/broad range sensor instrument is best suited for sewer entry. However, substance specific devices should be used whenever actual contaminants have been identified. The 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 entrants' 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.

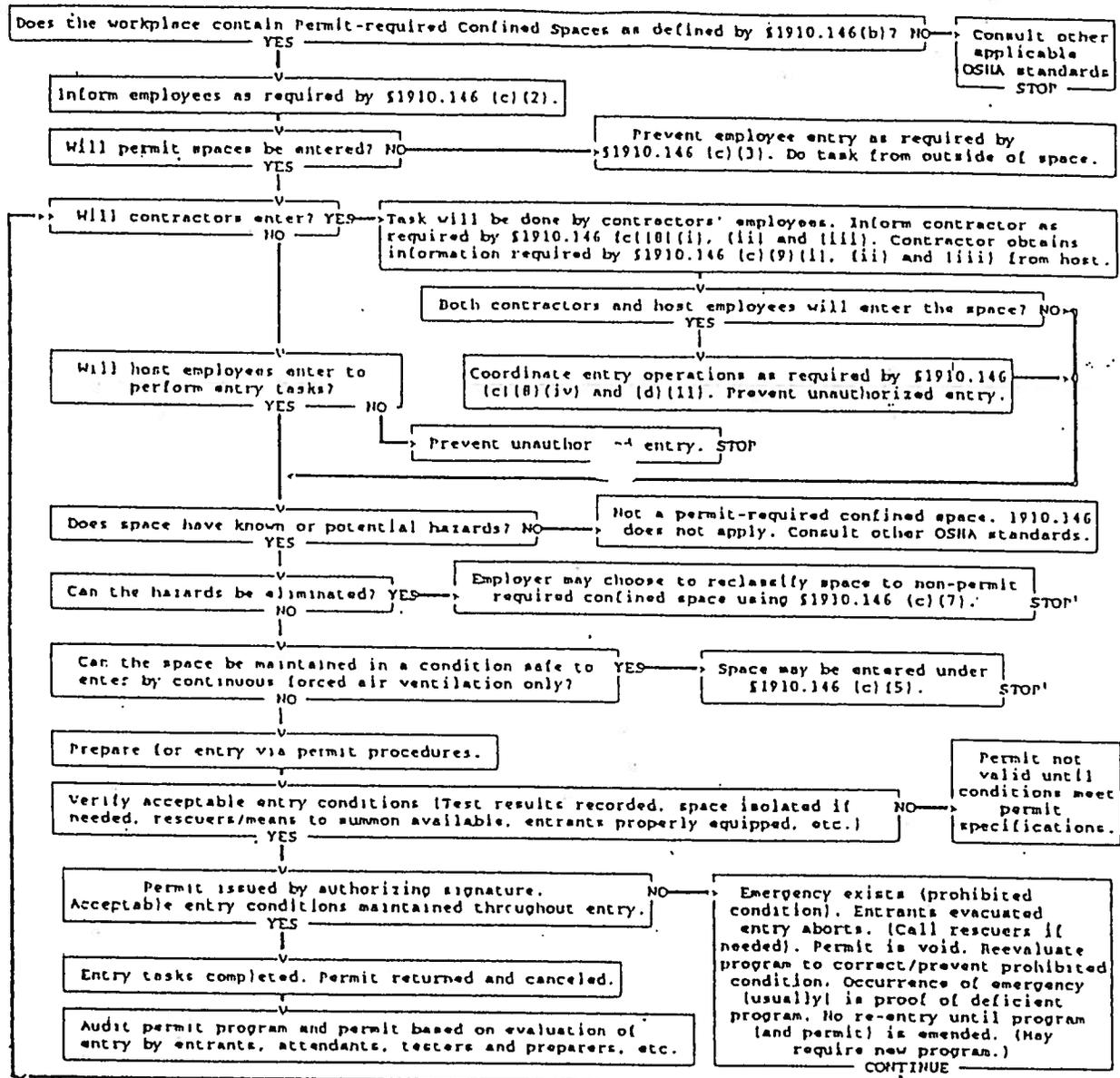
(3) *Surge flow and flooding.* Sewer crews should develop and maintain liaison, to the extent possible, with the local weather bureau and fire and emergency services in their area so that sewer work may be delayed or interrupted and entrants withdrawn whenever sewer lines might be suddenly flooded by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

(4) *Special Equipment.* Entry into large bore sewers 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 (ESCBAs) 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.

Appendix A to §1910.146—Permit-required
Confined Space Decision Flow Chart

Appendix A

Permit-required Confined Space Decision Flow Chart



* Spaces may have to be evacuated and re-evaluated if hazards arise during entry

equipment necessary for making rescues from permit spaces.

(ii) Each member of the rescue service shall be trained to perform the assigned rescue duties. Each member of the rescue service shall also receive the training required of authorized entrants under paragraph (g) of this section.

(iii) Each member of the rescue service shall 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. Representative permit spaces shall, with respect to opening size, configuration, and accessibility, simulate the types of permit spaces from which rescue is to be performed.

(iv) Each member of the rescue service shall be trained in basic first-aid and in cardiopulmonary resuscitation (CPR). At least one member of the rescue service holding current certification in first aid and in CPR shall be available.

(2) When an employer (host employer) arranges to have persons other than the host employer's employees perform permit space rescue, the host employer shall:

(i) Inform the rescue service of the hazards they may confront when called on to perform rescue at the host employer's facility, and

(ii) Provide the rescue service 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.

(3) To facilitate 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.

(i) 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, or above the entrant's head. Wristlets may be used in lieu of the chest or full body harness if the employer 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.

(ii) 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. A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet deep.

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

APPENDICES TO §1910.146—PERMIT-REQUIRED CONFINED SPACES

Note: Appendices A through E serve to provide information and non-mandatory guidelines to assist employers and employees in complying with the appropriate requirements of this section.

(12) The communication procedures used by authorized entrants and attendants to maintain contact during the entry;

(13) Equipment, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment, to be provided for compliance with this section;

(14) Any other information whose inclusion is necessary, given the circumstances of the particular confined space, in order to ensure employee safety; and

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

(g) *Training.* (1) The employer shall provide training so that all employees whose work is regulated by this section acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this section.

(2) Training shall be provided to each affected employee:

(i) Before the employee is first assigned duties under this section;

(ii) Before there is a change in assigned duties;

(iii) Whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained;

(iv) Whenever the employer has reason to believe either that there are deviations from the permit space entry procedures required by paragraph (d)(3) of this section or that there are inadequacies in the employee's knowledge or use of these procedures.

(3) The training shall establish employee proficiency in the duties required by this section and shall introduce new or revised procedures, as necessary, for compliance with this section.

(4) The employer shall certify that the training required by paragraphs (g)(1) through (g)(3) of this section 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.

(h) *Duties of authorized entrants.* The employer 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 the exposure;

(2) Properly use equipment as required by paragraph (d)(4) of this section;

(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 by paragraph (i)(6) of this section;

(4) Alert the attendant whenever:

(i) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or

(ii) The entrant detects a prohibited condition; and

(5) Exit from the permit space as quickly as possible whenever:

(i) An order to evacuate is given by the attendant or the entry supervisor,

(ii) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation,

(iii) The entrant detects a prohibited condition, or

(iv) An evacuation alarm is activated.

(i) *Duties of attendants.* The employer 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 the 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 paragraph (f)(4) of this section 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 paragraph (k)(1) of this section and if they have been relieved as required by paragraph (i)(4) of this section.

(5) Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space under paragraph (i)(6) of this section;

(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:

(i) If the attendant detects a prohibited condition;

(ii) If the attendant detects the behavioral effects of hazard exposure in an authorized entrant;

(iii) If the attendant detects a situation outside the space that could endanger the authorized entrants; or

(iv) If the attendant cannot effectively and safely perform all the duties required under paragraph (i) of this section;

(7) Summon 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:

(i) Warn the unauthorized persons that they must stay away from the permit space;

(ii) Advise the unauthorized persons that they must exit immediately if they have entered the permit space; and

(iii) 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; and

(10) Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

(j) *Duties of entry supervisors.* The employer 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 the 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 paragraph (e)(5) of this section;

(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, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

(k) *Rescue and emergency services.* (1) The following requirements apply to employers who have employees enter permit spaces to perform rescue services.

(i) The employer shall ensure that each member of the rescue service is provided with, and is trained to use properly, the personal protective equipment and rescue

29 CFR SECTION 1910.146—PERMIT-REQUIRED CONFINED SPACES

§ 1910.146 Permit-required confined spaces.

[1910.146 added by 58 FR 4549, January 14, 1993]

(a) *Scope and application.* This section contains requirements for practices and procedures to protect employees in general industry from the hazards of entry into permit-required confined spaces. This section does not apply to agriculture, to construction, or to shipyard employment (Parts 1928, 1926, and 1915 of this chapter, respectively).

(b) *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 and work within 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 employer's permit space program.

Authorized entrant means an employee who is authorized by the employer 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, and pits are spaces that may have limited means of entry.); and

(3) Is not designed for continuous employee occupancy.

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. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

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

Entry supervisor means the person (such as the employer, 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 section.

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 section 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;

Note: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.

(3) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;

(4) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, *Occupational Health and Environmental Control*, or in Subpart Z, *Toxic and Hazardous Substances*, of this part and which could result in employee exposure in excess of its dose or permissible exposure limit;

Note: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of

ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

(5) Any other atmospheric condition that is immediately dangerous to life or health.

Note: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard, § 1910.1200 of this part, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

Hot work permit means the employer'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 12–72 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.

Note: 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.